Organizational Size, Flexibility, and Performance:

A System Dynamics Approach

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Abstract

Whether organizational size has effects on flexibility has long been an issue of discussion and debate in the field of organization studies. In addition, whether organizations with a greater degree of flexibility will perform better in a rapidly changing environment has also been widely discussed in the literature of organizational change. This study intends to illuminate the interwoven nature and reciprocal relationships among organizational size, flexibility, and performance by building a dynamic model to examine the contradictory findings in existing theories. The results of analyzing the behaviors of the model suggest that organizational flexibility is a construct of multiple attributions that has been overlooked in different studies. As a result, only if we can clarify the meaning of flexibility, can we then resolve the arguments regarding whether large or small organizations are more flexible, and whether flexible organizations tend to outperform less flexible ones.

Keywords: organizational size, flexibility, performance, organizational change, resource allocation, system dynamics.

Introduction

In the field of organization studies, organizational size, as a critical factor that affects the degree of flexibility, is an issue of discussion and debate. For example, some scholars contend that large organizations tend to have a higher level of flexibility for successfully implementing change attempts due to the diversity of their resources and specialties and the greater tolerance capacity resulting from more available resources (Kaufman, 1971; Boeker, 1991). In contrast, other authors hold that only small organizations have greater flexibility to adapt to change because they can respond more quickly with a flatter and faster decision-making structure (Quinn, 1985; Macdonald, 1995). A third argument exists, however, which argues that there is an inverted-U-shaped relationship between size and flexibility. This argument holds that medium-sized organizations tend to possess greater flexibility and perform more successfully in a changing environment (Haveman, 1993).

In addition, recent research has also shown an increasing interest in exploring the effect of flexibility on organizational performance. On the one hand, flexibility is assumed to impair organizational performance in terms of making organizations more unstable and unreliable (Hannan and Freeman, 1984). On the other hand, flexibility is seen as an essential factor that will improve organizational performance since flexible organizations are more capable of adapting to the rapidly changing environment (Weick, 1977; Pasmore, 1994). Although all these scholars have made contributions to this issue in terms of providing insights for enlightening future studies, none of them has successfully illustrated the interwoven nature and reciprocal relationships among different forces in complex organizational settings.

Recent developments in the areas of organizational behavior and theory, especially in the organizational change area, have shown that the one-shot, unidirectional approach adopted in most studies is not sufficient for building comprehensive theories and interpreting organizational reality (Pettigrew, 1990; Mowday and Sutton, 1993; Thiêart and Forgues, 1995; McKelvey, 1997; Coleman, 1999). Therefore, although "[s]tudies that capture complex interactions are frequently more formidable undertakings" (Mowday and

Sutton, 1993, p. 217), researchers have become more aware of the importance of developing models that include reciprocal relationships between organizational contexts and individuals or groups so as to obtain a more in-depth understanding and explanation about the dynamics in organizations.

Responding to the call to develop models that help illuminate reciprocal relationships and interpret organizational reality, this paper provides a rudimentary effort by building a dynamic model to examine the effects of organizational size on flexibility and performance. The purpose of this effort is not to develop a new theory by analyzing empirical data. Instead, the purpose is to test existing theories regarding the relationships between organizational size and flexibility, and between flexibility and performance. The results may help us to explore the applicability of using system dynamics to clarify the complex phenomena and to facilitate our understandings about organizational reality.

The Nature of Flexibility

Organizational flexibility is a relatively ambiguous and controversial term. Although many people have used the word "flexibility" or "flexible" in their studies, most authors tend to take for granted that the meaning of flexibility is already known to their readers. Although a few scholars have attempted to provide a proper definition that can clarify the meaning of flexibility, little consensus has been reached about what it really is, and where it comes from. This section will examine the nature of flexibility based on related arguments in the literature.

The Capability to Respond to Change

In the literature, one of the most often used definition of flexibility views flexibility as a variety of organizational capabilities to respond to environmental change and uncertainty (Aaker and Mascarenhas, 1984; Pasmore, 1994; Liebeskind et al., 1996; Volberda, 1996). For example, Volberda (1996, p. 36) defined flexibility as "the degree to which an organization has a variety of managerial capabilities and the speed at which they can be activated, to increase the control capacity of management and improve the controllability of the organization." Pasmore (1994, p. 5) stressed that "being flexible means being able to change everything, all at the same time." King and Anderson (1995,

p. 16) considered flexibility to be "the ability to produce different categories of response." In all these definitions, flexibility is not only the capability to respond to change, but also the ability to change quickly and effectively.

To define organizational flexibility as the capability to respond to change may raise another question: How should this capability be assessed? The answers to this question may vary depending on the characteristics of the environments which organizations encounter. In a stable environment, scholars may tend to view flexibility as the ability to cope with the oscillations of price or market demand (D'Aveni, 1994). Alternatively, in a dynamic environment where competency is determined by innovation, people may tend to assume that flexible organizations are those which can invent more innovative products or services. For example, Liebeskind et al. (1996) found that two new biotechnology firms had been highly successful in the sense that they were better able to source and commercialize valuable scientific knowledge by using boundary-spanning social networks to improve their flexibility. Similarly, Craig (1996) found that two Japanese beer companies—Asahi and Kirin—had introduced more new products into the markets by building greater capability to respond to changing market demands. According to the arguments stated above, the model developed in this research will have an underlying assumption that the organization's capability to respond to change is positively related to the rate of innovation of products (Assumption 1).

