Dynamic Analysis on a Corporate Scandal and Its Recovery Process

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Abstract:

This study aims to reveal the fundamental structure and dynamics behind the lagged impact of a corporate scandal on its sales decline using the System Dynamics (SD) approach. The model simply represents a generic cycle of a corporate scandal and is calibrated to fit the data presented in a White Paper on the National Lifestyle 2008 published in Japan. These results show that the management of a corporate scandal becomes more difficult mainly because of a temporal improvement after the scandal without recognizing the fact that a steeper customer turnover occurs with a time delay. Appropriate corporate reactions to a corporate scandal are indispensable for corporate social responsibility but its forms vary according to the severity of the initial impact of the scandal. No reaction to a corporate scandal when the initial impact is limited sometimes results in a more desirable result for a company than that by taking some form of action, which implies that an overreaction to a small corporate scandal may ultimately result in a stronger sales decline. Ethical issues aside, this fact may cause intentional concealment of corporate scandals.

Keywords: Corporate reputation, corporate scandal, system dynamics, sales decline, lagged impact

1. Introduction

1.1. Problem background

Corporate reputation is one of the most important assets for companies because it substantially influences the buying decisions of customers (Helm, 2011; Maden et al., 2012; Swoboda et al., 2013) and causes a multitude of favourable impacts within various stakeholder groups (Tischer and Hildebrandt, 2013). It is of significant importance, especially, for companies that offer predominantly intangible assets (Babić-Hodović et al., 2011), which are difficult for companies to acquire and maintain for a long term but relatively easy to lose. Long-term retention of customers can no longer be taken for granted in today's changeable and uncertain economy (Podnar et al., 2012). Customer decline may occur naturally; however, artificial triggers are corporate scandals such as violation of laws, window dressing accounting and unethical conduct of employees.

Grant and Visconti (2006) analysed various cases of corporate scandals in the United States and Europe to conclude that most scandals were triggered by excessive passions of companies for further growth within a short term under resource constraints. They also reported that more rigorous requirements are in place for company executives to report higher achievements to board members than those occurring in the past, and they tend to neglect their efforts for compliance (Grant and Visconti, 2006). Although this fact implies that an essential cause of corporate scandals originates from the expectations of investors, investors are reluctant to accept the negative consequential results from their expectations. It is ironic that those who suffer greatest are those who originally create the potential suffering.

Once a scandal occurs, a company should immediately respond and communicate with its customers and society so that it can prevent severe customer turnover. However, most companies fail to manage such situations after scandals. Carnegie and O'Connell (2013) provided comprehensive surveys on corporate scandals and substantial impacts on corporate performances. Their longitudinal study in Australian enterprises revealed that governance reforms following corporate scandals have produced little significant change across the corporate sector (Carnegie and O'Connell, 2013). Their report implies that corporate reactions after scandals have not been entirely transformational in generating structural changes in corporate cultures. The reason was also analysed by Richardson and Kilfoyle, who stated that 'the complex interplay of factors in the regulatory environment encourages symbolic changes without real change in the behaviour of firms or a recycling of issues without resolution' (Richardson and Kilfoyle, 2009). Both studies support the theory such that counter reactions after corporate scandals are rather superficial and prevent the critical issues from being solved completely. Thus, structural analysis on a system is required for structural transformation of a company.

Historical records also show that companies generally fail to manage sales declines after scandals. Figure 1 shows the sales index of 13 Japanese companies that have endured corporate scandals (White Paper on the National Lifestyle, 2008). X represents the year of scandal occurrence, and the sales index is computed by the sales record of a particular year divided by that of year X. As shown in the figure, a significant decline in sales occurred because of a scandal in year X. However, more remarkable is the fact that sales continued to decline in the following years. A slight recovery occurred in year X+2 following the scandal; however, a more serious decline began after year X+3. Furthermore, in the present study, the average sales index was computed for five-year period prior to the scandal (112.4), two years following the scandal (97.7) and the following five years from X+3 to X+7 (65.5). The results indicate significant differences among these values ($\alpha = 0.01$), which means that although the primal impact of a scandal occurs immediately, a more severe secondary impact occurs with a certain time delay, which creates difficulties in managing corporate scandals. The mechanism of such unusual behaviour has not been fully studied thus far. Huang and Wilkinson (2013) mentioned that trust is a key dimension in business relationships, but low attention has been given to understanding the dynamics and evolution of trust and its causal mechanisms.

Many researchers have attempted to analyse the relationship between corporate reputation and financial performance (Babić-Hodović et al., 2011; Helm, 2011; Maden et al., 2012; Swoboda et al., 2013), but most faced challenges in isolating the causal impact of corporate reputation on financial performance (Tischer and Hildebrandt, 2013). This trend implies a limitation in the econometric case study approach. Moreover, several researchers have attempted to adopt a model process for a company's promotional activities (Maier, 1998; Milling, 2002;

Kondo, 2009; Ulli-Beer et al., 2010; Paich et al., 2011); however, the present study is designed to illuminate the management of a corporate scandal based on the company's protective activities. In this regard, Verhoeven et al. (2012) analysed the effects of apologies on a corporate crisis and determined that such a crisis response strategy did not significantly affect responses to the crisis in terms of trust and reputation. However, their studies solely focused on the influential relationship between corporate reaction and customer perception at the time of the crisis. The structural mechanism between the two was not specified.
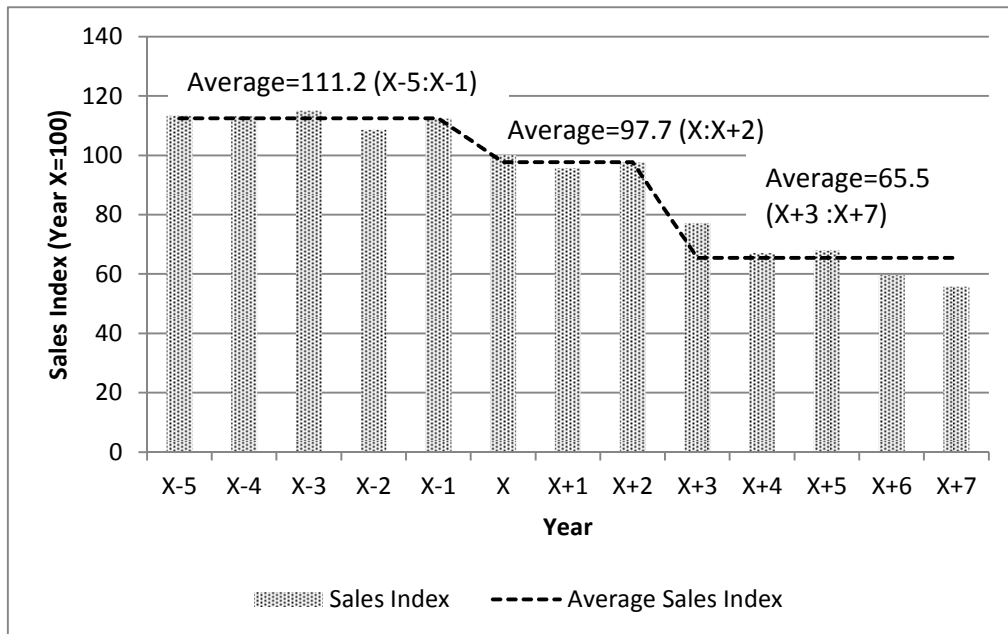

Figure 1 Sales index of 13 Japanese companies enduring corporate scandals

(Modified from the data of White Paper on the National Lifestyle, 2008)

1.2. Research purpose

Therefore, this study reveals the fundamental structure and dynamics behind the lagged impact of a corporate scandal on its sales. Previous researchers used case study approaches to mainly focus on the reasons for corporate scandal occurrence and the insufficient recovery of corporate performance (Grant and Visconti, 2006; Richardson and Kilfoyle, 2009; Podnar et al., 2012; Carnegie and O'Connell, 2013). However, little attention has been paid on the time delay between corporate scandals and corporate performance mainly because most of these studies have not effectively analysed the dynamics of customer interaction in a market during and after scandals, which in turn results in complex system behaviour. A dynamic simulation is required for understanding such time-dependent behaviour of customers relative to their buying decisions. Appropriate management of the recovery process from a corporate scandal requires an understanding of its structure and consequential results.

The significance of this research is not limited to business applications. Yet, as a Japanese proverb states, 'A natural disaster strikes when people lose their memory in the previous one', there is likely to be a common structure and dynamics associated with this type of phenomenon

in a social system. It is worth highlighting such typical dynamics for better management of a society in the future.

