Using System Dynamics to Investigate How Belief Systems Influence the Process of Organization Change

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Abstract

As an enterprise starts to grow larger, management will activate a series of activities of organizational development for creating a better performance. Prior researchers mainly focused on the relationships among organizational structures, those activities which can stimulate the organizational performance at least in a short term, and organizational performance. How organizational changes create superior performance is a popular issue, but the effects of leaders' beliefs are relatively ignored. This study explores the process that how a leader's belief directly affects the organization structure and indirectly drives organization performance. We developed detailed simulation model of General Electric, including human resources, financial and cost accounting, research and development, and operations. Historical information and archival data was used to specify and estimate the model. The results show that a leader's belief system can impact a company's tradeoffs between short term and long term effects. In the short term, leaders' beliefs influence the strategies of the company and can be beneficial to financial outcomes. In the long term, leaders beliefs may prevent the company from failures in the future.

Keywords: Leadership, System Dynamics, Simulation, Organizational Behavior

1. Introduction

Understanding how a corporation goes through the organizational change process is a critical issue to organizational behaviour and business strategy. Researchers are eager to explain the evolution of performance differences among firms and try to use the system dynamics method to clarify why some firms are more profitable than others (Gary, 2003; Gary, Kunc, Morecroft, & Rockart, 2009). Nevertheless, most existing studies focus on the relationships among organizational structure, organizational change and performance. Research findings show that organizational structures can lead a successful organizational change and achieve outstanding performances (Hsu, 2007). However, the importance of a leader's belief system, and leadership to the process of organizational change are underscored. Very little research focuses on the connection between belief system and organizational change (Eisenbach, Watson, & Pillai, 1999). Therefore, there is a need to investigate how a leader's belief system influences the procedure of organizational change and to clarify the dynamic process.

The main purpose of this study is to explore the effects of leader's beliefs on the process of organizational change. To be more specific, we explore the following questions: (1) How might a leader's beliefs lead to unintended consequences that undermine organization performance? (2) What policies might trigger such side effects? To answer these questions, this study tries to develop a SD model to investigate the organizational change process within the GE Company from 1970 to 2000. In this period, GE was lead by Reginald H. Jones and by Jack Welch. From the results of simulation, we discovered that how Welch led GE to break through the bottleneck and limitation of growth, and achieve superior performance. As we know, when a corporation becomes oversize, the bottleneck of growth will reduce the capacity and consume enterprise's resources. At this moment, management will trigger actions to change and tend to maintain or achieve stretch performance. Most companies fail in this stage, and many disappear altogether (Greiner, Cummings, & Bhambri, 2003; Kotter, 2008).

The structure of this paper is as follows. First, we review historical data of GE's performance during the period when the company was led by Jack Welch's belief system (1981~2001) using archival and historical data (section 2). Subsequently, we generate hypotheses about decision processes and feedback structures that generated the observed dynamic behavior (section 3). Third, a simulation model is developed and presented to examine the hypotheses and explore policies (section 4). Moreover, we examine an alternative belief system based on Jones's belief system to

compare the different policies which created extremely different performance (section 5). We conclude by discussing the implications of the leader's beliefs for organizational change programs in general.

2. Organization changes in the GE Company

2.1 The GE Company

Before Jack Welch took over as CEO of GE, Reginald H. Jones was CEO and considered a skilled practitioner of scientific management. He was known for his accomplishments as a bureaucrat. In the 1970s, through the methods of scientific management, GE created enormous wealth. During Jones' eight-year CEO term, he improved productivity mainly by investing in new technology such as factory-automation equipment (Tichy & Cardwell, 2004). Before 1980, this strategy seems have worked, but by 1987, GE reported negative cash flows. Jones recognized that there were three challenges for change of GE. First, productivity was growing slowly; second, compared with rivals, GE had to speed up to catch up the new technologies; third, global competition was severe and GE was not prepared for intense rivalry (Tichy & Cardwell, 2004; Tichy & Cohen, 2002).

By the late 1970s, rapid changes in the business environment and the wasteful organizational bureaucracy compelled GE to abandon the old principles and start to find new state-of-art management technologies and solutions. Jack Welch inherited the CEO position in 1981, and at that time, GE was one of the U.S.A.'s strongest and one of the world's most admired corporations. Welch foresaw the weakness and disadvantages of GE that were global competition and sluggish productivity, and sensed that these pitfalls would become a threat to GE's survival in the near future (Tichy & Cohen, 2002).

Starting from 1981, Welch executed downsizing plans and decreased the span of control in GE resulting in roughly 300,000 employees departing (Slater, 1998; Slater & Welch, 2004). In addition, he constructed a new growth engine founded on the idea of No. 1 or No. 2 market share. That is, any business that could not become the No.1 or No. 2 player in its market would not remain a part of GE. Later on, he launched a complex technique for pushing cultural change and organizational change in GE called Work-out, which began in 1988. Under these series of actions, GE went through a fundamental change. By the end of 2000, the sales revenue reached US $13 billion with a very different business mix. GE Capital Services produced 40% of corporate earnings. The percentage of revenues from products declined dramatically from 85% to 25% and shifted to services. What's more, GE reached the second-highest profits level among the S&P 500 (Tichy & Sherman, 1993).

In the 1970s, before Welch took over CEO, GE was known for its strategic planning. Due to the rapid environment change in the 1980s, these methodologies were not as effective as usual. Instead of controlling by detail planning, Welch launched a group of activities to lead a value system change. These seven stages of those activities are shown in Table 1. From Work-Out to Six sigma project, from 1989 to 2000, all the activities helped GE reduce jobs, keep the organization lean and fit, diminish the bureaucracy and decrease the time pressure on employees. Later on, the change process focused on cultural aspect, and one of GE's core beliefs was to rapidly respond and effectively adapt to environmental changes.

