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# Building Business-to-Consumer Competence in Chinese Fast-Growing Industries: A System Dynamics Model

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# BUILDING BUSINESS-TO-CONSUMER COMPETENCE IN CHINESE FAST-GROWING INDUSTRIES: A SYSTEM DYNAMICS MODEL

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## Abstract

*Most existing econometric studies addressed the success factors of the Internet-based Business-to-Consumer (B2C) by analyzing one or two specific issues, while little has been done to offer a holistic view. Taking the System Dynamics (SD) perspective, this paper offers a qualitative model that illustrates and a formal model that simulates the dynamic process of building B2C in Chinese fast-growing industries. Preliminary results show that the performance of a traditional firm with B2C is not much higher than those without B2C. Order fulfillment quality, customer service quality, online store quality, product customization capability are suggested as the key leverage points for B2C performance improvement. Future research is also discussed.*

**Keywords:** System dynamics, e-business, B2C, resource-based view, Chinese computer industry

## Introduction

The Business-to-Consumer (B2C) e-business model is a business model that extends the traditional brick & mortar-based business practice by introducing an online channel to customers. Over the last decade, e-business has been used as an important lever to foster business growth. It has allowed firms to pursue global strategies, shorten logistic channels, broaden potential markets and establish a direct relationship with end-consumers (Bianchi and Bivona 2002). B2C e-business has been widely adopted by many western firms, even though dot.coms have experienced dramatic boom and bust in the past five years. It was argued that as the competition in a conventional market became increasingly intense, an online business channel would emerge as a strategic imperative for companies to build competitive advantages (Segal 2000). However, in reality few Chinese companies have entered the online business market despite intense competition in the traditional market and increasing maturity of China Internet infrastructure. Having experienced dot.coms bust, many companies have suspended initiatives to build their B2C platforms, doubting the return on investment as an early mover into the online market (Mellahi 2000).

Two research questions arise here: 1) to what extent and how does the introduction to online business affect a company performance; 2) How can management successfully run the online business and the conventional business simultaneously? Considerable research has been done on B2C performance using econometric approach, but few studies have examined B2C as a dynamic system with complex interrelationships. Studies aimed to address these issues from a dynamic and holistic perspective are needed.

Our study aims to address the above issues by developing a generic dynamic simulation model from the system dynamics (SD) perspective. A research project has been started based on the following stages:

1. Analysis of the existing management and SD literature, aimed to build a qualitative SD model.
2. Development of a generic qualitative SD model integrating the findings in the literature review
3. Development of a SD simulation model in the context of a Chinese fast-growing industry based on the insights obtained from stage one and two.
4. Test of the Simulation Model on Chinese Companies

The research is still in progress: to date the literature review and the industry analysis has been done; the generic qualitative SD model and its quantitative counterpart have been preliminarily built. The quantitative SD model will later be applied to real Chinese firms.

This article aims to outline the findings generated so far from the first three stages. To provide a general framework for our study, the main critical factors of Internet-based B2C businesses emerging from the relevant management literature are initially outlined. Then a qualitative feedback analysis model based on the existing SD literature is presented to depict dynamics of the ups and downs of Internet-based B2C businesses, and subsequently to depict the main forces driving the building and draining processes associated with companies strategic resources. The quantitative simulation model, based on the qualitative analysis is finally shown. The main research findings and implications for further research are summarized.

One of the main issues emerging from our study is the difficulty of firms in fast-growing industries to timely perceive limits to growth arising from the lack of strategic resources. Although this problem can also be found in slow-moving industries, it is particularly critical for firms in fast-moving industries. Flaws in management mental models and the lack of a professional team in terms of strategic resources planning and allocation can be primary causes of failure in perceiving the limit to growth following fast-growing (Senge 1990; Paich and Sterman 1993; Sterman 2000; Bianchi and Bivona 2002).

The SD model we develop can support decision makers in understanding the dynamics of resources draining and building, as a result of a learning process through which one can better frame the system in question and challenge management mental models (Morecroft 1994; Sterman 1994).