Slack Resources

In a relative static environment, conventional wisdom suggests that organizations should invest their resources in building specialized assets (e.g., machinery, facilities) so as to exploit the benefits of economy of scale (Williamson, 1975). In contrast, in a dynamic and hypercompetitive environment, these suggestions may not be as useful since it is believed that in this type of environment, an organization which invests most of its available resources in specialized assets may become vulnerable to unexpected environmental surprise (D'Aveni, 1994; King, 1995). Therefore, operating in a rapidly changing world, organizations need to maintain room to maneuver or to create a cushion to initiate strategic change so as to respond to shifting environmental demands (Püpin, 1991; Haveman, 1993). In this sense, slack resources that can be generalized for multiple

uses are assumed to allow organizations to attain a higher degree of flexibility to reduce internal and external pressures (Sharfman et al., 1988). Moreover, it is generally asserted that only organizations that have excess slack resources can afford the cost of a mismatch between environments and organizational structures. On the contrary, the mismatch will become unaffordable for any organization with little or no slack resources (Yasai-Ardenkani, 1986). These arguments lead to the second assumption for model building in this research, that the increase of generalizable resources will lead to a higher degree of capability to respond to change (Assumption 2).

Resistance to Change

Structural inertia theory assumes that organizations need to reproduce themselves so as to maintain reliability and accountability. The reproducibility, however, tends to generate strong inertial forces and resistance to change (Hannan and Freeman, 1984). In general, institutionalization and routinization are considered to be the major sources from which the forces of resistance to change are produced (Kelly and Amburgey, 1991; Amburgey et al., 1993). This resistance to change in turn leads to a lower level of flexibility and makes the organization become less capable of responding to change in terms of moving in new directions and pursuing new opportunities more rapidly (Haveman, 1993; D'Aveni, 1994).

In order to minimize the resistance to change, it is often suggested that organizations should devote efforts to the reorganization of their structure, processes, and individual behavior (D'Aveni, 1994). The reorganization efforts, however, tend to consume resources, especially generalizable resources. For example, the organization may need to invest more resources in revising existing operational procedures, creating interactive structures, and transforming the thinking and behaviors of organizational members (Hammer and Champy, 1993; Heckscher, 1994; Pasmore, 1994). The ability to successfully implement these efforts will inevitably depend upon the willingness of the people to cooperate and collaborate. Regarding this issue, many scholars have raised concerns about the importance of people in determining the success of the organization. For example, Pfeffer (1994) contends that since many other sources of success such as product and process technology, protected or regulated markets, access to financial

resources, and economies of scale have become less powerful than they once were, people and how we manage them are becoming more important for the organization. Similarly, Senge argues that "[p]eople don't resist change. They resist being changed" (1990, p. 155). Therefore, although the investment of resources in preparing people for change may not be directly related to organizational performance, it should not be ignored. When people are not willing to cooperate, their resistance may significantly offset other efforts for improving response capability. This leads to two additional assumptions for developing a model that examines the link between flexibility and performance. First, it is assumed that investing more resources in the workforce will lead to lower resistance to change (Assumption 3). Second, it is assumed that lower resistance to change will lead to greater capability to respond to change (Assumption 4).

Flexibility and Resource Allocation

Attaining a higher level of performance is often perceived as the primary goal of organizations (Abrahamsson, 1993). Nevertheless, the issue of how organizations should make decisions to allocate their resources properly so as to attain higher performance is an area of great contention.

On the one hand, Williamson (1975, 1991) claims that asset specificity is essential for organizations to succeed in the presence of uncertainty. In contrast, organizations that have a medium level of asset specificity tend to become nonviable when the frequency of disturbances increases to a higher level. According to this argument, asset specificity is assumed to be more important for the organization to attain a higher level of performance. On the other hand, D'Aveni (1994) contends that although the commitments to a certain course of action tend to help an organization sustain its current advantages in static environments, investment in generalizable resources and in the workforce is more important for organizations to be able to succeed in dynamic environments.

The contradictory arguments stated above may result from the different assumptions about the nature of the environmental change. Henderson and Clark (1990) point out that before the emergence of a dominant design, organizations tend to invest more resources in exploring new products. Once a dominant design is established, more

efforts will be devoted to refining and elaborating the current design by improving production processes within a stable architecture. In this sense, it may be reasonable to assume that organizations will continuously adjust their resource allocation policy, depending on whether they perceive their environment as static or dynamic. According to this rationale, the model will assume that in a static environment, organizations tend to invest more resources in asset specificity so as to outperform their competitors. Alternatively, in a dynamic environment where new dominant designs continuously replace the old ones, organizations tend to increase their investment in generalizable resources so as to respond more quickly to environmental change (Assumption 5).