Table 1: Seven Renovation Stages in GE (Senge, 1999; Tichy & Sherman, 1993; Welch, 2005)

Name	**Policy**
Stage One Work-Outs	• By one outside facilitator to lead a one to three days' town meeting, focus on ending bureaucratic, hierarchical wastes of time and productivity. During the meeting, managers have to respond to all the proposals (at least 75%) and make decisions on the spot. • Develop an open culture and learning attitude.
Stage Two Best Practice	• Look outside GE for better ideas or problem solutions, which includes GE's customers, partners or any other organizations. • Change the way of rewarding, encourage people to share rather than store ideas in brain.
Stage Three Process Maps	• Started from 1991, GE instituted "stretch goal" in process mapping; a goal that was big enough to force people to think differently. • Enforced the sense of crisis in organization and promoted change speed.
Stage Four Change Acceleration	• Provide senior managers a framework or model along with a series of tools to drive successful change. • Composed Coach Teams to spread out new ideas and practices.
Stage Five Strategic Initiatives	• Set up a series of in-depth initiatives, focusing on highly significant issues, such as developing new competence.
Stage Six Making Customers Winners	• Began to share integrated learning skills with customers.

Stage Seven Six Sigma Quality	• By 1995, proposed a new stretch goal: to become a Six Sigma Company by the year 2000.

Through the processes above, by the end of 2000, GE accomplished notable results from the seven processes in Table 1. Profit rose from $3 billion in 1990 to $13 billion by the end of 2000. The impact of the organizational change processes was significant. For example, the "Work-Out" project involved over 0.2 million employees by the end of 1992; two out of three of employees in GE. At that time, around 20,000 employees were participating in related projects every day (Tichy & Cohen, 2002; Tichy & Sherman, 1993).

To sum up, GE's transformation created a new social relationship between employees and employers. Under the traditional enterprise hierarchy, there was no mutual trust between employees and employers, and all the management methodologies were based on the concept of control, that is how to control people effectively. Under Welch, GEers have a shared value and belief system, and employees tend to be self-controlled and have commitment on performance improvement. GE becomes more flexible and agile to defeat competitors who were still running by bureaucracy (Slater & Welch, 2004; Welch, 2005).

3. System Dynamics Model of the GE Company

GE's experience illustrates the complexity of organizational change processes. It is often difficult to fully explain the impact of organizational interventions such as Work-Out. SD models help us explore the consequences of alternative strategies and test the management policies on the environmental circumstances at that time. For the purpose of capturing complicated interventions or procedures such as organizational changes in a model, we need a methodology that can represent the institutional structure of the company and business environment, and that can portray the decision processes. It is also important to include the role of soft variables such as honesty, morale and fear of job losses. We also need a model that can deal with multiple levels of analysis, such as a leader's belief system and firm performance. To meet these requirements we adopted the system dynamics method to develop the theory and build the simulation model (Forrester, 1961, 1965; Richardson, 1999).

Multiple data sources were adopted to develop and test the model. Data was collected from leadership descriptions and publicly available financial data. Some secondary sources were also used that include quality improvement records (Pande, Neuman, & Cavanagh, 2000), interviews records (Tichy & Cardwell, 2004; Tichy & Charan, 1989; Tichy & Cohen, 2002; Tichy & Sherman, 1993), and management policies and strategies (Abetti, 2006; Bartlett & Ghoshal, 1994; Bartlett & McLean,

2006; Bartlett & Wozny, 2001; Ghoshal & Bartlett, 1996; Heskett, 2000; Malnight & Aguilar, 1990; Welch & Byrne, 2001; Welch, 2005). Some established system dynamics models guided some formulations, such as the corporate model (Forrester, 1961; Hall, 1976; Lyneis, 1980). The base structure was established based on Sherwood's (2002) general commercial model and testified the managerial decision making to specify the structure of the model and decision makers' action rules (Paich & Sterman, 1993; Sterman, 1989).

3.1 Basic Model

Referring to Sherwood (2002), this study developed a basic model, which is shown in Figure 2. The endogenous elements include a representation of GE's policy making process. A complete set of financial metrics (core engine, see Figure 3) such as profit, investment, sales revenue, markets and cost structure; product innovation loop such as patterns, R&D investment ratio and competition index; management control and efficiency loop such as organizational layer and management efficiency, and human resource loop such as employee hiring rate, honest level, employee pressure level and the workforce's perceived job security and fear of losing job. The model contains six exogenous inputs which are constituted by resource investment policy and human resource investment policy. (1) Resource investment policy contains three inputs – R&D investment ratio, management complexity investment ratio and human resource investment ratio. (2) Human resource investment policy includes three inputs – employee skill investment rate, employee bonus investment rate and learning ability investment rate. The core engine is the basic element of the company and three of the growth engines are the drivers to stimulate the growth of the company, which also indicate the policy designs of the whole company. While the model is too big to fully describe, we discuss the most important formulation: the human resource loop for the GE Company.