The reminder of the paper is composed as follows. Section 2 explains the methodology, Section 3 describes the model structure and data, Section 4 treats the model testing and Section 5 discusses the simulation results. Finally, section 6 summarises the key findings and mentions future work.

2. Methodology

One of the major difficulties in studying a corporate scandal is its data availability. Because corporate scandals are undesirable events for companies and employees, the staff members are generally reluctant to disclose detailed information on individual cases. Such an attitude creates difficulties in pursuing research on essential mechanisms of corporate scandals when using the case study approach, which generally requires in-depth interviews of internal individuals associated with the scandal. The System Dynamics (SD) approach is more suitable for corporate scandal issues than the case study approach because the former does not accuse specific individuals in the process of problem solving (Edahiro and Naito, 2007). Rather, the SD approach generally attributes any cause of an issue to the system structure, which in turn causes the issue (Sterman, 2000). Confidentiality is a key to success in this type of research.

Moreover, the direct effects of a corporate scandal are difficult to quantify for each individual case (Ivaschenko, 2004). Hence, for the purpose of modelling and simulation, this study used the aggregated statistical data of the Japanese government published in a White Paper on the National Lifestyle 2008 (Figure 1), which provides 13 historical records of Japanese companies on their corporate sales prior to and following corporate scandals. The present study reveals the fundamental structure and dynamics behind the lagged impact of corporate scandals on its sales. Hence, aggregated data of several companies are sufficient for reproducing common system behaviours associated with a corporate scandal. Furthermore, the aggregation contributes in eliminating the influences of deviated circumstances of individual cases that are treated as errors.

SD is introduced in the present study for considering interactions and transitional states of customers and time delays associated with a scandal event, in addition to corporate reactions within the entire cycle. SD is a method used to model the nonlinear dynamics of complex systems and was developed by Jay Forrester at the Massachusetts Institute of Technology in the 1950s (Sterman, 2000; Nakano and Minato, 2012). The SD simulation is capable of representing physical and information flows on the basis of information feedback controls that are continuously converted into decisions and actions (Suryani et al., 2010).

Several simulation models can be developed by using a Stock and Flow Diagram (SFD) according to the simulation purpose. As shown in Figure 2, this diagram uses several graphical icons such as stock, flow, valve and cloud icons to express a system. Stocks are integrated accumulations of inflows and outflows. Inflows are represented by pipes leading into a stock, and outflows are illustrated by pipes leading out. Valves in the middle of each pipe control the inflows and outflows. Clouds represent the sources, and sinks represent the flows (Sterman, 2000). SFD enables an understanding of various behaviours of a system according to different scenarios. The graphical notation facilitates modelling and the understanding of a complex system in a simple manner. For mathematical modelling, assume that the system state is represented by stock (t):

$$\text{stock(t)} = \int_{t_0}^{t} [inflow(s) - outflow(s)]ds + stock\ (t_0) \qquad \text{Eq. (1)}$$

where t_0 is initial time, t is terminal time, inflow is a flow connected into to the stock and outflow is a flow connected out from the stock. The deferential of the stock at time t is then calculated by

$$\frac{d(Stock)}{dt} = Inflow\ (t) - Outflow(t) \qquad \text{Eq. (2)}$$

Figure 2 Generic structure of stock and flow

3. Modelling

3.1. Model design: a conceptual model

Figure 3 illustrates a conceptual model representing sequential transitions of several customer states. For model simplification, it is assumed that a company that operates a single business delivers products with a certain lifetime to customers within a market of a fixed population.   It is also assumed that four customer states are included in the entire customer experiences: potential, supporting, criticizing and indifferent.

Companies usually remain in the nominal operation phase but can be suddenly transitioned to the corporate scandal phase when triggered by various factors such as accidental events, customer claims, inspections and whistle-blowing reports. The public learns of a scandal either immediately or gradually, and the phase then transitions to public perception. The time delay depends on the method used to transmit information regarding the scandal such as self-disclosure, mass media, social network service or governmental announcement. Diffusion of both positive and negative information through word of mouth is a critical element for understanding the public perception process in a corporate scandal. With a time delay, companies begin to respond to the undesirable situations and the phase transitions to corporate reaction. At this stage, a press conference is sometimes held, the business may temporally shut down, executive officers may resign and an apology advertisement may be distributed. Such reactions aim at acquiring reconsideration from customers who have come to dislike the company. With a time delay, companies are also able to recover some of the declined sales due to the customer reconsideration if their reactions are appropriate. A dynamic simulation tool is required for analysing the time-dependent behaviours of the customers and the sales in the entire cycle.

Nominal operation is represented by transitions from the potential to the supporting by adoption of the company's products. Two measures of adoption are assumed: adoptions by promotion such as advertisement and adoptions by word of mouth such as good reputation. Customers are assumed to discard the purchased product considering its average product lifetime. It was assumed that these discards would occur for only customers who are satisfied with the product. On the contrary, it was also assumed that the customer would leave at a certain rate because of unsatisfaction.

A corporate scandal is represented by transitions from the supporting to the criticizing. Two measures of leaving are assumed: sudden departures in face of scandals and gradually departures by word of mouth such as bad reputation. The number of sudden departures depends on the severity of scandals.

A corporate reaction is represented by a transition from the criticizing to the potential. It was assumed that some customers who already disliked the product would reconsider their attitudes to become customers again by the company's appropriate countermeasures such as the posting of an apology advertisement.

Performance recovery is represented by a transition from criticizing to indifferent, which reflects the exponential nature of the forgetting process of humans, which was first reported by Hermann Ebbinghaus (1885). It was assumed that some criticizing customers would forget either the unsatisfactory experience or the bad reputation of a corporate scandal at a certain rate. Such customers do revert back to potential but just become indifferent to the product, which implies that once customers become indifferent for a product, they never become customers again in the simulation.
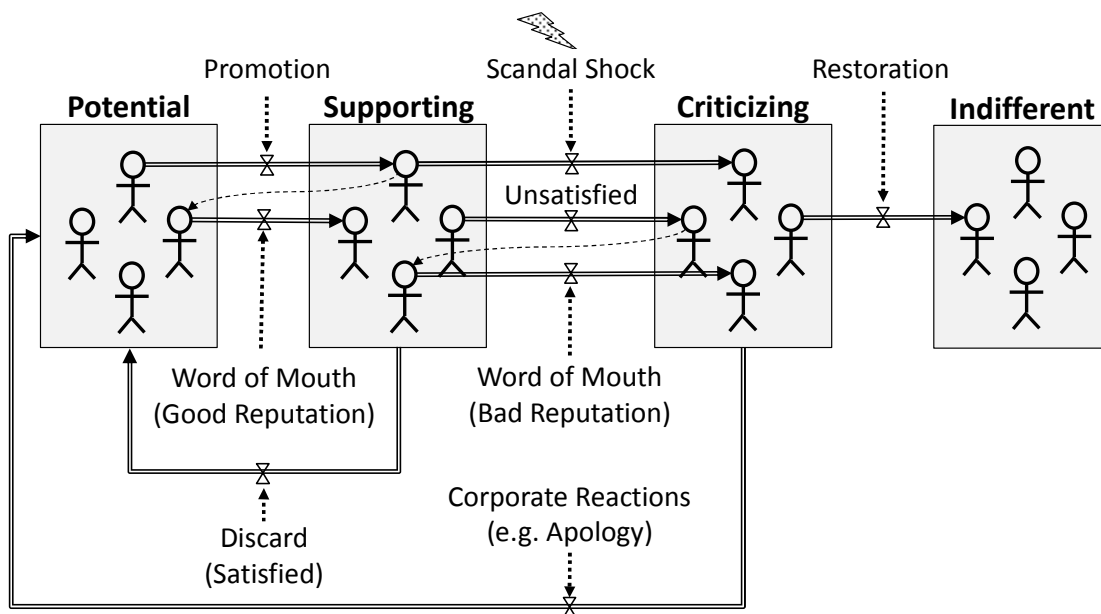

Figure 3 Conceptual model representing sequential transitions of several customer states.

3.2. Model building: a simulation model

Figure 4 shows a SFD representing the customer transition states defined in Figure 3. The

Bass diffusion model (Bass, 1969) was adopted with some modification using Sterman's replacement purchase model (Sterman, 2000). The model was kept simple to effectively represent the aggregated index data and to present a fundamental mechanism of a corporate scandal and its impact on sales. Four stock variables are used in the model: Potential Customers, Supporting Customers, Criticizing Customers and Indifferent Customers.