Size Effects on Flexibility and Performance

As discussed in the introduction to this paper, an important question for organizational studies is: How is organizational size related to flexibility and performance? Many scholars have attempted to answer this question. Few people, however, have clearly illustrated the relationship among size, flexibility, and performance with convincing evidence. Generally, scholars who assert that large organizations are more flexible and more likely to perform better tend to base their arguments on the amount of resources available to the organizations. For example, Kaufman (1971) suggested three reasons that would explain why large organizations may be more flexible. First, large organizations can divert their resources to experimentation with impunity because the deprivations can be shared by many members, thus limiting the burdens on each member within a tolerable range. Second, large organizations can use various subsystems to test different ways of doing the same thing without taking much risk. As a result, they are better able to explore the most effective responses and prepare themselves for various kinds of environmental shifts. Small organizations, by contrast, do not possess this advantage in the natural selection processes, since any failure in the variation stage may lead to unrecoverable impairments and at worst result in deaths. Finally, the diversity of specialties and tasks that are inherent in large organizations are more likely to ensure fresh ways of formulating and attacking problems. This advantage is not available to small organizations that possess only a few professionals, and thus have fewer chances of sparking these

individuals to develop new approaches. Due to the fact that large organizations can develop more repertories of behavior than their small counterparts, they can be seen as having higher levels of flexibility. In a similar vein, Boeker (1991) found that national brewers, owing to their size and large amounts of slack resources, could respond more quickly to environmental changes than those regional and local brewers which were relatively smaller in size and did not possess sufficient slack.

People who consider that small organizations are more flexible that enable them to perform better also have plausible rationales. One example of these arguments is Quinn's study (1985) of organizational innovation. As he argues, small entrepreneurs are not deterred by committees, board approvals, and other bureaucratic delays. As a consequence, they can experiment, test, recycle, and try again with little time lost. Moreover, since "technological progress depends largely on the number of successful experiments accomplished per unit of time, fast-moving entrepreneurs can gain both timing and performance advantages over clumsier competitors" (Quinn, 1985, p.76). Therefore, flexibility can be seen as an inherent attribute of small organizations due to their quick and timely responses. Based on an information perspective, Macdonald (1995) points out that small organizations are more flexible, not because of their possession of the structural capacity to change, but because of their ability to learn what to change. The ability for small organizations to learn is dependent on increasing the information networks by which the organization acquires external information, rather than on extending the boundary of controlling external information that is usually used by most large organizations.

Haveman (1993), based on his study of the California savings and loan industry, provided a third explanation. According to his argument, market power and bureaucratization are two major forces that determine organizational capability to respond to change. On the one hand, large organizations tend to be more bureaucratized and rigid, thus less capable of initiating changes. On the other hand, when market power dominates in the change processes, large organizations which are supposed to possess more resources are seen to be more capable of responding to external change. Although both forces operate simultaneously, Haveman finds that market power tends to dominate

bureaucratization in the change processes. Therefore, he posits that an inverted U-shaped relationship exists between organizational size and the capability to change. According to Haveman's findings, the following two hypotheses are proposed.

>**Hypothesis 1:** Medium-sized organizations are relatively more flexible than either large or small organizations.
>
>**Hypothesis 2:** Flexible organizations will perform better than the other organizations.

Research Design

In order to examine the two hypotheses stated above, a simulation model is built. In general, the environment which is presented in this model is divided into two parts: a static environment and a dynamic (or a hypercompetitive) environment. In the fifty-year time horizon, it is assumed that in the first twenty years, the organization is operating in a static environment in which few innovative products are introduced into the market. Beginning from year 20, the new product introduction rate increases dramatically. As a result, the organization will face a more competitive and more uncertain environment. An overview of the model structure is shown in Figure 1.

Overview of the Model Structure

The model is divided into five sectors: the environmental change sector, the organizational performance sector, the organizational resources sector, the response capability sector, and the process improvement sector. These five sectors can be seen in Figure 1.

In the **environmental change sector**, the competitors' price, production speed, and quality of products tend to influence the relative competitiveness, and hence the sales volumes and market share of the organization. A performance gap may result from the discrepancy between desired market share and perceived market share. In addition, an increase in the rate of new products introduction rate in the environment tends to lead to greater uncertainty. The level of environmental uncertainty will in turn affect decision making about resource allocation in the organization.

The **organizational performance sector** includes factors such as sales volumes, market share, costs, revenues and profits, performance gap, and relative competitiveness that influence the amount of available resources and how these resources are allocated.

In the **organizational resources sector**, the organization will make resource allocation decisions according to the conditions of environmental change and organizational performance. The amount of total resources allocated to generalizable resources and specialized resources will produce different effects on the response capability and process improvement of the organization. In addition, the different fractions of the generalizable resources that are invested in the workforce (e.g., training, welfare, and participation) and in improving response capability (e.g., research and development, information collection, and forming alliances) may also affect the level of resistance of the employees which will in turn reduce the organization's response capability.

The **process improvement sector** deals with incremental changes such as cost reduction, price cuts, and production efficiency. According to D'Aveni's (1994) argument, although the organization can strengthen the existing advantages by making current organizational processes move more efficiently in a static environment, these efforts will be of little use in a dynamic environment. Therefore, the focus of this sector is to illustrate the organization's response to a performance gap in a relatively static environment. Based on the principle of diminishing marginal physical productivity, there should be a limit on the maximum speed and minimum cost of production that can be reached. The production speed and cost are, therefore, designed to avoid indefinite improvement.