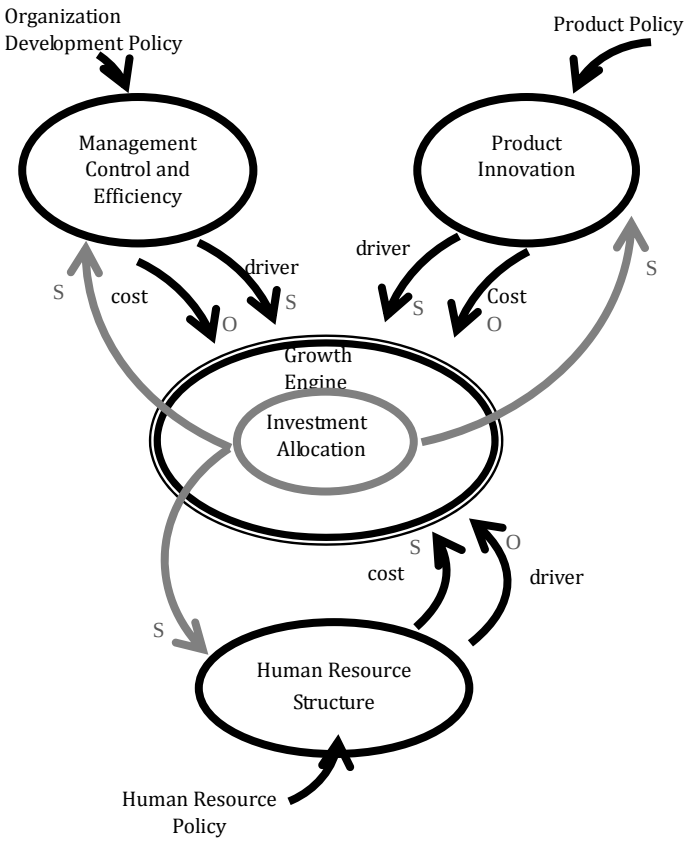


Figure 2 Overview of Model Structure

(Note: S indicates that two variables move in the same direction, and O indicates they move in the opposite direction.)

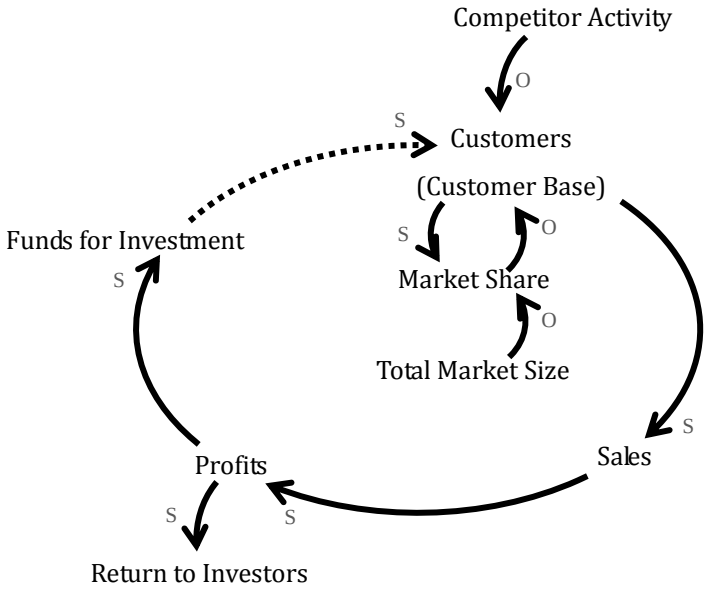


Figure 3 Basic growth engine

Source: Sherwood 2002

3.2 Human Resource Formulation

The dynamics of human resources were critical to the performance of the GE Company. Improvements in employees' skills and capabilities can speed the introduction of new and better products and services. What's more, they can create new markets and enhance demand. In this model, market demand is endogenous. GE's market share of the total market share for its products and services in which it competes is determined by the attractiveness of GE's products and services relative to the competitors. For a given functionality of product or service, customers are assumed to judge competing offers by considering the difference between perceived quality and expected quality. Attractiveness drops when these gaps enlarge (Sterman, Repenning, & al., 1997).

However, changes in human resources occupied the most important place in GE's organizational change (Welch, 2005). Through a set of well developed human resource objectives, organizations can push the growing capacity forward. When management invested appropriately, GE's product and service quality were promoted, and the portion of market share increased and satisfied customers rose.

Tracing GE's practice, the human resource formulation can be disaggregated into two categories. First, which is described below, is the tangible assets such as number of employees, employee skill level and job loading. Intangible assets such as burnout, employee morale and learning ability, are described in section 3.2.2. Some examples of how these variables are formulated in model are described.

3.2.1 Management Policy Formulation in HR (Creating New Ideas)

One of the most famous concepts in GE by Welch is to encourage employees to use their creativity to generate new ideas for the company to achieve growth (Tichy & Cardwell, 2004; Tichy & Cohen, 2002; Welch, 2005). According to GE's practice, the formulation of creativity accumulation process is shown as follows:

$$\frac{dNI}{dt} = ni^{i} - ni^{a}, \qquad (1)$$

$$\frac{dAI}{dt} = ni^{a} - ni^{d}, \qquad (2)$$

$$niiv = [(inv \times iicr) \div cpi] \times nicf, \qquad (3)$$

$$niipy = DELAY(niiv, delay\ time), \qquad (4)$$

$$niapy = NI \times ar, \qquad (5)$$

Where NI is the new idea level, ni^{i} is the rate of new idea increase per year, ni^{a} is the rate of new idea accepted per year, AI is the accepted idea level, ni^{d} is the rate of discard idea per year, $niiv$ is the number of new idea increase volume, inv is the

total investment, $iicr$ is the ratio of the investment in creating ideas, cpi is the cost of per idea, $niipy$ is the new idea increase per year, $niapy$ is the new idea adopt per year, ar is the adopt rate of new ideas, $delay\ time$ is the average delay time and $nicf$ is the factor of new idea creation.