The transition from the Potential Customers to the Supporting Customers is triggered by adoption (A_t^{total}), which is calculated by

$$A_t^{total} = \text{MIN}\ (A_t^{ad} + A_t^{wom},\ C_t^{potential})$$ Eq. (3)

where A_t^{ad} is Adoption by Advertisement and A_t^{wom} is Adoption by Good Reputation. The MIN function is used for non-negativity of the stock. Adoption by Advertisement is calculated by

$$A_t^{ad} = C_t^{potential} \times \text{Ad Effectiveness}$$ Eq. (4)

where $C_t^{potential}$ is the number of potential customers, and Ad Effectiveness defines the rate of adoption because of proactive advertisement activities of a company. Adoption by Good Reputation is calculated by

$$A_t^{wom} = C_t^{potential} \times Contact\ Rate \times Adoption\ Fraction \times \frac{C_t^{supporting}}{Total\ Population}$$
Eq. (5)

where Contact Rate defines the number of encounters held by a customer each month, and Adoption Fraction defines the rate of adoption because of a good reputation of a company. $C_t^{supporting}$ is the number of supporting customers, and Total Population defines the market size. When customers are satisfied with the adopted product, they are assumed to discard it, considering the average lifetime in Eq. (6):

$$D_t = MIN\ (\frac{C_t^{supporting}}{Average\ Lifetime}, C_t^{supporting})$$ Eq. (6)

where Average Lifetime defines the average time a product is used by a customer. The MIN function is used again for non-negativity of the stock. On the contrary, customers are also assumed to reject the product at a certain rate, which is defined by Unsatisfaction Rate in the model.

Transition from a Supporting Customer to a Criticizing Customer is triggered by rejection (R_t^{total}), which is calculated by the sum of three different forms of rejections:

$$R_t^{total} = MIN\ (R_t^{unsatisfied} + R_t^{boycott} + R_t^{reputation},\ C_t^{supporting}) \qquad \text{Eq. (7)}$$

where $R_t^{unsatisfied}$ is the number of monthly rejections because of unsatisfaction with the product calculated in Eq. (8), and $R_t^{boycott}$ is the number of sudden rejections because of the corporate scandal calculated in Eq. (9). The MIN function is used again for non-negativity of the stock:

$$R_t^{unsatisfied} = C_t^{supporting} \times Unsatisfaction\ Rate \qquad \text{Eq. (8)}$$

$$R_t^{boycott} = C_t^{supporting} \times Severity \times Scandal\ Shock \qquad \text{Eq. (9)}$$

where Severity defines the rate of rejection by the number of supporting customer for corporate scandals, and Scandal Shock generates a shot of a scandal event using the PULS function considering Months to Scandal from the simulation start. $R_t^{reputation}$ is the number of gradual rejections by Supporting Customers influenced by corporate scandals, which is calculated in Eq. (10):

$$R_t^{reputation} = C_t^{supporting} \times Contact\ Rate \times Strength\ of\ Criticism$$
$$\times \frac{C_t^{criticizing}}{Total\ Population}$$

$$\text{Eq. (10)}$$

where $C_t^{criticising}$ is the number of criticizing customers, and Strength of Criticism is defined by the ratio of criticizing opinions and supportive opinions in the entire market.

Two outflows from the criticising customers are assumed: Restoration ($O_t^{restoration}$), which represents customers' natural forgetting of corporate scandals over time calculated in Eq. (11), and Reconsideration ($O_t^{reconsideration}$), which represents customers' behaviour to repurchase the product because of company's appropriate reactions calculated in Eq. (12).

$$O_t^{restoration} = MIN\ (\frac{C_t^{criticizing}}{Average\ Forgetting\ Time}, C_t^{criticizing}) \qquad \text{Eq. (11)}$$

$$O_t^{reconsideration}$$

$$= MIN\ (C_t^{criticizing}$$

$$\times\ Effectiveness\ of\ Corporate\ Reaction, C_t^{criticizing})$$

<div align="right">Eq. (12)</div>

where Effectiveness of Corporate Reaction defines the rate of reconsidering customers who are likely to repurchase the product. The variable Special Effort is introduced to define the rate at which a company reacts to a corporate scandal. Months to Scandal is also considered for the time delay. The MIN function is used again for non-negativity of the stock.
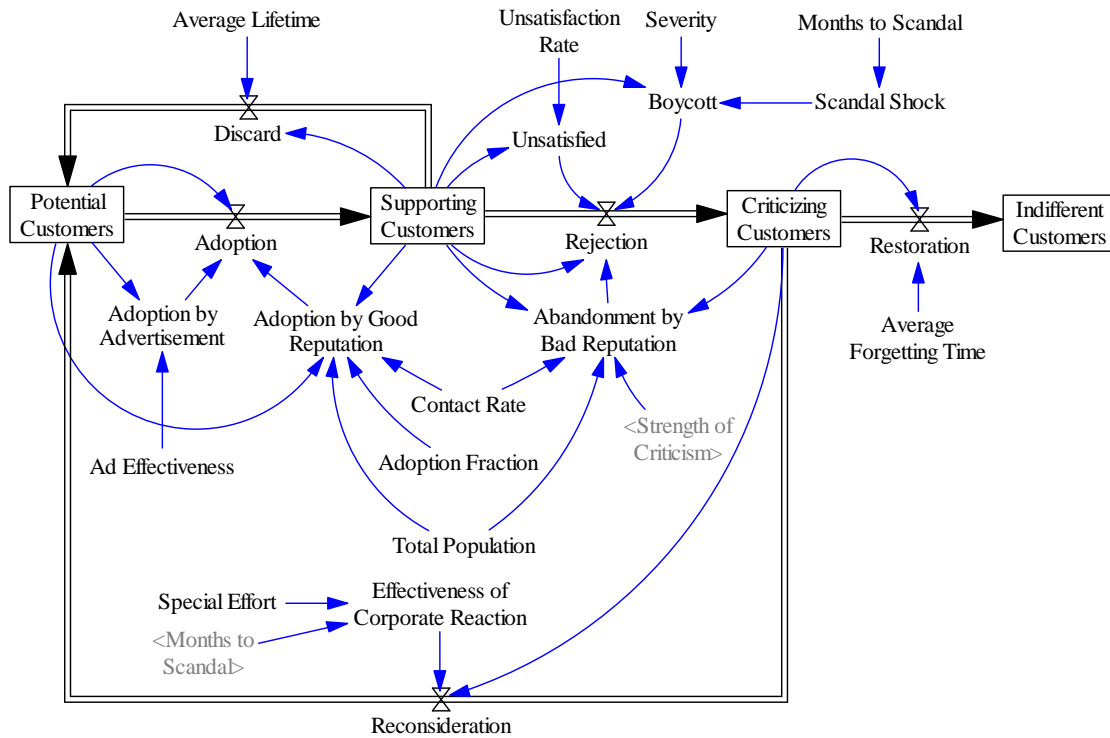
Figure 4 Customer state transition conditions

Figure 5 shows a SFD that represents the criticism strength on the basis of the co-flow structure. It was assumed that criticism would occur at every rejection, which is accumulated to stock in Criticizing Opinions ($Opinion_t^{criticizing}$) in Eq. (13). It was also assumed that the criticism would disappear considering average time for disappearance in Eq. (14).

$$Criticism_t^{appear} = R_t^{total} \times Average\ Criticizm\ per\ Rejecter \qquad \text{Eq. (13)}$$

$$Criticism_t^{disappear} = \frac{Opinion_t^{Criticizing}}{Averate\ Time\ to\ Criticism\ Disappear} \qquad \text{Eq. (14)}$$

In the same manner, it was assumed that appraisal would occur at every adoption, which is accumulated to stock in Supporting Opinions ($Opinion_t^{supporting}$) in Eq. (15). It was also assumed that the appraisal would disappear considering the average time for disappearance in Eq. (16). Strength of Criticism is defined as the ratio of Supporting Opinions and Criticizing Opinions and is calculated in Eq. (17).