Finally, the **response capability sector** illustrates the relationships among response capability, resistance, product innovation, and the quality of the products. By inventing new products, the organization can reduce the environmental uncertainty by decreasing the ratio between the competitors' and the organization's new product introduction rate. Moreover, the organization can increase its relative competitiveness through the improvement of the quality of its products. On the other hand, the fractions of the investments of the generalizable resources in the workplace and the response

capability are assumed to influence the level of employees' resistance. As noted above, the model also assumes that employees' resistance will in turn affect the organization capability to respond to change.
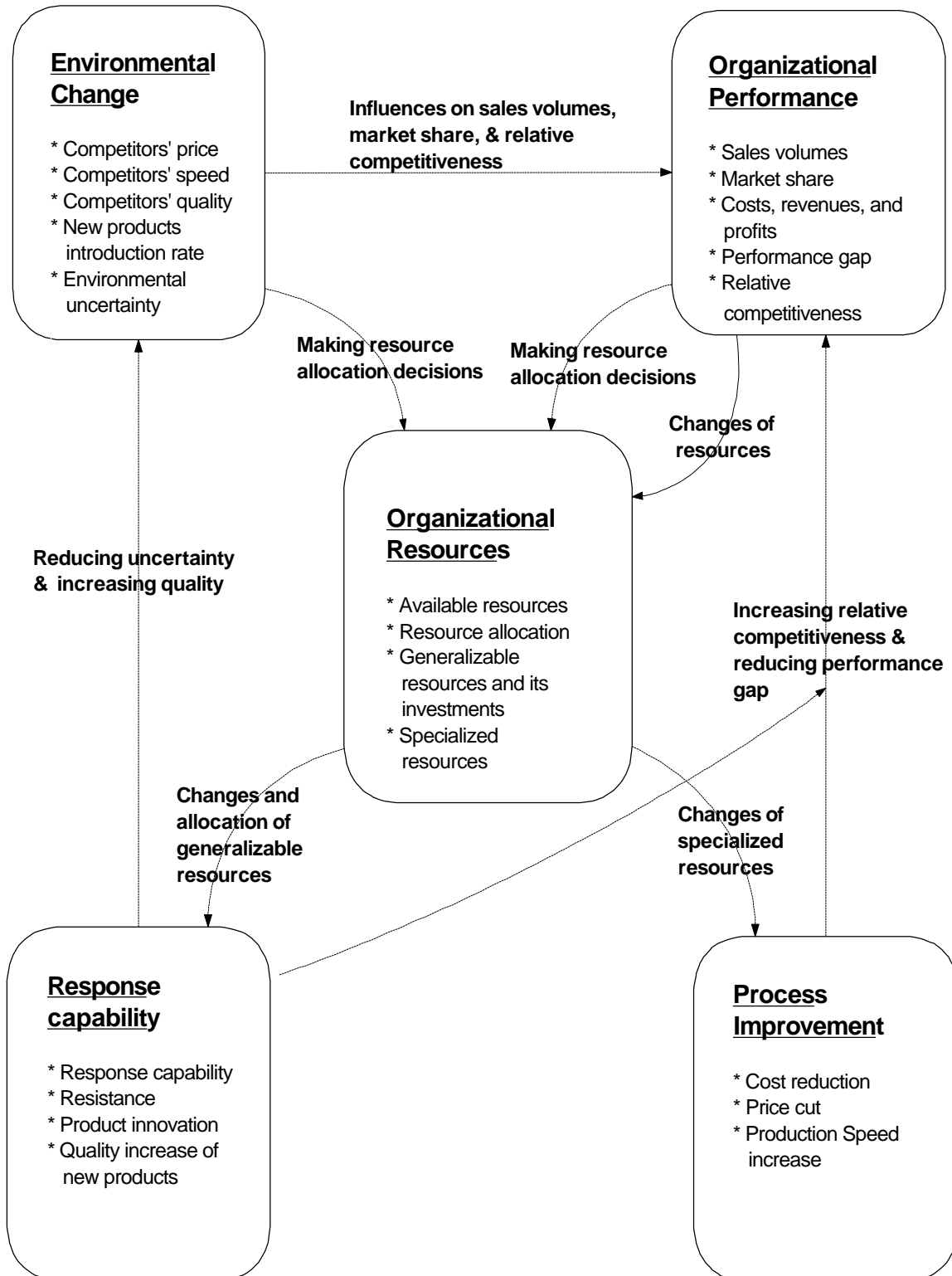
Environmental Change

* Competitors' price
* Competitors' speed
* Competitors' quality
* New products introduction rate
* Environmental uncertainty

Influences on sales volumes, market share, & relative competitiveness

Organizational Performance

* Sales volumes
* Market share
* Costs, revenues, and profits
* Performance gap
* Relative competitiveness

Making resource allocation decisions

Making resource allocation decisions

Changes of resources

Organizational Resources

* Available resources
* Resource allocation
* Generalizable resources and its investments
* Specialized resources

Reducing uncertainty & increasing quality

Increasing relative competitiveness & reducing performance gap

Changes and allocation of generalizable resources

Changes of specialized resources

Response capability

* Response capability
* Resistance
* Product innovation
* Quality increase of new products