## Major Success Factors of B2C Strategies

The existing literature has studied the relationships between buyers and suppliers in a highly networked environment (e.g., the Internet) (Sawy 1999; Ramanlal 1999). For instance, electronic commerce has led to changes in the part that traditional distributors and retailers play in the supply chain; their roles could be enhanced or threatened by the new channels introduced by electronic commerce that shorten the logistics channels(Lawerence 2001). From the Economics perspective, it is shown that e-commerce can benefit both suppliers and buyers through product customization, IT capability building, open architectures, expanding customer base and fixing pricing strategy (Ramanlal 1999). Anitesh (2001) suggests that IT applications, process and readiness are three critical e-business drivers to achieve operational excellence. Along the same lines, traditional companies expecting to benefit from B2C should focus on IT capability upgrading, customer base expansion, product customization and internal production process improvement, etc.

The existing literature has also studied distinct roles that customer service plays in e-business. Parasuraman (1991) found that online customers pay great attentions to service quality. It is also found that customer service in e-business may have different characteristics than that in traditional service (Cox 2001). Some determinants in traditional service are not relevant in e-business while some other determinants such as accessibility, communication, credibility, understanding, availability are equally applicable to e-business (Cox 2001). Similarly, a survey conducted in Europe by the KITE consortium (1999) notes that content (i.e., the presentation of a product or service offered over the Internet), convenience (i.e., usability of the website for the pursues for which it was designed), and interaction with customers before and after sales are critical factors influencing e-commerce performance. Thus distinct online service quality seems to be important in increasing online customer satisfaction and needs to be addressed be handled differently.

Online businesses involve complex agent-involved customer service due to the novelty of e-business. Customers lack online-shopping knowledge and experience (Cox 2001). The quality of customer service professionals is a determinant of the service quality they deliver. However, it seems challenging to maintain the quality of service professionals in fast-growing industries because it is found that fast-moving industries feature frequent innovation and high demand of knowledge, the rate of skills obsolescence becomes rapid and normal staff development processes may simply prove inadequate in building up the necessary new skill base (Winch 1998).

In short, the existing literature has addressed some essential issues related to successful B2C competence building, such as IT capability building, product customization, improving online and offline services, and managing customer base expansion, etc. However, as presented in this section, most researchers did so by breaking down the whole picture and analyzing one or two specific issues. A holistic view of the complex dynamics in B2C in fast-growing industries, to our best knowledge, has not been approached.

## Managing Internet-Based B2C Growth: A Feedback-Oriented Resource-Based View

Recent conceptual developments in strategic management has focused on corporate growth using a resource-based view (RBV) of the firm (Wernerflet 1984; Barney 1991). This perspective views the firm as a bundle of heterogeneous resources. Under the right conditions, the resources allow the firm to achieve sustained competitive advantages. The critical factors discussed previously could be viewed as key resources B2C businesses should manage and leverage.

A systemic view of the above critical factors should be taken in order to understand how the introduction of e-business might affect traditional companies performance. Each of these critical factors is dynamically linked with others and arises from the accumulation and depletion processes affecting strategic resources in the firm. Fang (2003) has suggested a conceptual SD model depicting the dynamics of using strategic resources in traditional firms operating within fast-growing industries (See Figure 1). As can be seen in Figure 1, five feedback loops illustrate the dynamics of key resources within traditional companies, including marketing resources (R1), R&D resources (R2), logistics capabilities (B1), A/S capabilities (B2) and production capabilities (R3). The marketing loop (R1), the R&D loop (R2) and the production capacity loop (R3) are suggested to enable firms to grow exponentially (Fang 2003); Meanwhile, the A/S service loop (B2) and logistics loop (B1) are suggested to cancel the reinforcing effects contributed by reinforcing loops and limit the firm from growing (Fang 2003). For instance, as balancing loop B2 shows, an increasing conventional market share caused by aggressive marketing investments may lead to increasing conventional orders, which leads to a bigger installed base. A bigger installed base leads to more service requests, which will likely result in lower service capacity adequacy and consequently lower service quality, which will negatively affect the conventional mark share. In other words, the benefits obtained through marketing investments tend to be naturally cancelled out by the inadequacy of A/S quality. Therefore, it is important to address the A/S service capacity issue adequately and timely as the company is growing. Along the same token, we suggest that effectively integrating and managing all these resources are essential for firms operating in conventional markets.