The ar ($adopt\ rate$) is a table function. In the base case, ar is varied by a leader's belief. Under Jones' strategy, the adoption rate is low, because he thought management efficiency is the leading factor for profit growth. With hierarchical structures, employee's ideas are difficult to be realized (Tichy & Cardwell, 2004; Tichy & Cohen, 2002). In contrast, Welch believed that employees' creativity is the key to success, and therefore, GE invested in activities to stimulate employees to use not only their hands but also their brains (Welch & Byrne, 2001; Welch, 2005).

The new idea increase speed is controlled by $niiv$ which is generated from two aspects. First one is the investment policy that is the amount of investment in creating a suitable atmosphere of creative environment. Another one is the $nicf$, a fraction rate of new idea creation, reflecting the effectiveness of investment in the investment and the atmosphere of the environment whether it suitable for generating new ideas or not (Tichy & Cohen, 2002). The model is shown as follows:

$$nicf = min\{f_{cl}(CL), f_{ef}(EF), f_{ep}(EP), f_{md}(MD)\}, \quad (6)$$

where $f_{cl}(CL)$ is the impact of honest level on new idea create effect, $f_{ef}(EF)$ is the impact of employee fear on new idea create effect, $f_{ep}(EP)$ is the impact of employee pressure on new idea create effect, and $f_{md}(MD)$ is the impact of manager's determination level on new idea create effect. These nonlinear functions, $f_*(*)$, are separately applied to these four factors which may be positive or negative. Sufficient evidence of these four factors causes positive and creative environment for employees to generate new ideas (Tichy & Cohen, 2002; Welch, 2005).

To develop employees' creativity requires top management's support, such as training, rewards or time vacancy. On the other hand, honesty is needed as a supporting variable to be required (Ciulla, 2004; Warren, 2002). These two functions are assumed as a s-curve that is

$$f_*(1) = 0;\ 1 <* < 100\ and\ 0 < f_*(*) < 1;\ f_*'(*) > 0, \quad (7)$$

(means CL and MD.)*

The other two influential factors, employee pressure and employee fear, function to be regarded as bell-shaped curves with a maximum value of 1 and a minimum value of 0, and assumed that while the input value reached 50 to 60, the factor value reach the maximum.

If employees are threatened by extremely high pressure or fear layoffs, job overloading, or financial problem. Their commitment to improve performance will

decline. On the other hand, without pressure or fear, it's just like a bureaucracy structure, without delegation or low responsibility, and this situation will reduce the effectiveness of the investment in human resource (Tichy & Cohen, 2002; Tichy & Sherman, 1993; Warren, 2002; Welch & Byrne, 2001). Therefore, the equation can be shown as:

$$f_*(1) = 0;\ 1 <* < 100\ and\ 0 < f_*(*) < 1; -1 < f_*'(*) < 1, \qquad (8)$$

(means EP and EF.)*

3.2.2 Building Learning Ability to GE

Stimulating employees to generate new ideas is the essence of the GE's transformation. Since Welch announced the No.1 or No.2 policy as the big idea for GE. GE employees are stimulated to create more ideas. As Tichy wrote in his book, GE's employees always chased various new ideas and this value has become their core concept that underlies GE's organizational style (Tichy & Cardwell, 2004; Tichy & Cohen, 2002; Tichy & Sherman, 1993). Started from integrated diversity in 1980s, boundary lessens, speed, simplicity and self-confidence in 1996s, ideas serve as GE's signposts of change

Ideas are so important to the GE Company, but every company has ideas. What's revolutionary and more important than the ideas themselves? It is the power of execution (Tichy & Cohen, 2002). GE's value is not abstractions, but instead captures value by capitalizing on new ideas (Welch, 2005). After Work-Out project started, a series of new policies was adopted, such as Best Practices and six-sigma. Welch and executives were pushing a systematic approach to keep challenging GE's management tradition. By increasing the adoption rate of new ideas, from 5 percent in 1990 to 80 percent in 2000, GE employees regained self-confidence. They emphasized continuous improvement, process innovation, and customer satisfaction. What's more, employees began to develop on ability to learn. It is the commitment for employees to put on GE's achievement on their will, and this is also the process of how GE creates the learning environment for employees (Tichy & Cohen, 2002).

Tracking from GE's practices, historical data, and description discussed above, the process of learning ability accumulation is a co-flow structure to the process of stimulating employees' creativity (Collins; Peters & Waterman, 1982; Slater & Welch, 2004; Sterman, 2000; Tichy & Cardwell, 2004). In this section, we also describe how we model the intangible asset in SD model and how it affects the whole system. As in a coflow structure, learning ability level can only be changed through the inflow or outflow procedure from the accumulation process of new ideas. Each new idea adopted brings a certain amount of effective learning ability. Thus, if adopted ideas are

discarded by the company or for some reason, they can't be executed furthermore, some degree of learning ability will be taken away with those ideas (Senge, 1999; Slater & Welch, 2004; Sterman, 2000; Welch, 2005):

$$\frac{dLA}{dt} = Smooth\left(la^{i} - la^{dd} + iio^{i} - la^{de}, 3\right), \quad (9)$$

$$la^{i} = (laipa \times ni^{a}) \div lag, \quad (10)$$

$$la^{dd} = ala \times ni^{d}, \quad (11)$$

where LA means the learning ability level, la^{i} is learning ability increase per year, la^{dd} is the learning ability decrease from discard idea per year, iio^{i} is the experience increase in on-going idea, la^{de} is the learning ability decay per year, $laipa$ is learning ability increase for per adopted idea, ni^{a} is the new idea adopted per year, lag is the learning ability gap between current and excepted goal, ala is the average learning ability, and ni^{d} new idea discard per year.