$$Appraisal_t^{appear} = R_t^{total} \times Average\ Appraisal\ per\ Adopter \qquad \text{Eq. (15)}$$

$$Appraisal_t^{disappear} = \frac{Opinion_t^{Supporting}}{Averate\ Time\ to\ Appraisal\ Disappear} \qquad \text{Eq. (16)}$$

$$Criticism_t^{strength} = \frac{Opinion_t^{criticizing}}{Opinion_t^{criticizing} + Opinion_t^{supporting}} \qquad \text{Eq. (17)}$$
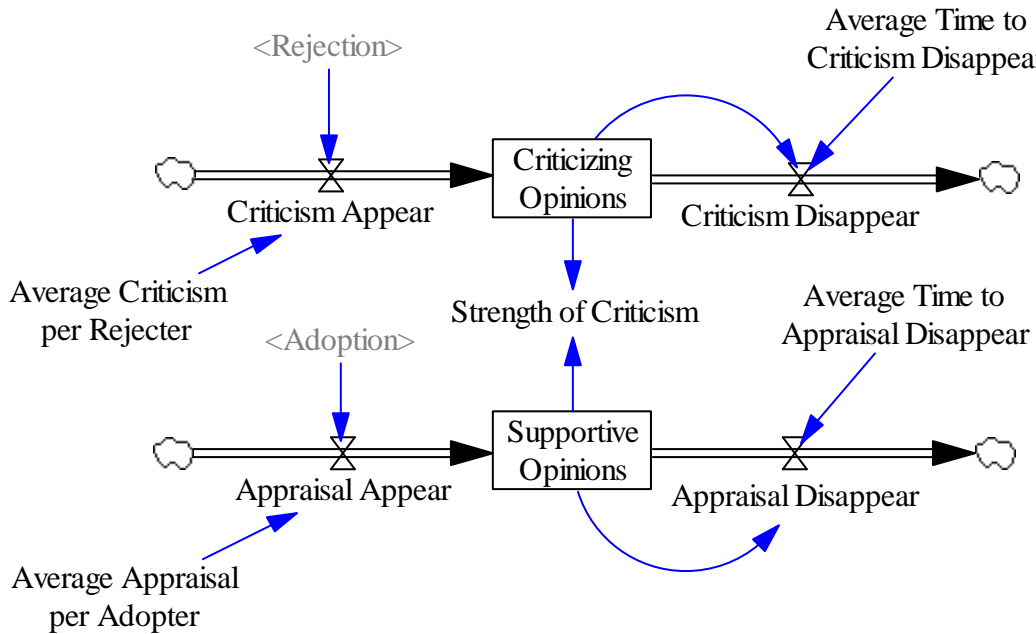
Figure 5 Strength of criticism

Finally, cash flow of the company was calculated by using the stock and flow model shown in Figure 6. Cash In is the multiple of Unit Revenue and Adoption calculated in Eq. (18). Annual Sales is calculated at the end of the fiscal year in Eq. (19) and is modelled by using the PULS TRAIN function at intervals of 12 time units. At the end of fiscal year, the accumulated Cash In amount is deducted from the stock Cash Flow, which enables the calculation of financial performance to restart for following year.

$$Cash\ In_t = Unit\ Revenue \times A_t^{total} \qquad \text{Eq. (18)}$$

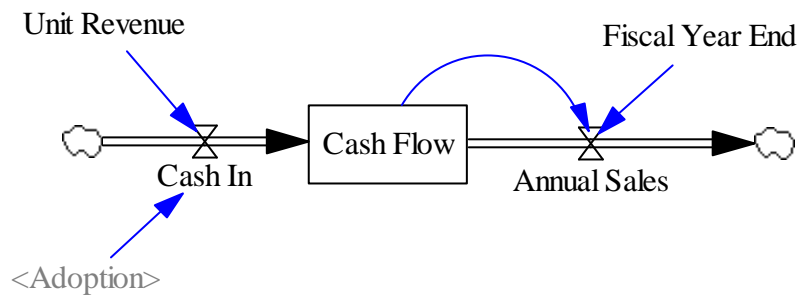$$Annual\ Sales_t = Cash\ Flow \times Fiscal\ Year\ End \qquad \text{Eq. (19)}$$

Figure 6 Cash Flow diagram

4. Model testing

The model was calibrated to fit the data in the White Paper on National Lifestyle 2008. The results of the first 12 months were discarded as a warm-up period of the simulation. Because the Bass model was adopted, the diffusion period of the product during the first several months is included in the simulation. However, the issue of the research begins at the saturation of product, as described in Figure 1. Thus, simulation results are used by removing the first 12 months in the model testing and following analysis and discussions of the simulation results. The parameters for model testing are summarized in Table 1.

The validity of the model behaviour can be examined by comparing the simulation results (X_m) and the historical records (X_d) in terms of Annual Sales. Although mean absolute error (MAE) and mean absolute percentage error (MAPE) both provide a measure of the average error between the simulated and actual series (Sterman, 2000), MAPE is dimensionless. Figure 7 shows a comparison of the simulation results (X_m) and the historical records (X_d); a fit between the two data series is evident. Statistically, MAE was 4.7, MAPE was 5.18% and the coefficient of determination (R^2) was 0.97. Therefore, the model is well tested and can be used for the simulation.
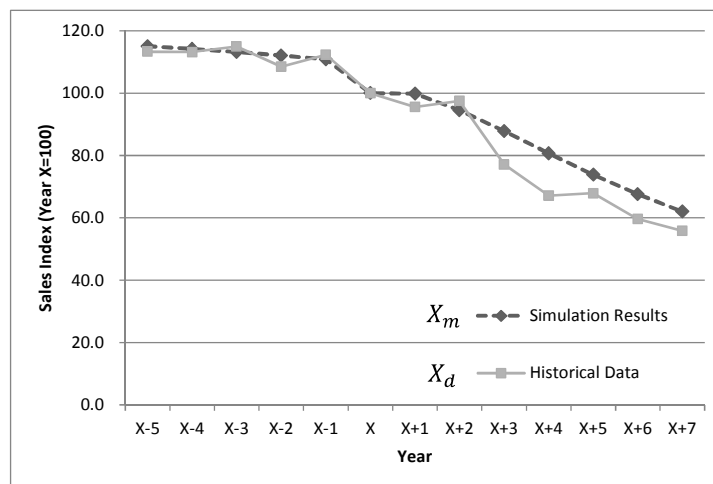

Figure 7 Graphic comparison of historical data and simulation results

Table. 1 Parameters for model testing

Name of Parameters	Value	Unit
Ad Effectiveness	0.01	
Contact Rate	4	people
Adoption Fraction	0.05	
Average Lifetime	2	Months
Unsatisfaction Rate	0.01	
Severity	0.5	
Months to Scandal	60	Months
Average Forgetting Time	60	Months
Effectiveness of Corporate Reactions	0	
Average Criticism per Rejecter	2	
Average Appraisal per Adopter	1	
Average Time for Criticism to Disappear	2	Months
Average Time for Appraisal to Disappear	1	Month
Unit Revenue	100	USD

