Dynamic Modeling of
Corporate Reputation Management Process

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ABSTRACT

The resource-based theory suggests that firm's resources are the main determinant of sustainable competitive advantage and thus firm performance. As survey found, the first important resources are company reputation. Using the resource-based view to study the reputation system is an important issue both for academic and for real business management. This paper used the system dynamic method to build a dynamic model of corporate reputation management process. Base on cognitive psychology, the generic structure of reputation system was constructed as an information process system. Reputation is treated as the publics' information type accumulated in the long-term memory stock. The operational processes about the accumulation and depletion of reputation are then link to advertisement, word of mouth, and user experience by the process of exposure, attention, rehearsal and memory.

1. Introduction

The resource-based view of the firm has become an important stream of literature in strategic management. The resource-based theory suggests that firms resources are the main determinant of sustainable competitive advantage and thus firm performance

(Michael D, MichalisinRobert D, and SmithDouglas M Kline,1997). The company will be positioned to succeed if it has the best and most appropriate stocks of resources for its business and strategy (David & Cynthia, 1995; 1998).

The firm resources include physical capital resources, human capital resources, and organizational capital resource (Barney, 1991). Reed and Defillippi (1990) further argue that the intangible resources, not by the physical resources, drive the competitive advantage. The intangible resources are imperfectly imitable due causal ambiguity, social complexity, and unique historical conditions.

However, what is the most important resource in the intangible resources? Hall (1992) surveyed chief executive officers in the United Kingdom to determine the relative importance of intangible resources of firm success. The CEOs were asked to rank resources in terms of their importance to the firm's success for each of the years 1987 to 1990. The first important resources are company reputation.

Corporate reputation has long been recognized as a critical factor in successfully marketing a service (Eunsang, et al., 1993; Thomas, 1978). A good reputation is viewed as an asset that can enhance the buyer's expectation about the company's offerings (Eunsang, et al., 1993; Schmalensee, 1978; Shapiro, 1983). Marketer's reputation enhances communication effectiveness; for example, pricing and advertising serve as a communicator of product quality (Shapior, 1973; McGinnies, 1973; Tellis and Fornell, 1988; Eunsang, et al., 1993).

It is obviously that using the resource-based view to study the reputation system is an important issue both for academic and for real business management. However, there exist two problems. In the one hand, as the authors know, the researches of reputation are all too aggregate and too abstract. They did not touch the operational and dynamic processes in reputation system, and also did not touch the interactive dynamic processes between reputation system and other business functions.

In the other hand, Morecroft (1998) suggested that the traditional resource-based theory is also static. The field of strategic management needs tools to help firms diagnose, anticipate and influence the time-path of competitive advantage whether be it the rate at which opportunities can be exploited or the progress of the competitor's forces that threaten revenues and profitability.

Morecroft (1998) argued that the System Dynamics method provides an ideal tool for this purpose, providing a rigorous means of formulating the mathematical integration underlying the accumulation and depletion of resources. But, as the authors know, in system dynamics field, there is no research study the reputation issue by dynamic resource-based view.

This paper used the system dynamic method to build a dynamic model of corporate reputation management process. Base on cognitive psychology, the generic

structure of reputation system was constructed as an information process system. Reputation is treated as the publics' information type accumulated in the long-term memory stock. The operational processes about the accumulation and depletion of reputation are then link to advertisement, word of mouth, and user experience by the process of exposure, attention, rehearsal and memory. Finally, we will also discuss how to use the proposed generic structure as one modeling building block to create a dynamic and systemic reputation management system.

2. The Core Structure: Reputation and Human Information Process System

In this paper, reputation is treated as the publics' information type accumulated in the long-term memory stock. As observed by DiMaggio & Powell, (1983), publics construct reputations from available information about firm's activities origination from the firms themselves, from the media, or from other monitors. Publics used and propagate information they deem important for assessing firms' successes and failures at acquiring resource inputs, improving throughputs, and sustaining outputs. As signals about firms' activities, achievements, and prospects diffuse, individual interpretations aggregate into collective judgments that crystallize into reputation orderings of firms in organizational field.

Due to reputation is a process of information communication between corporate and public. It seems nature to start modeling reputation system from the human being's information process system.

In cognitive psychology, human's mind is treated as an information process system. It is convenient to think of information as passing through several stages, each with its own characteristics. A simplified representation of possible stages of information processing is given in Figure 1(Bourne, et al., 1986, p.12).