Besides the regular inflow and outflow of the learning ability level, each idea gains additional experience of learning ability (Malnight & Aguilar, 1990; Sterman, 2000; Welch & Byrne, 2001; Welch, 2005). This increases named iio^{i} is the number of the learning ability increase for each on-going idea per year summed over the total on-going ideas:

$$iio^{i} = (AI \times laio) \div lag, \quad (12)$$

where $laio$ is the learning ability increase for per on-going idea gained.

Furthermore, effective learning ability also rots as employees neglect or forget the related knowledge. The average decay rate in this model regards as a constant. The total loss of learning ability is the average loss of learning ability in the total amount of all adopted ideas.

$$la^{de} = (AI \times ala) \times adr, \quad (13)$$

where adr is the ability decay rate.

The structure conducted from (1) to (13) can be described by a level and flow chart as Figure 4. It displays the co-flow structure of the process of generating employees' creativity and maintaining of learning ability in the GE Company.

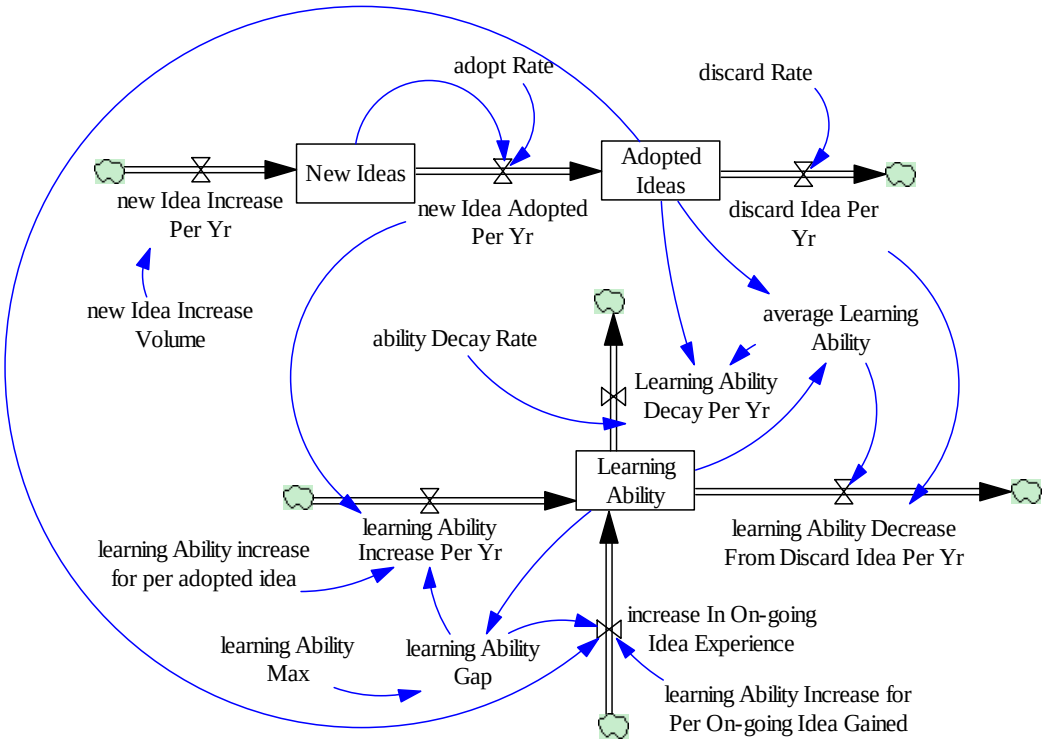


Figure 4 GE's structure of employee creativity and learning ability

The mix effect of new idea creation process and learning ability accumulation process determines the dynamics of one the human resource policy, stimulation of employee creativity and render of learning. The introduction of this policy stimulates some performance improvement effort which was made by GE's leaders. As the equation shown (Equation 6), while the honest level and managers' determination are high, and employee pressure and employee fear are in an adequate level, the investment in human resource and employee creativity will encourage employees' learning level, and furthermore, service quality will accrue over a period of time, and then lead to a greater customer base and better profits. The positive feedback loop will grow rapidly and smoothly. In contrast, even if the investment in employee creativity is huge or managers' determination in organizational change is steady, thus the four factors are not in a suitable level, for example, layoffs leads to a high level of employee fear, the effect of $nicf$ could possibly flood the effect of wasteful investment and cause the confidence of change to drop and frustrate employees to learn. Therefore, the feedback system from the diffusion of employee creativity is critical to the whole process of organizational change. The loop structure is expressed endogenously inside the model, however, they are not only affect the structure mentioned above but also influence the rest of the system and take a particular position in whole model and the GE Company as well.

3.2.3 System Structure of Human Resource Model

Figure 5 provides a wider view into the main feedback loops associated with human resource levers operated in the GE Company. It shows how an investment strategy may lead to a rise of customer base and profit. It also indicates how GE's organizational change processed. Likewise, investment in human resource can split into three areas, employee creativity, bonus policy and employee skills, that can induce the GE Company's capability to further increase the services quality (positive loop, R1, R2 and R3), and then produce an objective profit for the company. Thus, this set of investment strategy meets two internal limits to growth, associated with two negative and one positive feedback loop. The first one is related to poor employee creativity environment, B1 loop, due to abnormal low employee pressure caused by bureaucracy structure in the GE Company. The second one is associated with lower honest level of employees that is caused by management control level as well, that would be sustained to achieve a lower beneficial environment for stimulating employees to create new ideas, such as employee fear. Thus, under rapid environment change condition, organizations tend to create a more suitable environment for producing more good ideas, and GE was not an exception. While the leader push to have more employee creativity and ideas, it also triggers the balance loop, B1, which produces a side effect for employee pressure, and reduce the employees' creativity. On the other hand, another negative loop, B2, could eliminate the problem of extremely high employee pressure that is to increase the investment in employee skill and decrease the employees' job loading and burnout situation, thereby also decreasing the employee pressure to an acceptable level that could stimulate employees achieving higher creativity.