Process Improvement

* Cost reduction
* Price cut
* Production Speed increase

Figure 1   The Sector Overview Diagram of Organizational Flexibility

Operationalization of Variables

According to the viewpoint of system dynamics, there are two kinds of variables—endogenous and exogenous. Endogenous variables are those variables which are included in a system. Under the influences of feedback loops, there are no endogenous variables that will not be affected by the other variables. On the other hand, exogenous variables are the variables which will produce impacts on the system but which are not affected by the other variables (Richardson and Pugh, 1981). The major endogenous and exogenous variables are shown in the causal loop diagram of Figure 2.
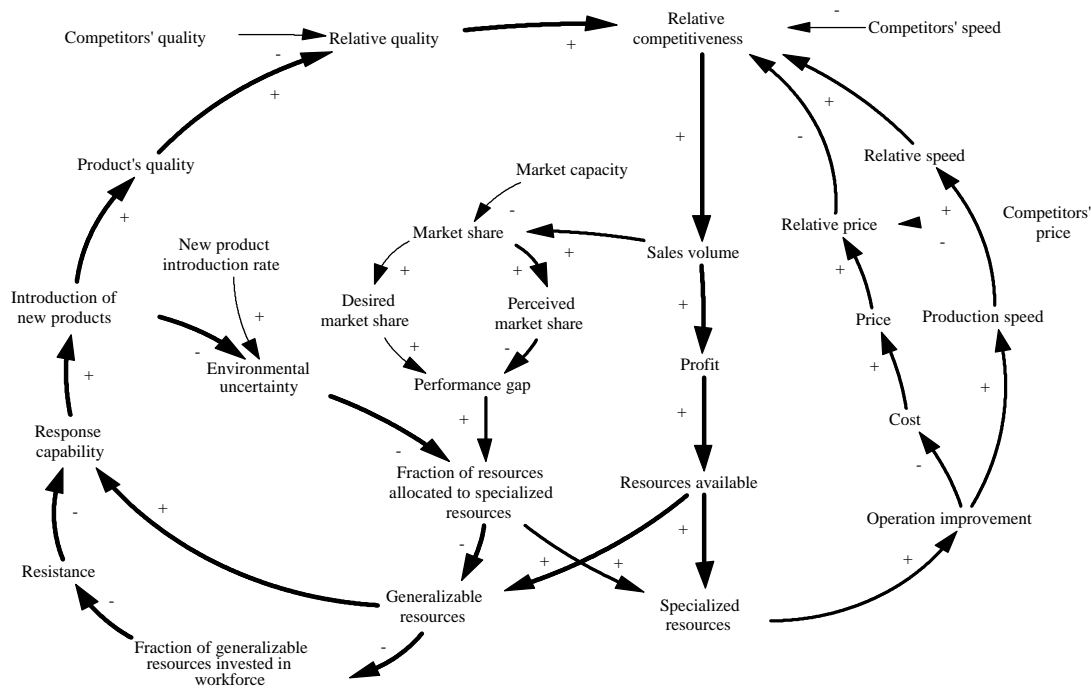
Figure 2 The Causal Loop Diagram of Organizational Flexibility

Endogenous variables: The most important endogenous variables are the variables that will be used to represent *organizational size*, *flexibility* and *performance*. First, *organizational size* is measured by the sales volume (i.e., units of product sold) of an organization. In order to examine the effects of organizational size on flexibility and performance, the sales volume is the only variable that has an initial value before running

this model. By using different initial values, the effects of organizational size will be tested. Second, *generalizable resources*, *response capability*, and *resistance to change* are seen as three attributes of the construct *organizational flexibility*. Among these three variables, *generalizable resources* will be objectively measured by dollar amount. *Response capability* and *resistance to change*, on the other hand, are measured by dimensionless numbers ranging from 0 for the least capable to respond and lowest resistance to change to 10 for the most capable to respond and highest resistance to change. Third, *organizational performance* is composed of two variables—*market share* and *relative competitiveness*. Market share is measured by the percentage of an organization's sales volume in market capacity. Relative competitiveness, on the other hand, is a dimensionless measure determined by aggregating three other variables— relative quality, relative price, and relative speed. Although the relative weights of these three variables determining relative competitiveness can be arbitrarily assigned, it is plausible that the importance of quality should be greater than that of price and production speed.

Exogenous variables: Five major exogenous variables are used in this model. First, *market capacity* is fixed at the level of 10,000 units. Although market capacity tends to vary over time (Brittain, 1994), a constant value is assigned to it for the sake of simplicity. Second, *new product introduction rate* is assumed to be 0 before year 20 so as to represent a static environment. After year 20, it is raised to 3 units per year so as to show that more innovations have been initiated by the competitors. As a result, the environment begins to become more turbulent and more uncertain. Finally, *competitors' price* is assumed to be fixed at 12 dollars per unit. However, *competitors' quality* and *production speed* are assumed to begin to increase at a constant rate from year 5 to year 10 and from year 20 to year 50 respectively so as to simulate the dynamic changes of the external environment.

Other parameters: Other parameters are also used to run this model (See Appendix). Some parameters are used as conversion factors and reference parameters. Other parameters represent the relationships between two variables. In the first group, *innovation normal* is the proportion of the innovative products that can be

commercialized. It is assumed that in ten innovative items, only one item has the potential to be introduced to the market. Therefore, *innovation normal* is assigned a constant value of 0.1. *Introduction time delay* is the time needed for introducing new products to the market after the new products have been invented. The average time lag between invention and commercialization of the new products is assumed to be three years. *Quality increase normal* is the effect of a new product on the improvement of the total quality provided by the organization. The value of *quality increase normal* is assigned a dimensionless value 2. *Price normal* has a value 1.2, meaning that the organization will sell the product at the price of 1.2 times of its cost.

The relationship parameters in the second group are formulated by graphic functions. In the literature review presented earlier in this paper, several underlying assumptions were presented. In the model, these assumptions are translated to the parameters *capability of change f*, *workforce investment f*, *resistance to change f*, and *uncertainty f*. Table 1 shows the correspondence between the assumptions and these parameters. On the other hand, the principle of diminishing marginal returns is used to determine the other parameters such as *performance gap f*, *sales change f*, *effect of operation on speed f*, *effect of operation on cost f*, and *operation improvement f*.