As traditional companies introduce Internet-based B2C business, three major issues may arise: 1) a web site will emerge to presenting the company and its products and to accept customers orders; 2) the emerging B2C business will share the above key resources; 3) there is an substitution effect between the conventional channel and the online channel. Fang (2003) suggests that dynamic loops associated with the Internet-based business should be brought into the above diagram, as illustrated in Figure 2.

The newly added loops (i.e., B3, R4 and R5) represent feedback-oriented dynamics associated with the introduction of e-business. Balancing loop B3 shows that an increasing amount of online visits will result in higher server workload and lower server response quality, which will negatively affect the online market share and consequently the amount of online visits (Fang 2003). Reinforcing loop R4 and R5 address that increased online order result in increased income, which leads to more investment in web software maintenance and content maintenance, which in turn contribute to better webpage content quality and consequently an increased online market share (Fang 2003). In other words, web server capacity and website quality have emerged as key resources as traditional companies introduce Internet-based B2C businesses.

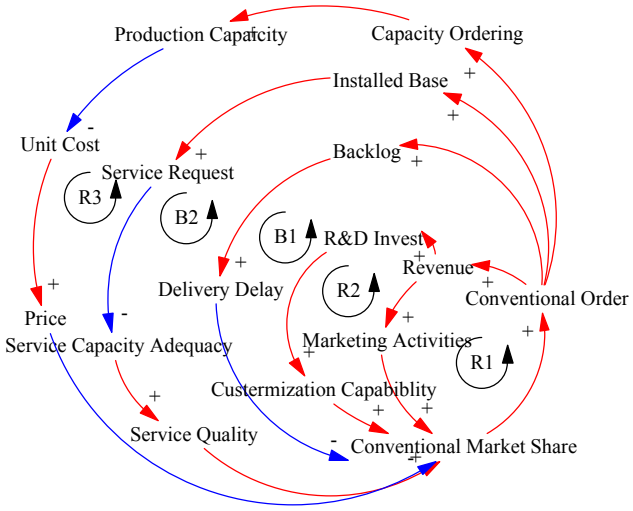


**Figure 1. The Dynamics of Key Resources Affecting Corporate Growth Through Conventional Channel, Adopted from Fang (2003)**

The emerging online channel needs to share with the existing conventional channel the firm marketing, R&D, production, service and logistics resources, as shown with loop R1 R2 R3 B1 B2 in Figure 2. Reinforcing loop R1 R2 and R , similar to R1, R2 and R3, may potentially push the company to grow even faster. However, balancing loop B1 and B2 jointly with B1 and B2, may deplete the firm A/S service resources and logistics resources even faster than only B1 and B2 would do.

Furthermore, there emerges a substitution effect as the e-business comes into play, as shown with loop R6 in Figure 2. It implies that some conventional customer shift to online ordering, while some online customers shift to the conventional channel. The direction of customer flow depends on the relative attractiveness of each channel (Fang 2003). In addition, customers certainly may choose neither of them, but competitors.

In summary, it seems that the adoption of Internet-based B2C businesses may affect corporate performance at least in three ways. First of all, the firm web server and website are the key resources for online businesses. Their adequacy and quality (i.e., server response quality and webpage content quality) will affect corporate performance. Giese and Oliva (2000) in their study on dot.coms have also demonstrated this point. Secondly, the introduction of online businesses might cause the existing traditional capacities (i.e., marketing, R&D, logistics, A/S service, production, etc) to change, which in turn might affect corporate performance. Thirdly, the co-existence of two ordering channels might cause customers to interflow between them, and consequently change the size of the two customer bases. This has implications to corporate strategic planning concerning the focus of the firm target market (i.e., mortar vs. mouse).

To manage Internet-based growth strategies properly, it is crucial to foster management learning processes of accumulation and depletion of the firm key resources as discussed in this section. These processes are often difficult to perceive, not only because they cannot be measured in monetary terms, but also because they gradually evolve over time and are subject to inertia (Bianchi and Bivona 2002).