5. Results and discussions

5.1. No-scandal scenario

The initial simulation was ran on a scenario with no scandal and did not include any events that resulted in customer turnover except for inevitable abandonments of the product according to a certain unsatisfaction rate (1%) and the subsequent word of mouth effect. Because only a small amount of criticism was generated on the product, the sales index continued to be stable over time (Figure 8). This stable behaviour can be explained by Figure 9, which shows the number of customers during each state. The simulation results are presented in month from the initial year (week 0) to the final year (week 156) for more precise understanding of the behaviour. The number of Supporting Customers remained at approximately 300, which in turn generated stable revenue to the company, and that of Criticizing Customers increased during the first few years to reach a maximum level at approximately 48 months. The model successfully reproduced the stable behaviour of the business system at the time of normal operation. That is, the model generally fits actual conditions without a scandal.
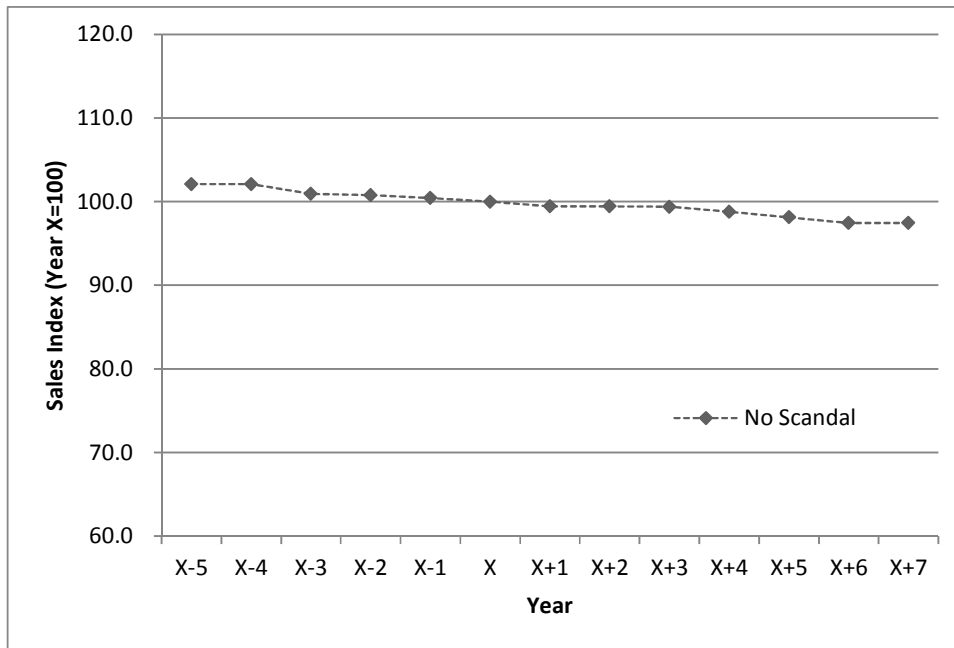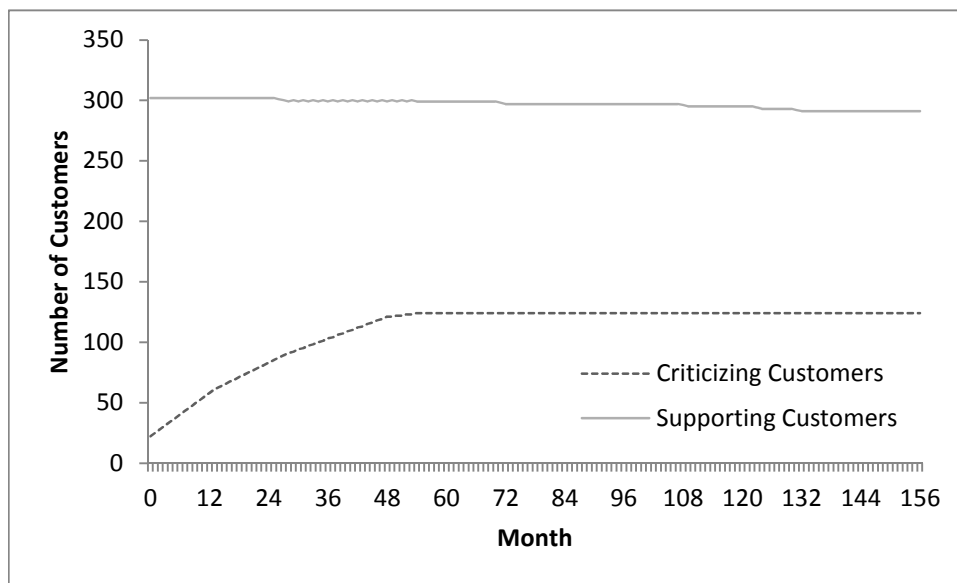
Figure 8 Sales index in no-scandal scenario

Figure 9 Number of customers in no-scandal scenario

5.2. Scandal scenarios

The next simulation was ran with a scandal scenario that includes one shot of a corporate scandal assumed to occur in year 5 (week 60), in accordance with the data in the White Paper on National Lifestyle 2008.

Figure 10 shows the sales index under the scandal scenario, which clearly indicates a sudden drop in sales during the year of scandal occurrence. The company's sales were maintained for a few years after the scandal but gradually began to decline in the years following. This behaviour can be explained by Figure 11, which shows the number of customers during

each state. A clearer impact of the scandal can be found in Supporting Customers. During the first five years, a stable number of supporting customers is shown, as in the previous scenario of no scandal; however, the number suddenly drops in week 60 to nearly half that of the previous month (Figure 11), which reflects the severity of the scandal set as 0.5 in the simulation.
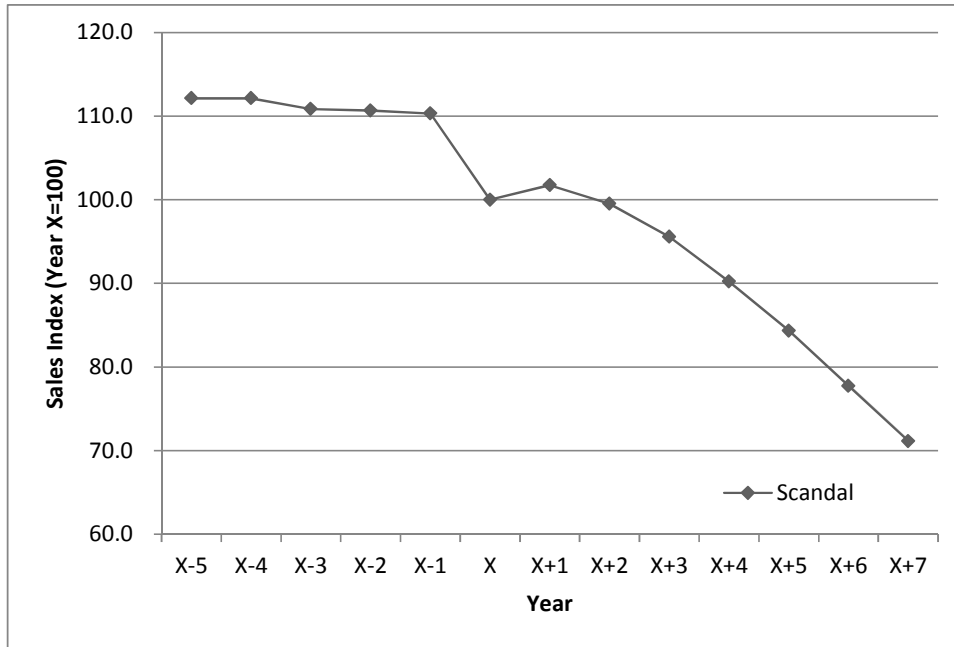

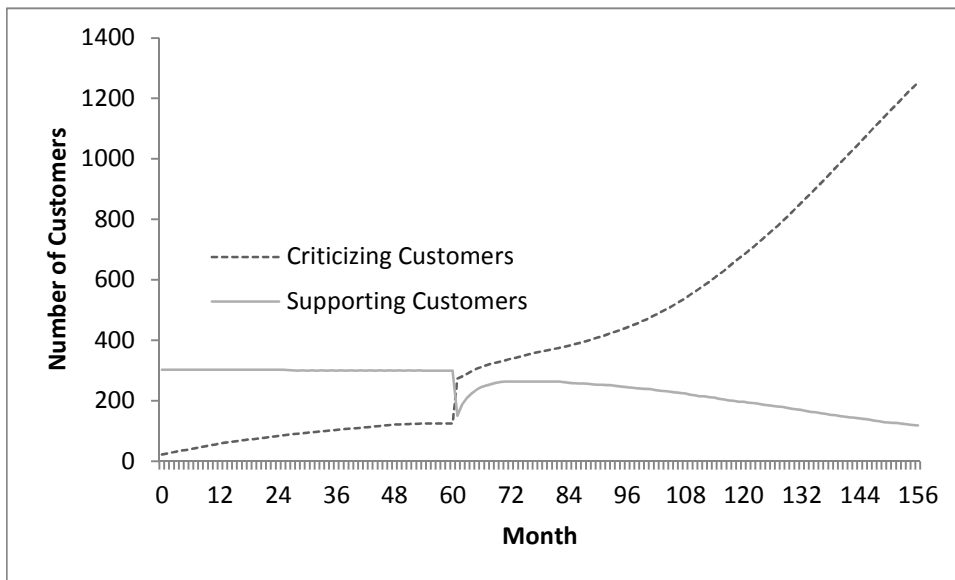**Figure 10 Scandal scenario including sales index**

Figure 11 Scandal scenario including Criticizing and Supporting customers.