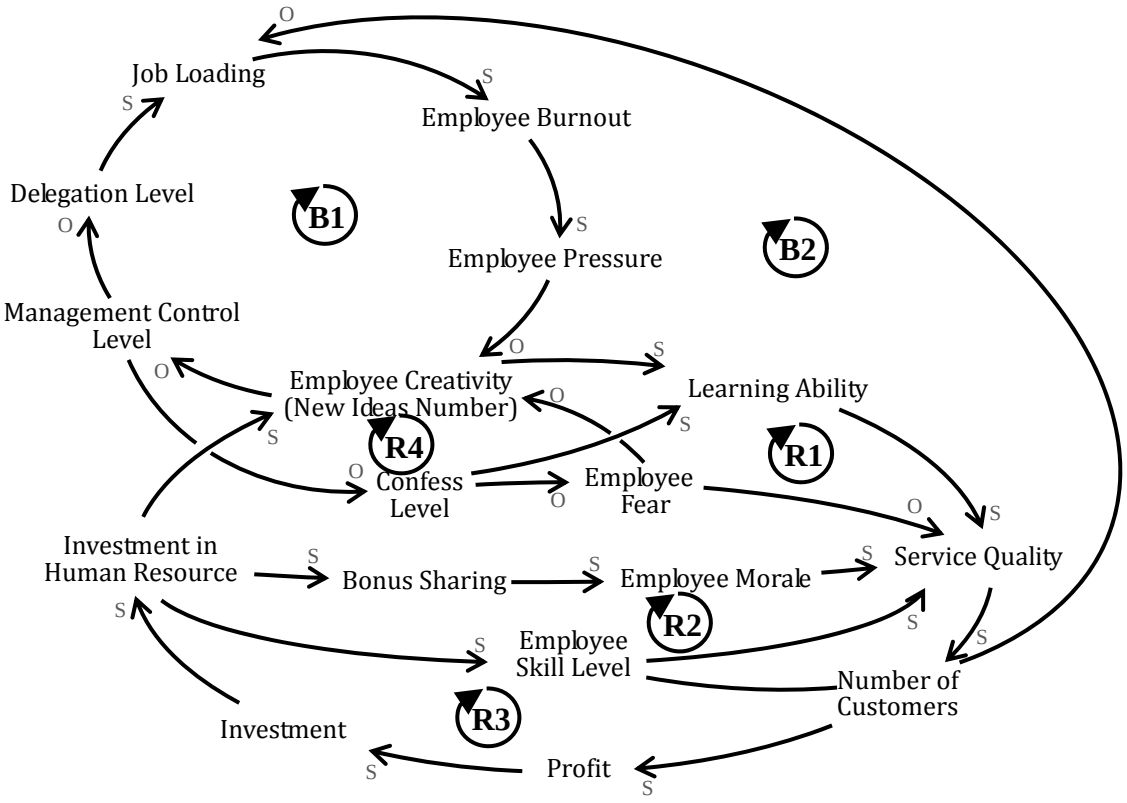
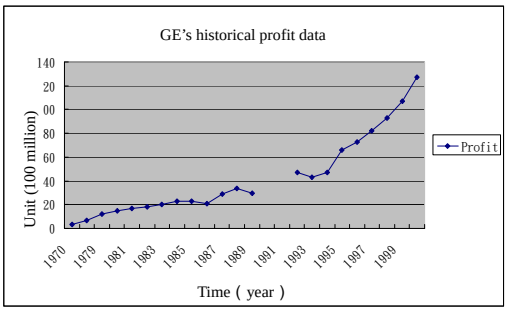


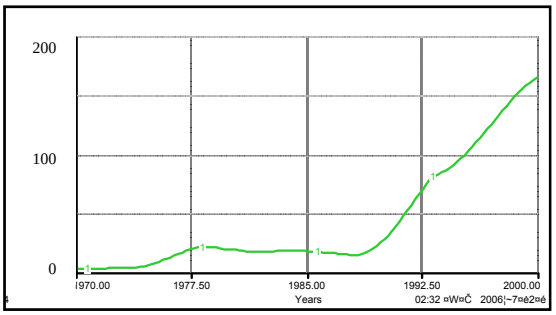
Figure 5 Systems Thinking Structure of GE's Human Resource Model

4. Result Analysis

4.1 Validation Process

In order to validate the SD model, researcher should adopt a wide range of tests are comprised in model testing of system dynamics, such as model structure and a match of historical behaviour (Barlas, 1989; Forrester & Senge, 1980). The SD model was evaluated using historical data and published financial information. Examined with documentary and references help ensure that the feedback structures are correct and the effect of policies are captured. To evaluate the adoptability of the model, we assessed extreme condition tests, parameter sensitivity tests, and structure sensitivity tests. Then, partial model tests were done to be sure all major sub-systems in the model with historical data don't have obvious deviations from historical behaviour (Homer, 1983).