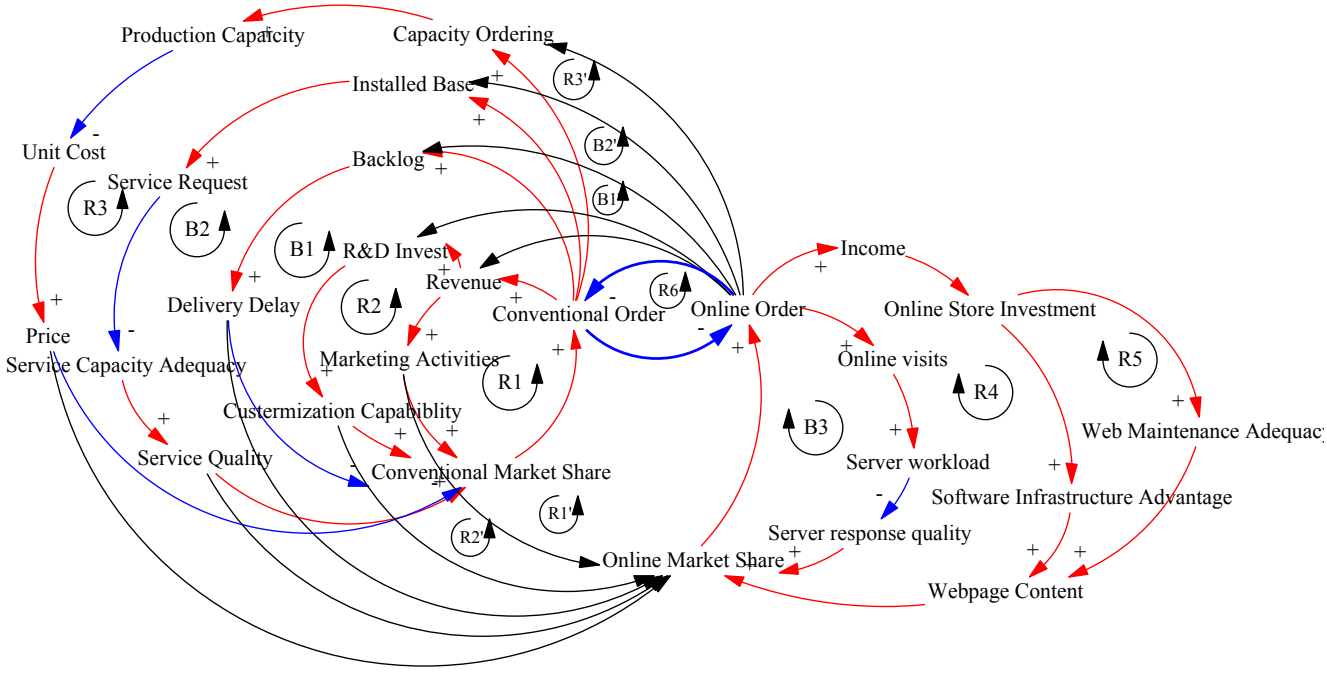


**Figure 2. The Dynamics of Key Resources Affecting Corporate Growth Through the Conventional and the Online Channel, Adopted from Fang (2003)**

## Generic SD Simulation Model to Analyze B2C Business Strategies in Chinese Fast-Growing Industries

The qualitative analysis in the previous section has explained the reasons that the adoption of B2C may change corporate performance. However, it cannot address how much to change and when to change. Qualitative analyses can help management be aware of dynamic problems, but they cannot enable management to learn and explore alternative strategies based on the dynamic analysis, and cannot quantitatively measure the results of alternatives. To address these limits, a generic simulation model has been built using the SD approach. We expect the formal model:

- To gain more insights into the dynamics of Internet-based B2C businesses and to identify the core population/flow structure of the issues studied in the earlier stage
- To develop a simulator for the analysis of different scenarios. For example, we may simulate and compare the performance of the company exclusively with a conventional channel, and the performance when it has adopted the Internet-based B2C channel.
- To test alternative policies and to find out the leverage points that can most effectively address the business problems

For the study of this stage, the SD simulation modeling techniques is adopted and Chinese computer industry specific data are used as the testing inputs of the model. The SD simulation modeling technique, Chinese computer industry, the formal model framework and model validation are discussed below. The results from the initial model testing are also presented.