Table 1 The Underlying Assumptions and Their Related Parameters

Assumption	Contents	Corresponding Parameters
1	The organization's capability to respond to change is positively related to the rate of innovation of products.	Innovation of products = Capability to respond to change* Innovation normal
2	The increase of generalizable resources will lead to a higher degree of capability to respond to change.	Capability of change f
3	Investing more resources in the workforce will lead to lower resistance to change.	Workforce investment f
4	Lower resistance to change will lead to greater capability to respond to change.	Resistance to change f
5	In a static environment, organizations tend to invest more resources in asset specificity so as to outperform their competitors. Alternatively, in a dynamic environment where new dominant designs continuously replace the old ones, organizations will tend to increase their investment in generalizable resources so as to respond more quickly to environmental change.	Uncertainty f

Analyses of Model Behavior

To examine the size effect on flexibility, the model employs three sales volumes (i.e., 5000, 2000, and 100 units respectively) to represent a large, medium-sized, and small organization, respectively (i.e., Firm A, Firm B and Firm C). The behavioral changes of *generalizable resources*, *capability to respond to change*, and *resistance to change* of Firms A, B, and C are exhibited in Figures 3, 4, and 5.

Figures 3 shows that Firms A, B, and C all tend to increase their allocation of *generalizable resources* when the environment becomes more uncertain due to a drastic increase of the new product introduction rate beginning in year 20. The amounts of *generalizable resources* possessed by Firms A, B, and C are, however, different. Firm A has the greatest amount of generalizable resources (i.e., about 8,800 dollars) at the end of year 50. In addition, its generalizable resources are still growing at a constant rate. Firm

B, on the other hand, has about 3,200 dollars generalizable resources. Finally, Firm C generalizable resources are only about 100 dollars.
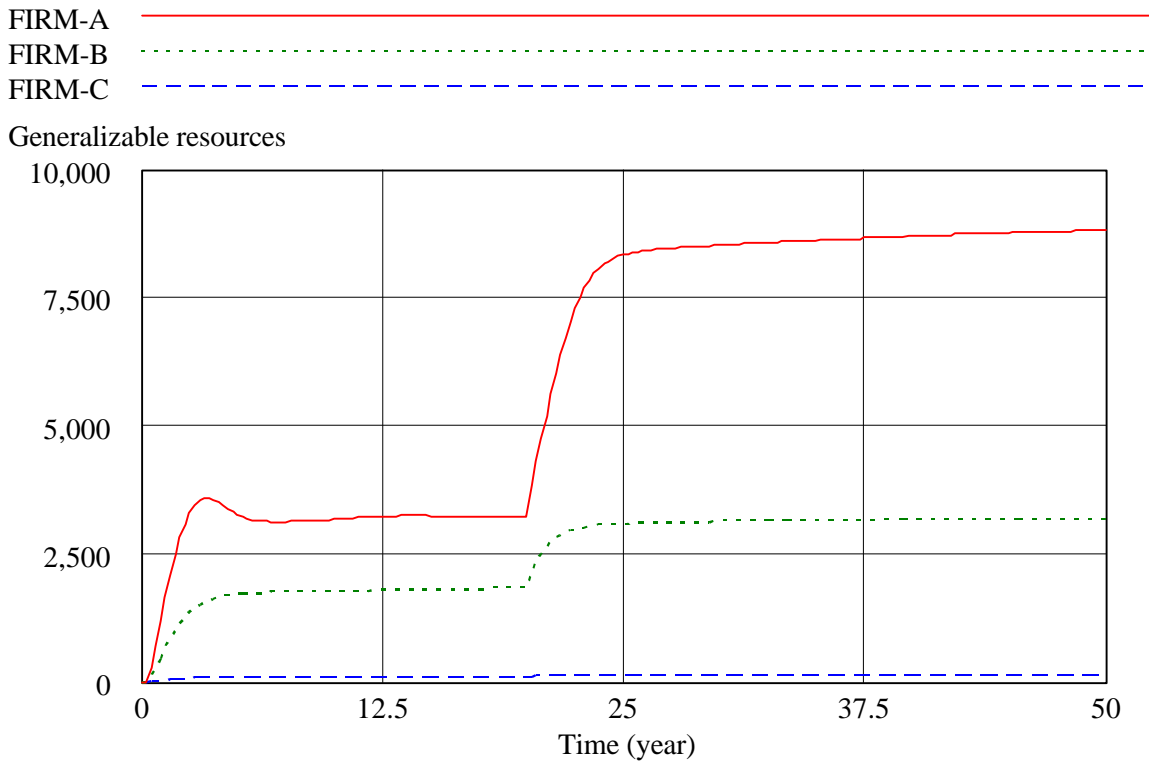
FIRM-A ——————————————————————————————
FIRM-B ···
FIRM-C –