Environmental information is processed first by sensory memory, which has large capacity and do not encode the information. Large amount of information will lose quickly in this stage, because the short-term memory's capacity is limited. The remained information will be encoded then process into limited short-term memory. Information will lose also in this stage. If there is rehearsal or if the existed knowledge do the pattern recognition, then the remained information will inter-associated with other information and become more permanent long-term memory. Long-term memory also may be forgot and lost, but in a different time scale, e.g. week, month or year.
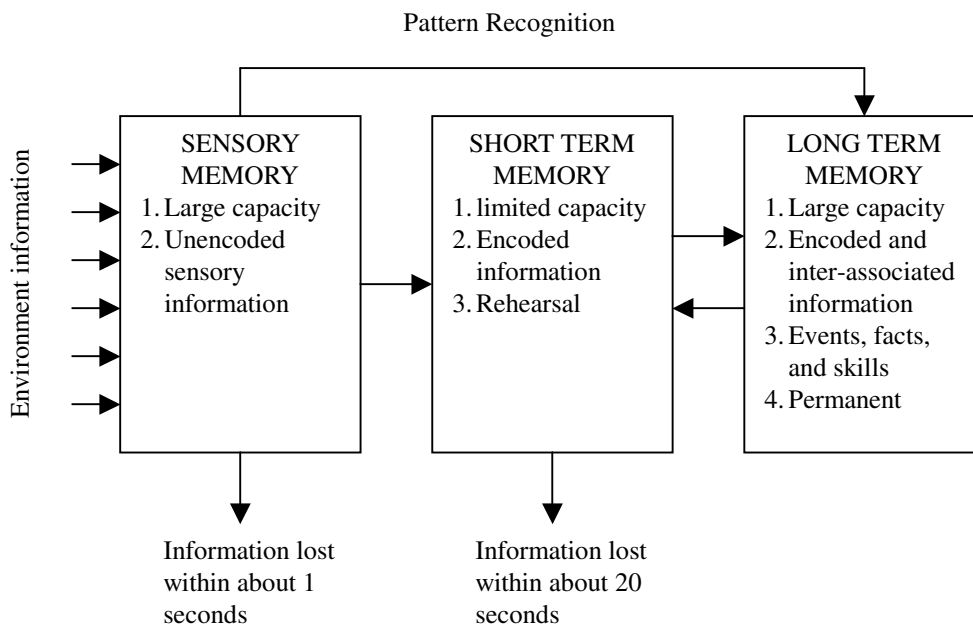
Pattern Recognition

SENSORY MEMORY	SHORT TERM MEMORY	LONG TERM MEMORY
1. Large capacity	1. limited capacity	1. Large capacity
2. Unencoded sensory information	2. Encoded information	2. Encoded and inter-associated information
	3. Rehearsal	3. Events, facts, and skills
		4. Permanent

Environment information

Information lost within about 1 seconds

Information lost within about 20 seconds

Figure 1: A simplied representation of the human processing system

According to Figure 1, reputation is a long-term memory type existed in publics' mind. Publics construct reputations from available information about firm's activity origination from the firm's advertisement, from the media, from word of mouth, from product using experience, or from other monitors. Those information will lost much before enter long-term memory. All the remained signals will be interpreted into collective judgments, and then becomes an aggregate image of that corporate' reputation.

Figure 2 transfer those processes into system dynamics language. The equation is list in Table 1.
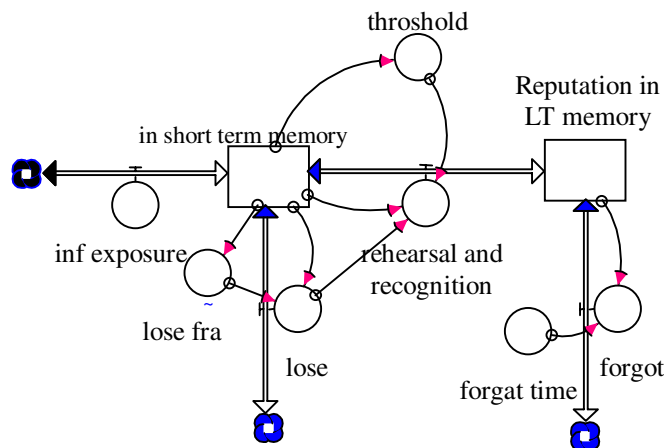