### *SD Simulation Modeling Approach*

We used the system dynamics approach to build an enterprise-wide generic simulation model that portrays the structure of a Chinese computer company with both a conventional sales channel and an online sales channel. The model offers a holistic view of the major operations of a traditional computer company with B2C practice by including major components discussed in the above section (i.e. customer base, R&D, IT capability building, marketing, A/S customer service, etc).

The company in the generic model is posited to be undertaking structure changes when setting up online channels. As discussed earlier, the system under examination features complexity and dynamics. It involves two different channels (online vs. conventional) simultaneously. Computer purchasers choose to purchase through one of the two channels or to leave for its competitors. Strategy resources sharing between the two channels and customer turnover between channels and/or between competitors can cause dynamic and complex interactions as previously discussed. Thus, we need a methodology that can portray the system dynamics and complexity, reflect delays and feedbacks, and can predict the patterns over time through simulation. Traditional econometrics applies mathematical and statistical approach to economics, but the dynamics (i.e., feedbacks and delays) embedded in a system are not explained (Sterman 2000).

System dynamics (SD) is a perspective and a set of conceptual tools that enable us to understand the structure and dynamics of complex systems (Sterman 2000). We have used it in the previous stage of our study. It is also a rigorous modeling method that enables us to build formal computer simulations of complex systems and use them to design more effective policies and organizational systems for the future(Forrest 1961; Forrest 1961; Forrest 1971; Sterman 2000). It is essentially a simulation-based modeling technique that begins with levels or populations (e.g., a stock of order backlogs), and determinants of rates of flow of populations (e.g., current market size, the simulated firm marketshare, etc). Rates of flow can be based upon any information in the model, including previous rates of flow or size of populations and perceived differences among them. It is this capacity to have flows influence populations, which in turn influence flows, that allows SD to capture complex and non-linear behavior of systems over time (Thatcher and Clemons 2000). Given its ability in addressing dynamic structures, the SD modeling technique was adopted in the study of this stage.

### *The Chinese Computer Industry*

The Chinese computer industry was chosen to provide preliminary data for initial testing of the formal model. We chose this industry for two reasons:

1) Chinese online businesses are enjoying fast growing. E-commerce in China was forecast to grow more than ten-fold since 2000, according to government estimates. Businesses on the web were expected to reach a volume of USD

$96.7M by 2000, and would reach $1.2 billion by 2002 (BBC 2000). The number of Internet users in China reached 45.8 million on June 30th 2002 (CNNIC Survey, 2002). As such, e-commerce market in China has been of great interest to global practitioners and the emerging dynamics in this market should be of great interest to business researchers.

2) China is regarded as one of the most fast growing market for personal computers. From 1996 to 2000 China's personal computer market grew at an average annual rate of 25%.[1] Its market size was about 4 million units by 1997. The number exceeded 10 million by 2000. Since 2000 the overall growth rate was estimated to be at 20%.[2] The fast-growing Chinese computer market has attracted many national and international players. This leads to a dramatic increase of competition. Strong players such as IBM and DELL have sold computers online in China since 2000, aiming at strengthening their competitive advantage by offering more purchasing channels and product options to customers. Many other computer companies in China are still wondering to what extent and how to start an e-business, as it is still an emerging business. Given the early stage of the Chinese online computer market, how B2C should be adopted in this market remains interesting to both academia and practitioners.

Thus, the computer industry-specific data in China was collected as the testing inputs of the formal model. Values for all constant variables about China's computer industry were obtained from official statistics and major Chinese computer magazines (e.g. China Stats, China Computer News; Computer World; IT Executives, etc). To get data not available in these sources, Chinese firm-specific data in particular, preliminary interviews with professionals in the Chinese computer industry were conducted to obtain expert insights. Initial values for the level, flow and auxiliary variables were defined using other variables within the model because they are all endogenous variables.