On the contrary, the number of Criticizing Customers suddenly increased at the time of the scandal (Figure 11) and continued to increase in the following years. This behaviour can be explained by Boycott (Figure 12) and Abandonment by Bad Reputation (Figure 13). The sudden rise was caused by the boycott, which simultaneously occurred at the time of scandal and reflects an active disliking behaviour of the customers. As a result of the criticizing, negative impressions

of the product began to be distributed to other customers who still utilized the product. Some remaining customers are expected to be affected by the distributed negative information and will likely abandon the product in the end. Although the corporate scandal was only a single event during the simulation period (Figure 12), its impact continued to affect the system behaviour mainly because of the abandonment of the product by the bad reputations diffused in the market (Figure 13). The lagged impact on sales is likely caused by the remaining influence of the company's bad reputation.
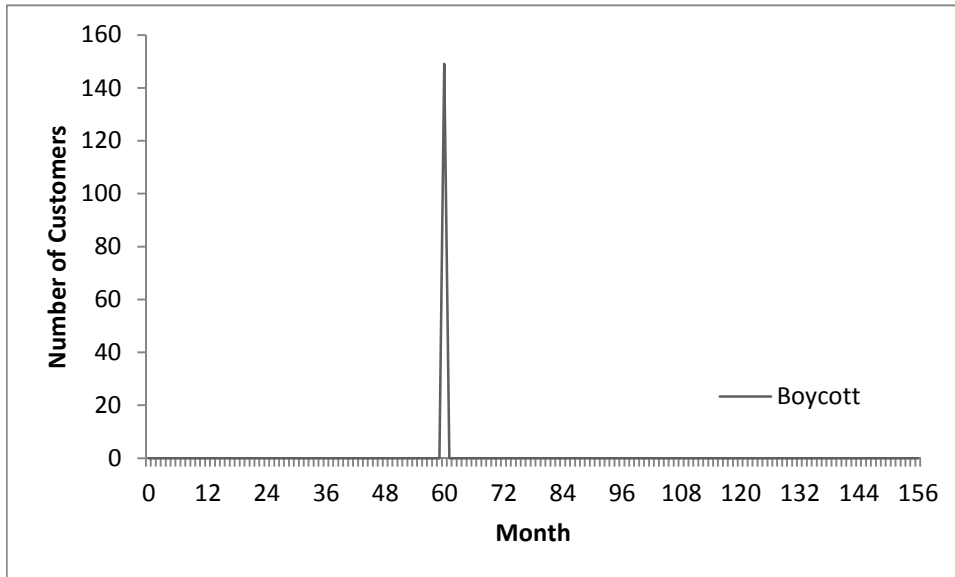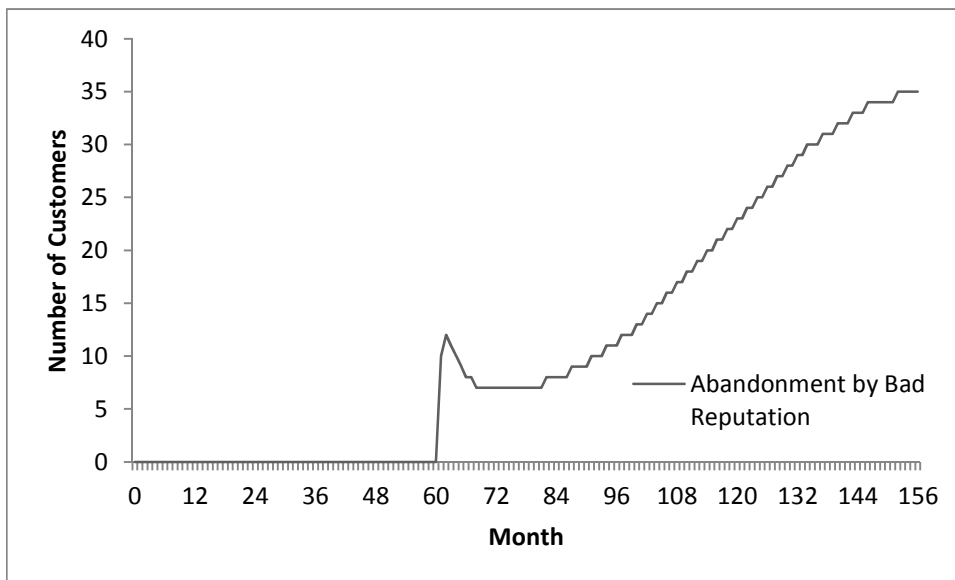
Figure 12 Scandal scenario including Boycott

Figure 13 Scandal Scenario including Abandonment by Bad Reputation

Management of the scandal is difficult because of the temporal improvement, or more precisely, the temporal decrease, in the number of Abandonment by Bad Reputation customers after the scandal (Figure 13). However, such a decrease is temporal and followed by a steep increase. This result likely occurred because customers may have been easily satisfied with the

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appearance of convergence in the bad reputation diffusion and may have begun to neglect efforts for managing the situation without understanding the more serious impact of the scandal in the future. The delay of the impact is one of the reasons a company fails to manage a corporate scandal and its decline in sales. Therefore, it is critical to manage the influence of Criticizing Customers by providing appropriate corporate reactions directly following a scandal. The next simulation thus includes corporate reactions that aim to decrease the number of Criticizing Customers.

5.3. Scandal with Corporate Reaction

The next simulation was ran on a scandal scenario with a corporate reaction, which assumes that a company would make a certain amount of effort to decrease the number of Criticizing Customers who are likely to distribute negative impressions on the product in a market. Such counter reactions are often taken for granted in terms of corporate social responsibility (CSR). CSR generates consumer trust in a company, which in turn results in positive perceptions of the company by consumers (Mitra, 2011; Park et al., 2014).

Corporate reactions following a scandal are implemented in several forms such as press conferences and apology advertisements. Such reactions aim at acquiring reconsideration of the Criticizing Customers who have already formed a dislike of the product. In the SD model (Figure 4), the customer reconsideration behaviour is modelled as a returning flow from Criticizing Customers to Potential Customers triggered by Effectiveness of Corporate Reaction. The special effort represents the rate at which corporate reactions are effective for the purpose of regaining customers' trust. For example, a special effort of 1.0% indicates that 1.0% of Criticizing Customers decided to return as Potential Customers who are likely to purchase the product again in the future. It was assumed that corporate reactions would begin only after the scandal and not beforehand.

A parametric study on special effort was implemented with settings of 0% (No Reaction), 0.5%, 1.0%, 1.5%, 3% and 10%. Figure 14 shows the results on sales index. As also shown in Figure 10, the no-reaction scenario shows a continuous decline in sales over time. When special effort is set at 0.5%, a slight recovery of sales occurs, but a continuous decline remains. When special effort is increased to 1.0%, the sales significantly recover, but the trend of decline does not change. The sales decline stops only when the effort is set at 1.5%, which implies that the customer behaviour reaches equilibrium at approximately 1.5% of special effort by a company. However, the equilibrium does not necessarily indicate that the sales have fully recovered to the previous state. Figure 14 illustrates that 3% of special effort gradually improves the sales over time but in order to recover to nearly the previous level, 10% of special effort is required. This result implies that the current effort level by a company is insufficient for accomplishing a complete recovery of sales following a scandal.

This phenomenon can be explained by analysing the number of Criticizing Customers for each scenario. As shown in Figure 15, the number of Criticizing Customers does not decrease when special effort is set at 0%, 0.5% and 1.0%. The number begins to decline at 1.5% and further declines at 3.0%, nearly disappearing in the end at 10% special effort. In the scenario of 10%, the rapid decline in the number of Criticizing Customers can prevent negative impressions of the product from being diffused by word of mouth in a market. The special effort rate required for managing a corporate scandal partly depends on a company's strategic objective definition. If

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a company would like to pursue a nearly perfect recovery, an effort rate of approximately 10% or more is required, as indicated by the simulation. Conversely, if a company does not pursue a perfect recovery but is nonetheless able to reach an equilibrium state of sales following a scandal, the required effort rate is only approximately 1.5%.
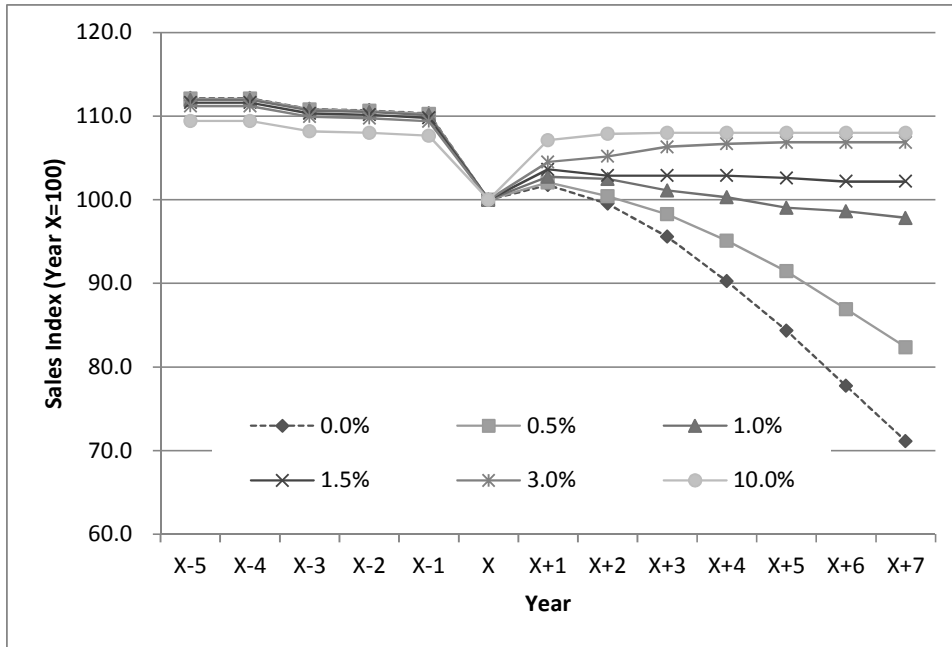