(a). GE's historical pattern of profits (b). GE's simulated patters of profits

Figure 6 GE Profits in historical data (left) and simulation result (right)

The simulation starts from 1970 to 2000; accompanies with historical data. From 1970 to 1980, Jones' strategies were adopted; from 1981 to 2000, Welch's strategies were used. After the basic simulation, profits in the two periods were compared and the time series data was shown in Figure 6. The pattern shown in Figure 6 indicates that the fit for the data is good. To sum up, the model is able to duplicate the behaviour of the GE Company.

4.2 Base Case (Simulation)

The base case simulation shows a reference situation that the model represents GE's historical behaviour from 1970 to 2000. Within the model, there are six inputs (shown in Section 3) for each time slide, which reflect the three major policies in the GE Company. The policies that apply in the base case simulation are given in Table 2.

Table 2: Management policy of base case simulation

Time Zone	**Leadership**	**Management Policy (Investment Policy)**
1970-1980	CEO: Reginald H. Jones Style: • Scientific management	● High attention on R&D, regarded product quality is the key point to competitors. ● Heavily relied on hierarchic control technology, believed it can lead management effectiveness.
1980-2000	CEO: Jack Welch	● Maintain qualified product quality, but regarded service innovation and service quality is the key point.

	Style: • Flexibility • Honesty • Organizational learning	● Adopted flat hierarchy, believed flexibility can lead to innovation and creativity. ● Invested on creating employees' learning ability and generated a good environment for creating new ideas.

The time zone of the model covers 30 years period to contain two leaders' management style and result. The first one, Jones, focused on product innovation, which is based on the idea of research and development can bring with high profit, and another main concept is scientific management. Jones was an accomplished bureaucrat, who believed that hierarchies are the best solution for effective control (Tichy & Sherman, 1993). The inheritor, Welch, focused on service innovation rather than products, and tramped the organizational hierarchies, Welch believed that management empowerment can lead high innovation, creativity and increase flexibility, and then focus on developing employees' learning ability to accrue service quality and create amazing profit result.

The base case simulation, shown in Figure 7, indicates a slight drop of profits after Welch taking over CEO position from 1980, and after that, profits start to climb steadily from 1983 to 1985, and remains stable until 1988, and then rise up dramatically from 1989 to 2000. This also shows that Welch's strategy is suitable for the management environment at that time rather than Jones'. When Welch took place of CEO, he started a series of organizational change activities which is based on his belief system- differentiation. As Figure 7 shows, employee pressure, burnout and employee fear increase noticeably, until he pushed the idea of honesty, the situation released. At the same time, GE is aware of that service quality is the key successful point for the next competition, so start to commit developing learning, such as Work-Out project, best practices, continuous improvement and six-sigma. They build a culture of learning inside of GE by promising a suitable environment of creating ideas, and while this main concept and system take effect, employees release from a high level of job loading and burnout, and service quality promotes, which brings profits on a new growth wave from 1996 to 2000. But, employee fear remains rising steadily, due to the policy of layoff and differentiation, and this still a critical issue in the GE Company.

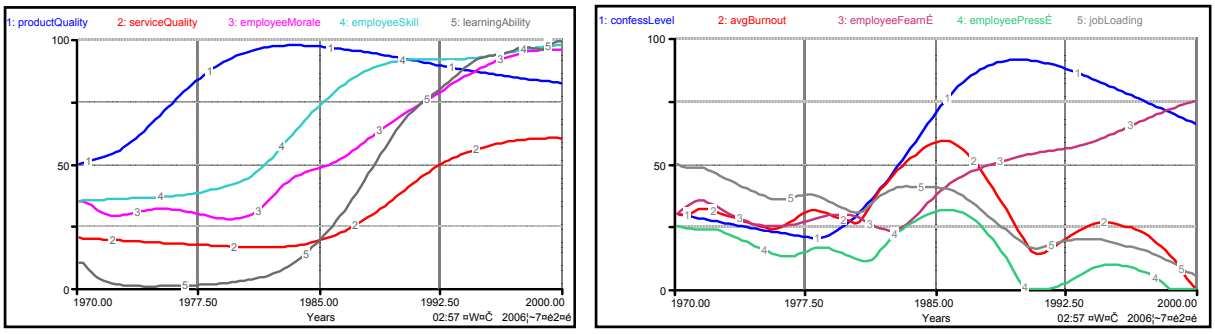


Figure 7 Base Case Simulation

5. Policy Analysis

5.1 Insist on Jones' Belief System & Management Policy

Based on Drucker's research, the normal response of management in a business of the wrong size is to try to bring the sales of the business up to the size required to support the hypertrophied function (Drucker, 1999). To conclude, the management will trigger a growth plan to bring about balance. By this concept, a simulation is done to describe that when the GE Company face the challenge from the business environment, they still address the same strategy that proved could effectively solve the problem in the past, that is Jones' strategy (as shown in Table 2). Figure 8 shows that the simulation result which displays GE's profits drop since 1980 and also proves Jones' belief system is not working in that management environment.