### *Model Briefing (High-Level)*

The model in this study was developed on the basis of classic corporate models in the existing SD literature (e.g., Forrest 1968; Morecroft 1983; Madnicks 1991; Sterman 1993; Sterman 2000). It consists of ten key modules including *R&D (i.e. the proxy of customization capability), manufacturing process*, *inventory management*, *product delivery*, *customer service*, *product pricing*, *advertising*, *customer flow (both the traditional channel and the online channel)*, *website construction (hardware construction, software construction, content maintenance)* and *accounting*. The model assumes dis-equilibrium dynamics as it models rapid corporate growth (or decline) in a fast-growing industry, just as the Chinese computer industry. The simulated company can reach two states of "equilibrium" – bankruptcy or generating a stable stream of profits. The simulation model has a time horizon of 400 weeks. Such a period has been set to capture the short-term and long-term effects. A summary of each module is given in Table 1.

Powersim, one of the major SD modeling tools, was used to develop this formal model in our study. Sixty stock variables (e.g., inventory, A/S service backlog, online customers, etc), ninety flow variables (e.g., order, customer service request, shipment rate, R&D investment, etc), two hundred forty auxiliary variables and one hundred fifteen constant variables were defined and quantified in the stock-flow diagram (see Appendix 1 for an overview of the preliminary simulation model). The Powersim model was expected to run simulation and generate projected behaviors of the company in the model. (The definitions of all the parameters in the model are available upon request)

The model at its current stage (i.e., stage three of the whole research project) still remains a generic one. Although customized modeling is, in general, the most suitable option to analyze the specific processes of a conventional company with a web presence when enough project resources are available, the use of generic structures that can be easily and quickly tailored to an individual firm has also proved to be successful in enhancing learning-oriented studies (Arthur and Winch 1998; Bianchi 2002).

[1]Data source: 2001 Annual Report for China Computer Market Summary by HLYT at **http://www.icansoido.com/English/marketresearch/1.htm**.

[2]Data source: 2002 China Computer Market Overview, CEIINET, **http://www.ceiinet.gov.cn/scyj/jsjryj/200301100004.htm**.

**Table 1. Major Modules with Descriptions and Original Sources**

| Module | Description | Source |
|---|---|---|
| R&D | Models the process of R&D investment decision-making and R&D capability adjustment. Chinese slow investment concern reflected. | Adapted from Chapter 12 (Sterman 2000) |
| Manufacturing | Models the dynamic process of production capacity adjustment against desired capacity. | Adapted from Chapter 12 (Sterman 2000) |
| Inventory | Models the process of deciding desired production capacity and actual shipment rate. | Adapted from Chapter 18 (Sterman 2000)<br>Adapted from Chapter 16 (Sterman 2000) |
| Product Delivery | Models the process of delivering products for traditional purchase and online purchase (two channels share the same delivery capacity) | Adapted from Market Growth Model (Forrest 1968) |
| A/S Service | Models A/S service division handling customer calls/Emails, and service staffs acquisition, training and turnover. Chinese companies relative low service quality is reflected by the average response time. | Partly adapted from Multi Market Model Davidson & Myrtveit (1994);<br>Partly adapted from Software Project Dynamics (Madnicks 1991) |
| Pricing | Models a common pricing strategy that the price is determined by cost, markup rate and inventory adequacy. | Adapted from Multi Market Model Davidson & Myrtveit (1994) |
| Advertising | Models advertising investment decision-making process; Chinese conservative adv. strategy reflected. | Adapted from Multi Market Model Davidson & Myrtveit (1994) |
| Customer Flow | Models Chinese Internet users' online shopping behaviors including browse, purchase, develop loyalty, change preference on suppliers & channels. | Adapted from Giese & Oliva (Giese and Oliva 2000) |
| Web Construction | Models infrastructure (hardware and software) investment process and content maintenance process | Based on (Sterman 1993) |
| Accounting | Sum up all the financial measures to generate the company revenue and cost. | N/A |

## *Model Validation*

The process of judging the validity of a system dynamics model includes a number of objective tests (Richardson and Pugh 1981). They are:

- **Face validity.** To test the fit between the rate/level/feedback structure of the model and the essential characteristics of the real system. The model was developed jointly with academic researchers in the e-business field. At this stage, the generic structure of the model has been confirmed by the academic experts in the field. However, deep interviews with e-business practitioners in China remains to be conducted to obtain company-specific insights.