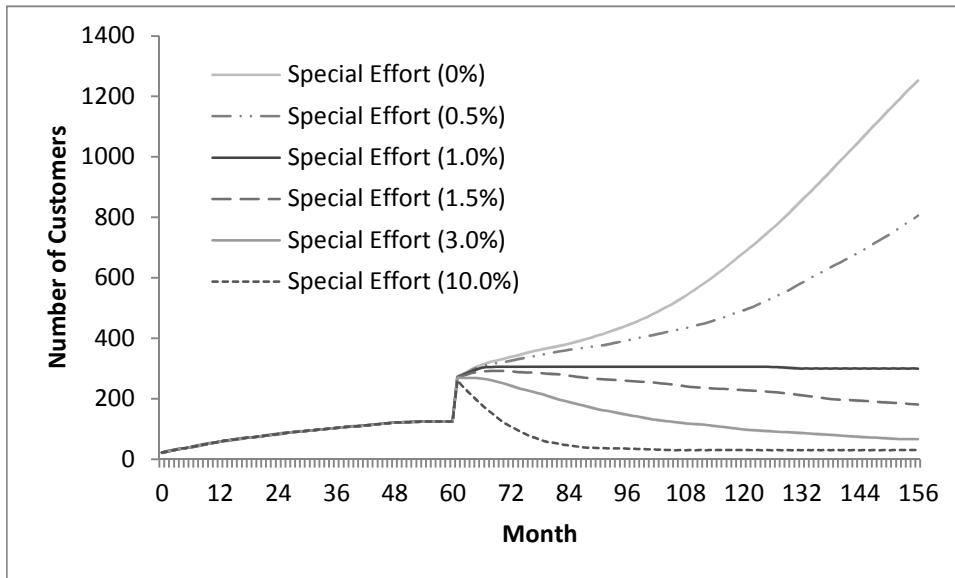**Figure 14 Scandal with Corporate Reactions including sales index**

Figure 15 Scandal with Corporate Reactions including number of Criticizing Customers

5.4. Severity of Scandal

Thus far, the simulation has been run under the assumption that the severity of the corporate scandal is the middle of the scale, such that severity = 0.5). However, the degree of

severity actually varies in each case. For example, some scandals may ultimately lead to the entire bankruptcy of a company, and some may have only a slight impact on sales (Low et al., 2008). Such inconsistencies require a special effort rate for managing a corporate scandal depending also on the degree of destruction of the initial impact. Thus, simulations of two different settings have been implemented on the severity of a scandal in the model (Figure 3) to represent a very severe scandal (severity = 0.9) and a less severe scandal (severity = 0.1).

Figure 16 shows the results of sales index for a very severe scandal (severity = 0.9). Two different corporate reaction scenarios were examined for the scandal. When a company has no reaction (special effort = 0%), it will lose most of its sales, which will continue to decline over time (dotted line in Figure 16). On the contrary, if a company puts forth a certain amount of effort for sales recovery (special effort = 10%), it will successfully return to its pre-scandal state (solid line in Figure 16). These results imply that the degree of corporate reaction has a significant influence on corporate performance when a scandal is very severe.

On the contrary, Figure 17 shows the sales index results for a less-severe scandal (severity = 0.1). Two different corporate reaction scenarios to the scandal were again examined. The results show the same trend such that the sales continuously declined over time with no corporate reaction (special effort = 0%) and successfully returned to the previous state when sufficient corporate reactions were offered (special effort = 10%). However, the results failed to indicate a huge difference between the two scenarios (Figure 17). Because the initial impact of the corporate scandal was relatively limited, the company could maintain its sales to a high standard without adding special efforts for managing the scandal. That is, a company can decide the amount of reaction following a scandal.

Therefore, it is important to carefully consider the degree of reaction offered by a company to a corporate scandal. Overreactions to a scandal may lead potential customers to unnecessarily learn about a company's negative reputation, which could ultimately result in worse sales. It is certain that a company will react to a very severe corporate scandal; however, no reaction would bring about better results when a corporate scandal is least severe. Such results may appear to be a contradiction to business ethics in general; however, a company actually has a chance to acquire better outcome with abdication of its responsibility. For this reason, a company may choose to conceal a scandal, particularly when it is less severe.

This theory can be supported by analysing the number of Criticizing Customers. When a corporate scandal is very severe (severity = 0.9), the number of criticizing customers dramatically increases if there is no corporate reaction (dotted line in Figure 18). On the contrary, when a corporate scandal is less severe (severity = 0.1), the number increases gradually; however, the increase is not as steep as that in the previous case (solid line in Figure 18). The increase rates depend on the numbers of existing Criticizing Customers in a market who generate the word of mouth effect to other customers. Therefore, it is important for a company to make a strategic decision regarding necessary corporate reactions according to the initial impact of the scandal. Furthermore, the desired quickness of recovery also influences a company's strategic decision on the degree of corporate reactions. Figure 19 shows the number of Supporting Customers per month. When a corporate scandal is less severe (severity = 0.1), approximately 12 months is required for the number to recover to the previous state. On the contrary, when a corporate scandal is very severe (severity = 0.9), the number gradually increases, with nearly 24 months required for the number to recover to the previous state. These results indicate that if a company expects a convergence of the scandal within one year, the current effort (special effort = 10%) is insufficient for achieving such a strategic objective. Therefore, it is necessary for a company to