Figure 2: the "Reputation- LT memory" structure

Table 1: Equation of Figure2

in_short_term_memory(t) = in_short_term_memory(t - dt) + (inf_exposure - rehearsal_and_recognition - lose) * dt
INIT in_short_term_memory = 0

inf_exposure = -7
rehearsal_and_recognition = if ABS(in_short_term_memory-lose)>ABS(throshold) then throshold else (in_short_term_memory-lose)
lose = in_short_term_memory*lost_fra
Reputation_in_LT_memory(t) = Reputation_in_LT_memory(t - dt) + (rehearsal_and_recognition - forgot) * dt
INIT Reputation_in_LT_memory = 0

rehearsal_and_recognition = if ABS(in_short_term_memory-lose)>ABS(throshold) then throshold else (in_short_term_memory-lose)
forgot = Reputation_in_LT_memory/forgat_time
forgat_time = 18 {months}
throshold = if in_short_term_memory<0 then -5.5 else 5.5
lost_fra = GRAPH(ABS(in_short_term_memory))
(0.00, 1.00), (1.00, 1.00), (2.00, 0.985), (3.00, 0.945), (4.00, 0.895), (5.00, 0.8), (6.00, 0.7), (7.00, 0.61), (8.00, 0.555), (9.00, 0.52), (10.0, 0.5)

Figure 3 shown the sensitivity analysis with information exposure varies from –15 to 15 (step with 1), the responses of reputation in long-term memory. As shown in Figure 3, the structure of Figure 2 has four characteristics:

(1) Reputation can be positive or negative. Information also can be that. Good information can trade with bad information.

(2) The structure does not response to too much information (overload) or too little information (no rehearsal). If there is too much information flow in, the limited capacity of brain's information process will become a threshold to filter information. If there is too little information, the lose rate of human mind will make little information can be remained. Without enough rehearsal, signals are difficulty to enter long-term memory.

(3) The scale of reputation is range from almost 100 to -100. The scale is determined by two parameters: threshold and forget time.

(4) If exclude the extreme condition (too many or too little information), the relationship between reputation and information exposure is S-curve. The shape is determined by table function of "lose fraction" with "short-term memory".

The "Reputation- LT memory" structure has one input variable and one output variable. The input variable is "inf. Exposure". The output variable is "Reputation in LT memory". Other variables are all implicit in human's mind, form the informational

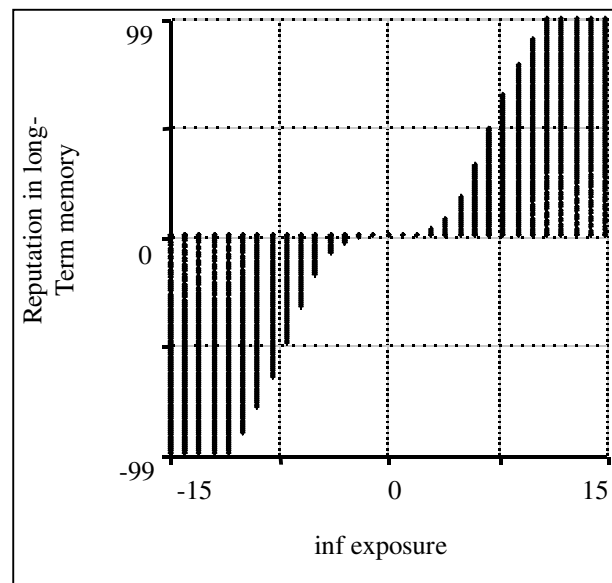process mechanism of brain. We will discuss these two linking points as next two sections.

Figure 3: Sensitivity analysis with information exposure varies from –15 to 15 (step with 1), the response of reputation in long-term memory

3. Information exposure link to advertisement, word of mouth and user experience

The input variable of "inf. Exposure" in the "Reputation- LT memory" structure (figure 2) can link to any information sources that influence public's reputation image. In the references of reputation's researches, the information sources includeing : the firm's advertisement, the media, the word of mouth, the product using experience, or the other monitors.

Eunsang et al.(1993) has identified two major source of a company's reputation : experience and information. Word of mouth is an important means of information diffusion that affects company reputation (Eunsang e.t. al., 1993). Corporate advertising is effective for improving the social conduct image of the company (Eunsang et al., 1993; Winters1986). A corporate image is at least partly determined by the media (Argenti, 1994). The chances of receiving negative publicity from the media are much higher than the chances of receiving positive press attention because of their preference for the bad news (Jan, 1998; Dennis & Merrill, 1996).