- **Reference mode replication**. To test whether the model can endogenously reproduce the various reference behavior modes characterizing the system. Reference modes reproduced by the model included a diverse set of behavior patterns both reported as industrial news and studied in the literature (e.g., typical boom and bust behavior in dot.coms were generated using the model).

- **Extreme condition test**. To test whether the model behaves reasonably under extreme conditions or extreme policies. A model that does not work reasonably under extreme conditions is suspectable, because it is not unlikely that extreme conditions may happen in ordinary simulations. The model at the current stage has passed this test well.

- **Case study**. A case study exclusively using data from one single company is to be conducted yet after the model has been completely developed. This constitutes an important element in validating mode behavior, and is a process of turning the generic model at this stage to a more customized one.

Any of these tests by itself is not sufficient as the indicator of model validity. However, they can be a formidable indicator if taken all together (Richardson and Pugh 1981). At the current stage of this research project, the model developed so far has well passed reference model validation, extreme condition test, and partly face validity check. Face validity test by e-business practitioners will be conducted jointly with the case studies.

### *Preliminary Results in the Base Runs*

At the current stage, the model was run under two scenarios (I. with the traditional channel only; II. with both channels) for a comparative analysis. Results showed that the conventional markets share in scenario II was less than that in scenario I (See Figure 3). Thus, a performance problem seems to be that an increase of the company market share captured through its online channel was cancelled out by a decrease of its market share captured through the traditional channel. The reason might be due to the substitution effect and enlarged product delivery delay and service delay in the traditional channel caused by resources inadequacy. For instance, as shown in Figure 4, the delivery delay through the conventional channel was longer in scenario II than that in scenario I, because the introduction of online businesses occupied part of the firm logistics capability.

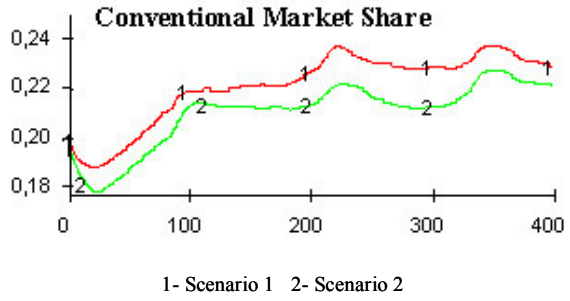


**Figure 3. Conventional Market Share in Scenario I and Scenario II**

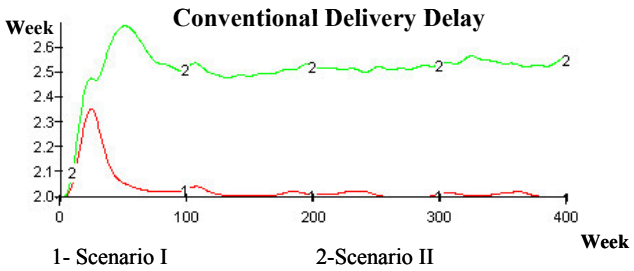


**Figure 4. Conventional Delivery Delay in Scenario I and Scenario II**

As can be seen in Figure 5, the profits by the conventional channel and the online channel in each scenario were growing with constant fluctuations. The profit behavior unfolded two performance problems. 1) The conventional profit in scenario II was lower than that in scenario I, although the online business contributed to the overall profits in scenario II; 2) all the profits were growing with structural fluctuations. A smooth growth was not achieved. Besides, although the total growth was positive, it should be driven by the high growth rate in the fast growing computer industry in China, because the market shares had been staying constant since week 200.