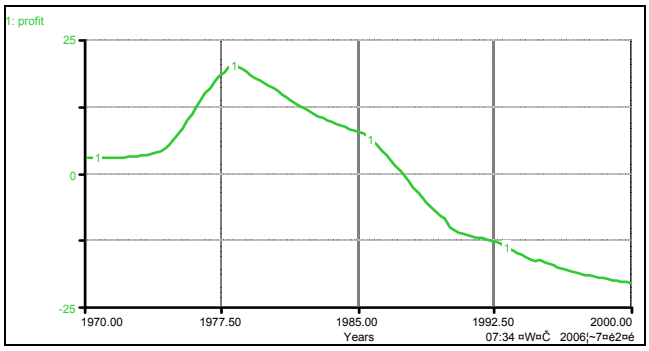


Figure 8 Profits in Jones' Strategy

In contrast to the base case simulation, Jones' strategy results in a high level of product quality around 90 to 100. Nevertheless, the service quality remains low and lead to a limited customer base. Considering the age of 1990s, enterprises needed not only the hands of their employees but also their brains. Without remarkable ideas and the determination of continuous improvement, given no competition in the market,

companies still lost customers in the end.

By the simulation, there is a notable difference between the base case simulation and Jones case that the environment that has been created in the GE Company is not appropriate for generating creativity. Employee fear, employee pressure and job loading fall steadily owing to the high hierarchical organizational design.

5.2 Focus on Increasing Learning Ability

One of the insights from the base case simulation which is mainly based on Welch's believes is the rising of learning ability of the organization can lead to accrue the service quality and profit as well. Since the strategy is proved to work in this system, we test a policy in which the GE Company keeps maintaining its investment in employee creativity policy (shown in Table 3). The objective is to rapidly magnify the learning ability level and create a fitting environment for creativity which embraces high honest level, and appropriate employee fear and employee pressure. Under these setting environments, the continuous improvement of quality can climb up quickly, and enlarge the customer base, and then more profit come.

Table 3 Management policy of focusing on learning ability

Time Zone	**Leadership**	**Management Policy (Investment Policy)**
1970-1980	Follow Jones' strategy. (shown in Table 3)	
1980-2000	Focus on "Learning Ability"	● Maintain qualified product quality, but regarded service innovation and service quality is the key point. ● Adopted flat hierarchy, believed flexibility can lead to innovation and creativity. ● Invested on creating employees' learning ability and generated a good environment for creating new ideas. ● Rearrange the investment ratio, concentrated on employee creativity to develop a learning organization.

Figure 9 shows that focusing on learning ability do not guarantee the long term profits. What's more, the performance is worse than base case simulation. The fundamental reason for this result is ignoring the accumulation process of learning environment. Though the investment ratio in different policies can change, the time delay of creating suitable atmosphere of learning environment still exists. If managers doesn't take time delay into account, the same belief system with slightly different

policies may result in an unexpected anti effect. When employees are not ready to propose their ideas, the pressure and fear would defeat their commitment to make improvement. Shown in Figure 9, from 1989 to 1995, the profits compared with base case simulation keep dropping, until 1996 it rises again. To sum up, investment in learning ability is a long term investment. It can possibly result in positive profits. In short-term, managers still need to consider other growth engines, such as R&D and employee skill.

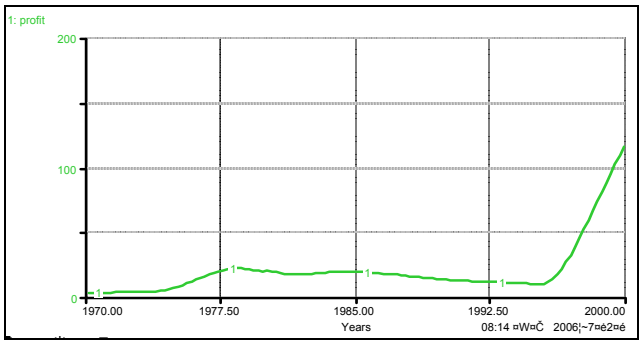


Figure 9 Profits in Policy Test

6. Discussion

This study provides tries to simulate the effect of a leader's belief system with system dynamics, and analyses that how one belief spread into strategies, plans and actions, and then determines the corporation performance. Organizational change is a complex process. It includes not only a series of plans but also a time-horizon line; therefore, it's suitable to adopt system dynamics as a key approach to explore the whole process. Furthermore, three different belief systems from two leaders and one policy test were developed. GE's experience shows a dynamic process of the organizational change and indicates that a leader's belief system decide the organization's performance in the future.

Based on the study, some implications emerge. First of all, business management is a dynamic process. When business environment changes, managers have to deal with dynamic complexity rather than detailed complexity (Senge, 1990). Shown as policy test (Section 5.1), the ordinary management skills (Jones' strategy) was simulated and the result shows negative performances.

Second, a complete organizational change process requires various kind of supporting conditions, and all these conditions need time to develop. In base case simulation, this study demonstrates how the environment is created, such as honest level, employee fear, employee skill level, employee pressure, employee morale and learning ability. Only if the leader creates these advantage circumstances for the organization, the organization have higher possibility to go through a successful

organizational change process. In policy test, the performance result gives evidence of this hypothesis. In the meanwhile, this research also proves that structure influence behaviour. While the core of organizational structure and atmosphere don't change, any single-direction revolution activity may cause short term benefit, but in long term point of view, it may cause profit loss.

Third, time delay is the most important factor while implementing an organizational change procedure. Coordinate with long term and short term growth engines is the way to pledge that the process will take effect. When leaders look forward the future and consider something have to change in order to promise the market growth in the future, they have to think that during this time delay (from strategy implementation to become revenue), what can support the business system keeping in growth. In GE's practice, organizational learning is the keen destination. However, during the process GE considered how to keep the business running smoothly, so GE adopted different strategies such as product quality improvement, flat hierarchical structure, employee layoff policy, or Work-Out meeting. These management tactics in one hand help to create an appropriate environment for developing a learning organization, on the other hand, provide a business growth scheme to make sure a company maintains enough power and energy to keep further down.

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