Figure 4 demonstrate the representation method used system dynamics method. Each information source can separate to three parts. One is the information content, the second is information exposure times, third is the weight publics relied on judgement. For example, if one advertisement has high Gross Rating Point (high exposure in

media), but the advertisement is very bad, then the higher the exposure, the lower the reputation image in public mind. Moreover, different customs have different weights of the information source. For example, The re-buyer relies on more weight on product using experience than new buyer does. Different products also have different weight. Some product is more rely on word of mouth than others do.

The information integration function of the input variable "inf. Exposure" may be able to be formulated by "weighting average" as suggested by Information Integration Theory. It is shown as follow:

Inf_exposure = adversity_reach*adversity_inf*weight_of_Ad+
               wom_reach_times*WOM_inf*weight_of_WOM +
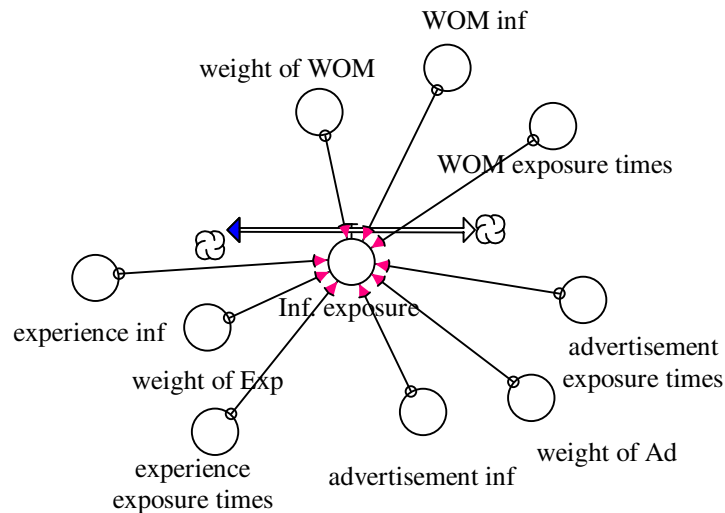   experience_reach*experience_inf*weight_of_Exp

Figure 4: the links to information sources that influence public's reputation image.

The word of mouth sector could be modeled as shown in Figure 5. Positive and negative word of mouth (WOM) have their own population stock. One bad WOM custom may tell 15 people, while good WOM custom may tell 5. That two sources determine the total information exposure times in allover the market. That total times combined with the total public's population will determine the desity. The density will then determine the exposure times one people will be reached. Finally, the information content is then can be easily determined by Positive WOM and negative WOM.

Figure 6 show the advertisement sector. Advertisement budget, the quality of human resource of marketing, and the announced advertisement content are important factors. Budget could be determined by revenue and budget policy. Quality of HR is feedback influence by reputation (the higher the reputation, the higher the HR's

motivation and the easier to hire good employ). The announced advertisement content will be compared when custom had used the product. If there is gap, it will influence reputation.