Generalizable resources

Figure 3 The Generalizable Resources of Firms A, B, and C

As to the *capability to respond to change*, Figure 4 shows that Firm B has the greatest response capability after year 2. Although Firm A is the largest organization, its response capability does not appear to match its size. On the contrary, it only has a medium level of response capability. The smallest organization, Firm C, is the least capable firm to respond to change. This result does not seem to completely conform to the traditional assumption that generalizable resources lead to a higher level of response capability. The further examination of another related factor esistance to change ay be necessary for illuminating the reason why this result is obtained.
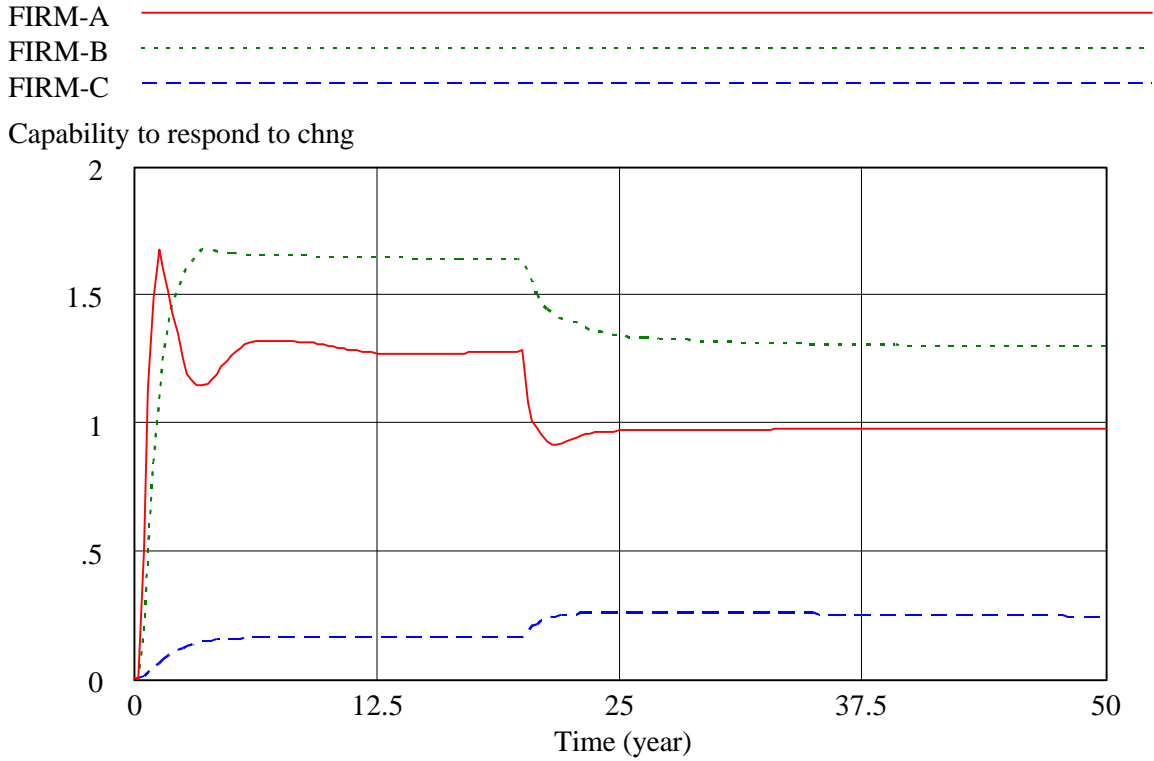
Figure 4 The Response Capability of Firm A, B, and C

Figure 5 exhibits the *resistance to change* of Firms A, B, and C. According to structural inertial theory, large organizations often tend to encounter stronger inertial pressures and a greater degree of resistance to change (Hannan and Freeman, 1984). The result of the simulation is consistent with this argument. Firm A, being the largest organization, encounters the greatest resistance forces. The resistance to change of Firm B falls in the middle. The smallest organization, Firm C, tends to keep its resistance forces at a minimum and constant level.
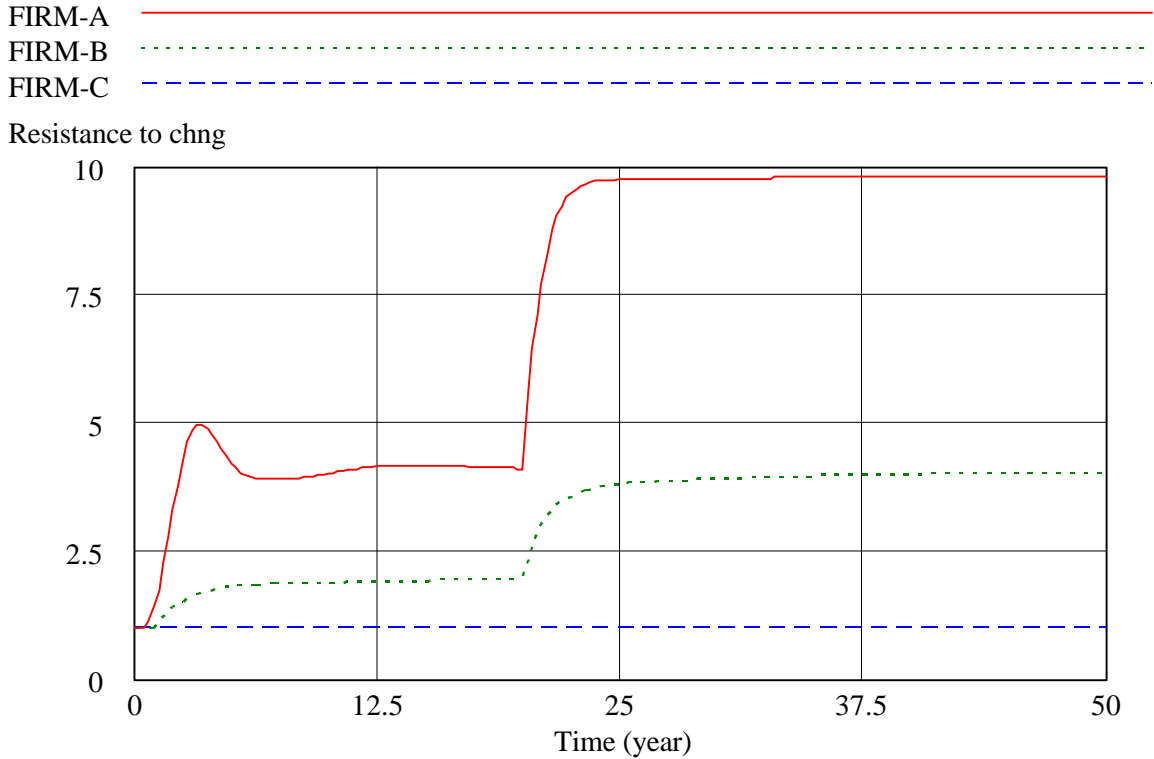
Figure 5 The Resistance to Change of Firms A, B, and C