consider both the initial impact of a corporate scandal and its strategic objective for managing the scandal.
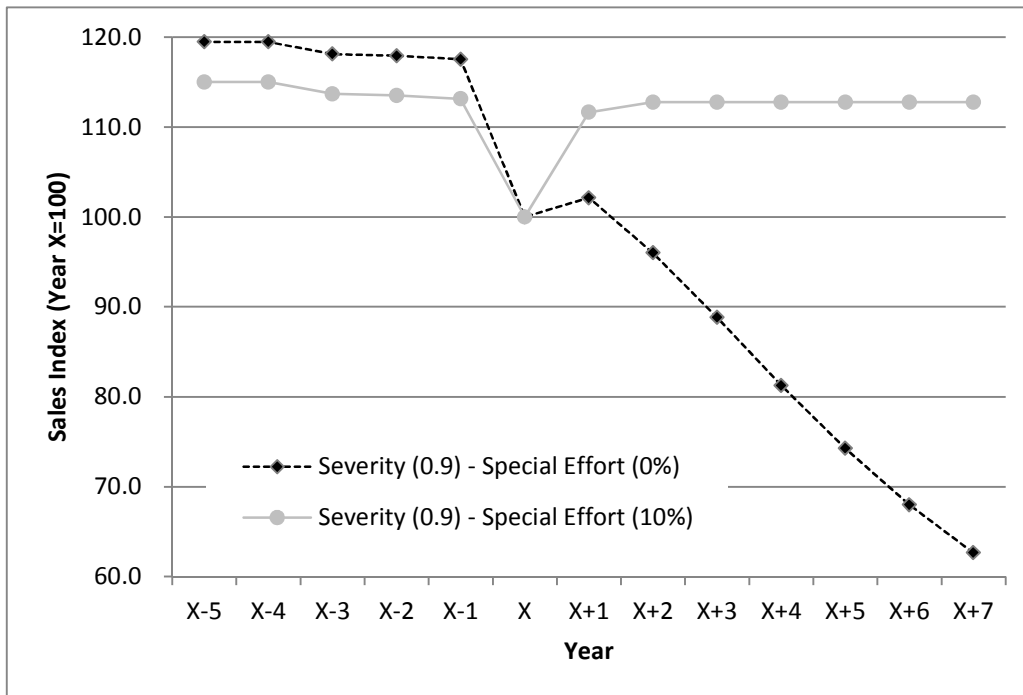
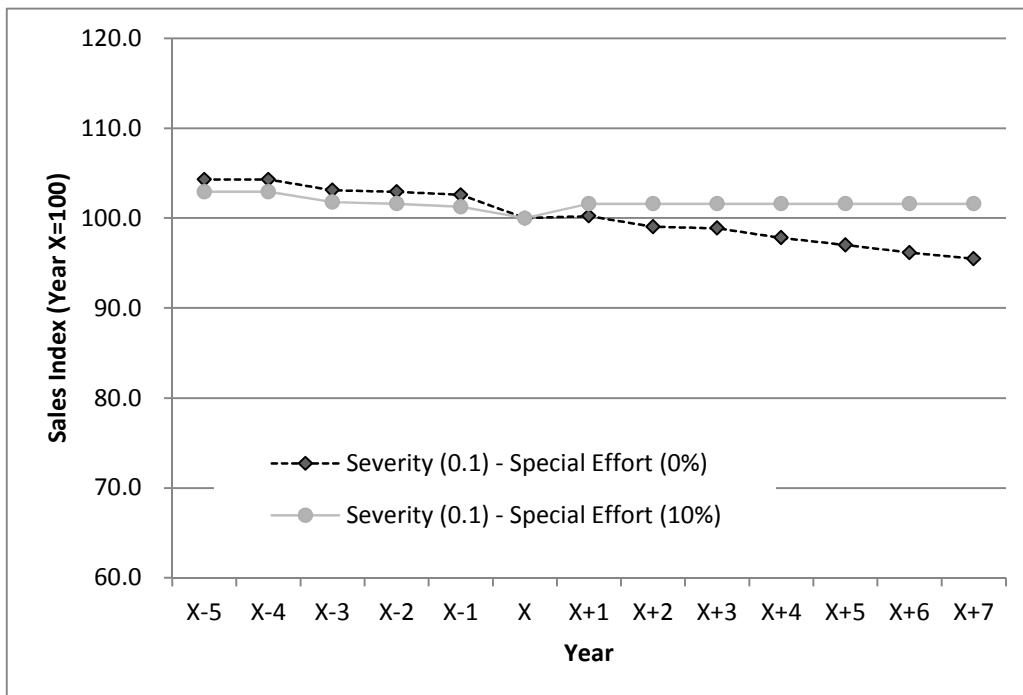

Figure 16 Impact of very severe scandal on sales index

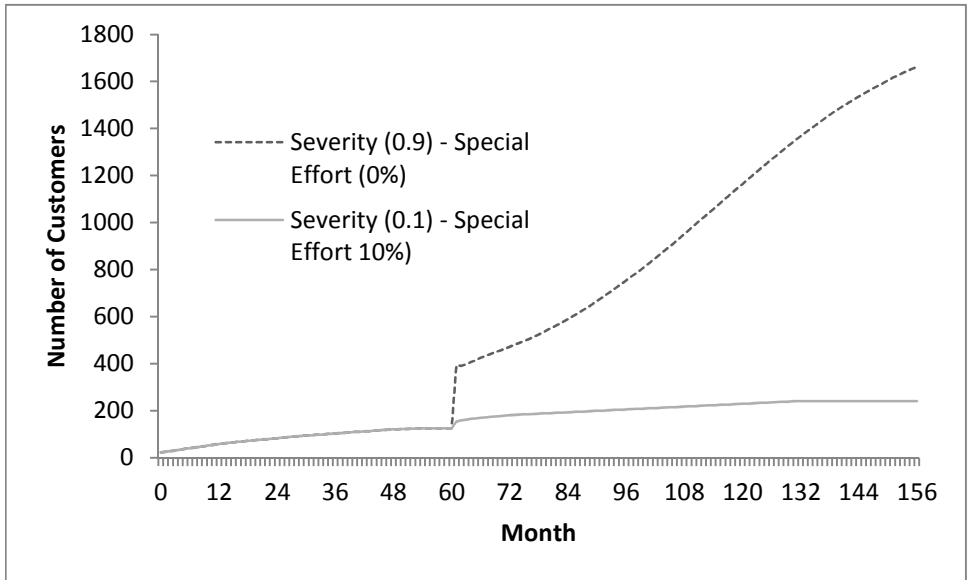**Figure 17 Impact of less severe scandal on sales index**

Figure 18 Impacts of scandals with various levels of severity on the numbers of Criticizing Customers
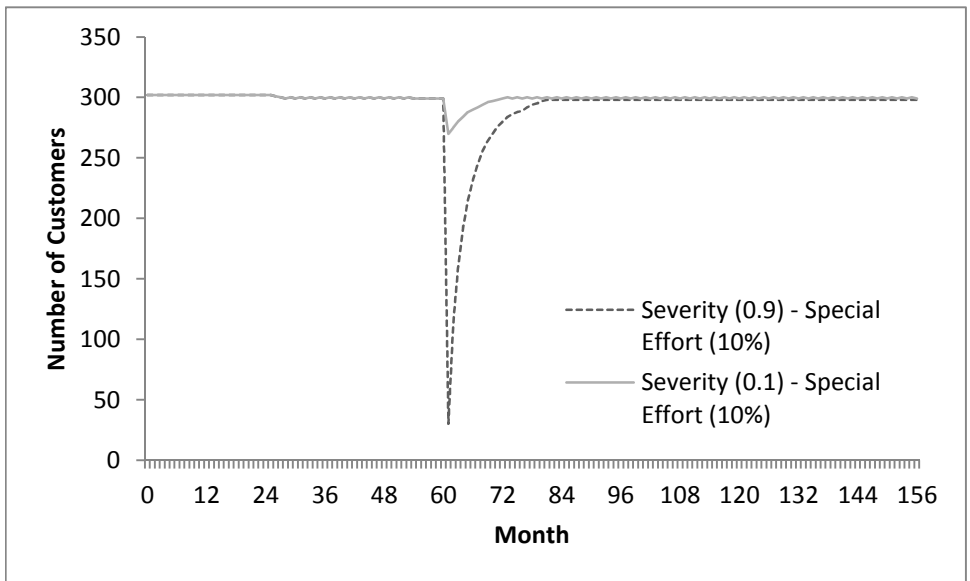

Figure 19 Impacts of scandals with various levels of severity on the numbers of Supporting Customers

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6. Conclusions

Corporate reputation is a critical asset that results from a company's interactions with its stakeholders (Helm, 2011; Bartikowski and Walsh, 2011). The fundamental structure and dynamics of the lagged impact of a corporate scandal on its sales were examined in this study using SD modelling and simulation. The model was calibrated to fit the data in the White Paper on National Lifestyle 2008. The major findings are summarized in the following points:

- Management of a corporate scandal is more difficult when a temporal improvement occurs following a scandal because of a temporal decrease in Abandonment of the Product. However, there is a steep increase in the abandonment reoccurs. The delay of the impact is one reason for a company to inappropriately manage a corporate scandal and its decline in sales.
- The degree of corporate reaction to a corporate scandal should be decided on the basis of two judgement criteria: a company's strategic objective regarding the point of recovery from the scandal and the severity of the initial impact of the scandal.
- No reaction to a corporate scandal sometimes creates more desirable results for a company than that when some action is taken, whereas overreaction to the scandal may ultimately result in worse. Setting aside ethical issues in managing a corporate scandal, the fact may cause intentional concealment of a corporate scandal when it is less severe.

Such attitudes of company's concealment of a scandal have not been fully examined in the current model. Therefore, future work includes an additional subsystem that represents a negative impact of corporate reactions to potential customers. More precisely, a company's overreaction to a corporate scandal may lead potential customers to unnecessarily learn about its negative reputation and could ultimately cause worse sales. Furthermore, socially expected reactions to a corporate scandal are strongly affected by the culture of the country in which the scandal occurs (DeFrank et al., 2004; Hope, 2004). However, researchers have paid little attention to the cultural aspects of reputation–customer outcome relationships, even though cultural values and norms are important for interpreting such information (Bartikowski et al., 2011). Thus, future research should implement a study of cultural impacts on the required extent of reactions to a corporate scandal.

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