Finally, the user experience is most relied on the quality of the product. So, the production sector and the R&D sector can link to this point.
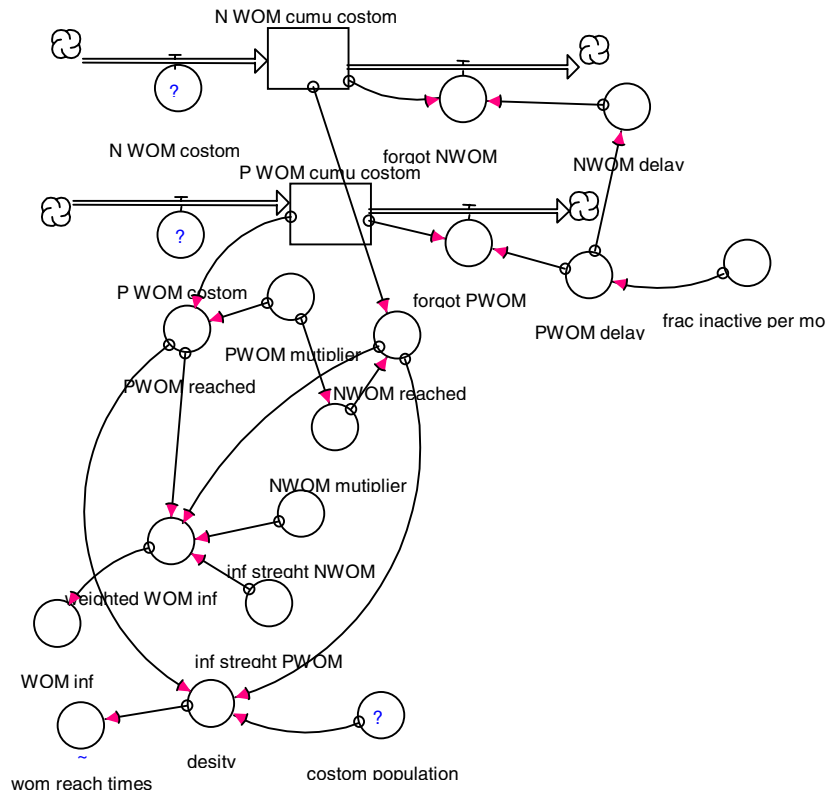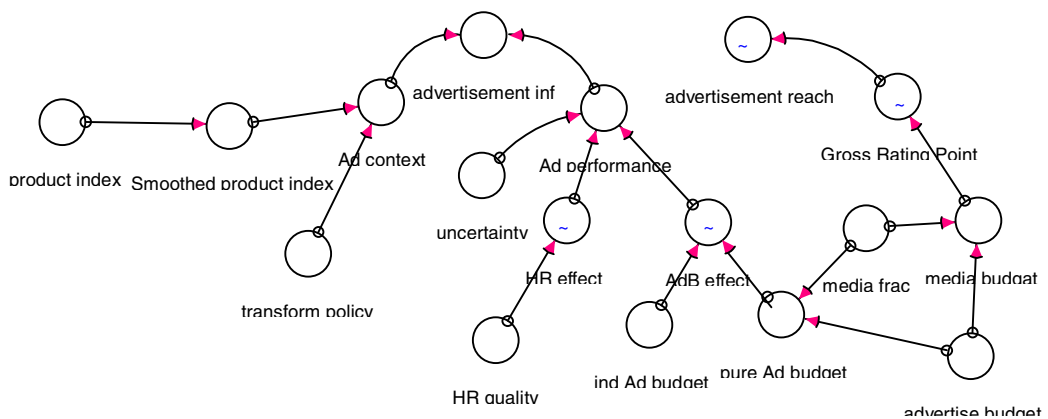
Figure 5: the word of mouth sector.

Figure 6: the advertisement sector

4. Output influence of the "Reputation- LT memory" structure

The output variable of "Reputation in long-term memory" in the "Reputation- LT memory" structure (figure 2) can link to other business function which is influenced by reputation. There exist at some linkages in references. For example, marketer's reputation enhances communication effectiveness; for example, pricing and advertising serve as a communicator of product quality (Shapior,1973; McGinnies, 1973; Tellis and Fornell, 1988; Eunsang, et al., 1993). Corporate reputation has long been recognized as a critical factor in successfully marketing a service (Eunsang, et al., 1993; Thomas, 1978). A good reputation is viewed as an asset that can enhance the buyer's expectation about the company's offerings (Eunsang, et al., 1993; Schmalensee, 1978; Shapiro, 1983). Marketer's reputation enhances communication effectiveness; for example, pricing and advertising serve as a communicator of product quality (Shapior,1973; McGinnies, 1973; Tellis and Fornell, 1988; Eunsang, et al., 1993).

In sum, there exist at least four link :
(1) Output to price setting.
(2) Output to custom flow: aware, purchase, re-buy decision.
(3) Output to human resource sector: motivation, hire, quit.
(4) Output to finance: public's purchase decision of firm's debt or stock.

5. Conclution

The resource-based theory suggests that firm's resources are the main determinant of sustainable competitive advantage and thus firm performance. As survey found, the first important resources are company reputation. Using the resource-based view to study the reputation system is an important issue both for academic and for real business management. This paper used the system dynamic method to build a dynamic model of corporate reputation management process. Base on cognitive psychology, the generic structure of reputation system was constructed as an information process system. Reputation is treated as the publics' information type accumulated in the long-term memory stock.   The operational processes about the accumulation and depletion of reputation are then link to advertisement, word of mouth, and user experience by the process of exposure, attention, rehearsal and memory.

Researchers and Managers can easily use this generic structure as a building block for modeling. Using the modeling as learning process, managers may be able to involve into the dynamic operational process of reputation system. Thus, corporate can use the proposed generic structure as a base to create a dynamic and systemic reputation management system.

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