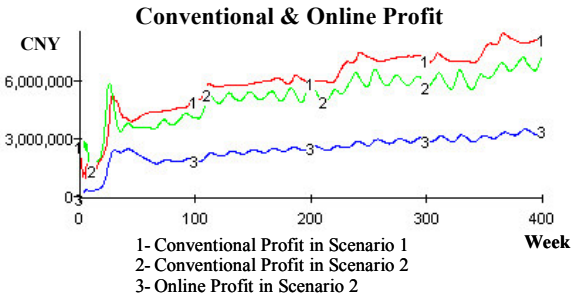


**Figure 5. Profits by Channel in Scenario I and Scenario II**

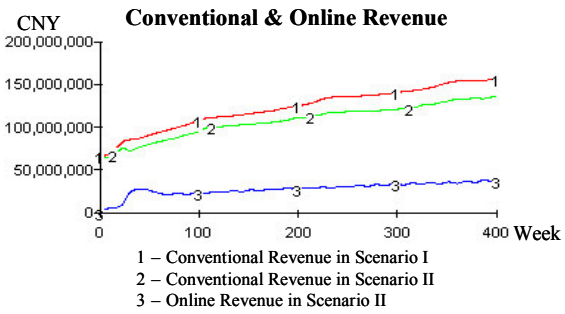


**Figure 6. Revenue by Channel in Scenario I and Scenario II**

Similarly, Figure 6 showed that the conventional revenue in scenario II was less than scenario I. The online business generated revenue that could make up the revenue lost in the conventional channel. It was noted that the profits were constantly fluctuating but the revenue was smooth. This implies that the overall cost might be a potential problem that hampered corporate performance.

## Discussion

By preliminarily running the model under the two scenarios, our study shows that managers may consider the following factors in the online computer business in order to improve the company performance. They are *the product delivery quality* and *the customer service quality*. They are the major leverage points to which the company performance is highly sensitive in the model.

Orders increased a lot as the online sales channel opens. This would potentially hamper the product delivery time. Product delivery quality can be sustained by adjusting the shipment rate corresponding to the inventory adequacy or by re-estimating desired production capacity and then adjusting actual production capacity. This result is also supported by the generic model growth and Under-investment in the existing SD literature because capacity building is argued to be essential for fast-growth companies (Coyle 1993).

Customer service quality can be improved by controlling the turnover rate of experienced staffs or by allocating sufficient training time to inexperienced staffs. High rookie/experienced rate has negative effect on service quality. This result is also supported by existing literatures (Heskett 1991; Finegold 1996).

Besides these two factors can affect the corporate performance by impacting both the conventional channel and the online channel, we also propose that *website quality* and *customization capability* are the factors that can have major impacts on the online channel. Better website quality attracts more online customers, which contributes to online revenue generation. More revenue makes more investment on website possible. These two strategies are consistent with Anitesh (2001) argument on website quality. Empirical evidence is also available: The websites of Cisco Systems and Dell, the two online business leaders in the computer industry, offer excellent websites and online order processing systems. The website quality can be improved by investing more technical resources and implementing better software. Customization capability is built through R&D. An increase in R&D can result in more product options to online customers, which results in more customers and more sales, and consequently more R&D investment. Product customization capability can be improved by investing more in R&D. The testing of these two propositions will be done in the later stage of our research project.

## Conclusion and Continuation of the Research

System dynamics models are powerful tools to help understand and explain the feedback interrelationships of complex management systems. The model in this study offers an operational methodology to support decision-making and policy design. It can provide a perspective complementary to the classic econometrics-based research, can address the dynamics within a system (e.g. feedbacks, delays, non-linearity), and can explain the causalities in loops. As the academia, we can use the SD model to test hat-if? scenarios and to explore what could happen under a variety of future conditions (Sterman 2000). It could also be a useful business simulator and a learning environment for practitioners when a user-friendly interface is developed in the future work.

The project is still in progress. More model validation and behavior analyses will be conducted. Future work will include:

- Interviews with online business practitioners to improve face validity and to obtain real Chinese firm-specific data for case study
- More analyses on the behaviors of the two scenarios (i.e., the conventional and the online channels) generated by the model to obtain more quantitative insights of the structural problems identified in the research to date.
- Testing alternative decisions to address the dynamic problems caused by the introduction of online businesses, including the two problems identified in this article (i.e., service capacity, logistics capacity), the two proposed issues (i.e., website quality, customization capability) and other issues to be found in the simulation.
- Integrating business decisions to develop business policies (a well-defined set of decisions) Literally the simultaneous application of multiple strategic decisions can help achieve much higher performance due to the synergy effects, while it is also possible that their effects just cancel out each other. They will be explored in the future research
- Developing an interactive learning environment (ILE) to facilitate management's learning processes

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# Appendix 1. Preliminary Simulation Model