According to the analyses above, it is obvious that the *capability to respond to change* is determined by two factors—*generalizable resources* and *resistance to change*. *Generalizable resources* alone cannot guarantee that an organization will become more flexible. On the other hand, a minimum level of *resistance to change* will not necessarily result in a flexible organization. Only when these two factors interact in a balanced way, will the organization possess a higher degree of response capability. In this sense, the medium-sized organization, Firm B, is the most flexible organization among the three organizations. This result may be considered as a support to Hypothesis 1 in this research.

To further examine the effects of organizational flexibility on performance, Figures 6 and 7 illustrate the change patterns of *market share* and *relative competitiveness*. As shown in Figure 6, along with the change of resource allocation, Firm A's market share continues to grow. Firm B's market share grows from 20% to 22%, and then remains stable. Firm C's market share only grows a little during the first ten years, then it begins to fall until year 50.
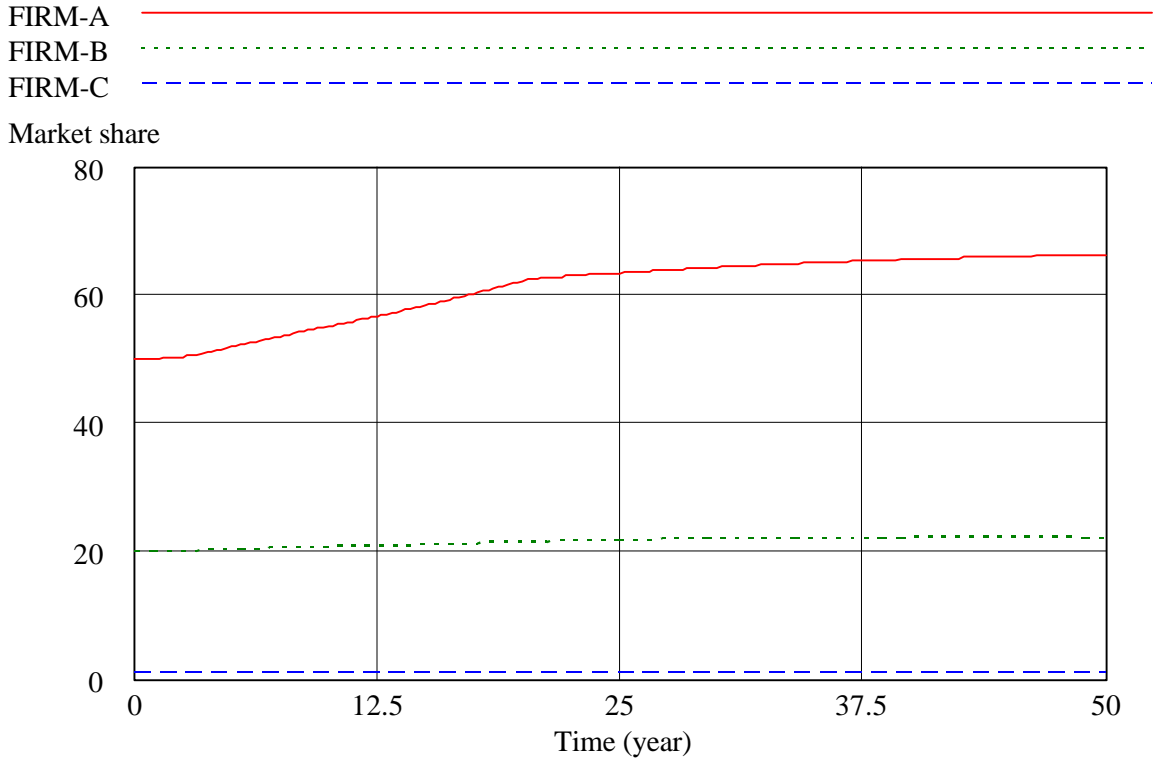
Figure 6 The Market Share of Firms A, B, and C

As to the *relative competitiveness*, Firm A also outperforms Firm B and Firm C. As shown in Figure 7, the *relative competitiveness* of all three organizations begin to decline in year 20 under the greater impacts of other competitors in the environment. Nevertheless, Firm A still holds more competitive advantages than Firms B and C. Therefore, in terms of *market share* and *relative competitiveness*, Firm B, the most flexible organization as identified in previous analyses, does not seem to have the best performance. This result will lead to the rejection of Hypothesis 2 in this research.
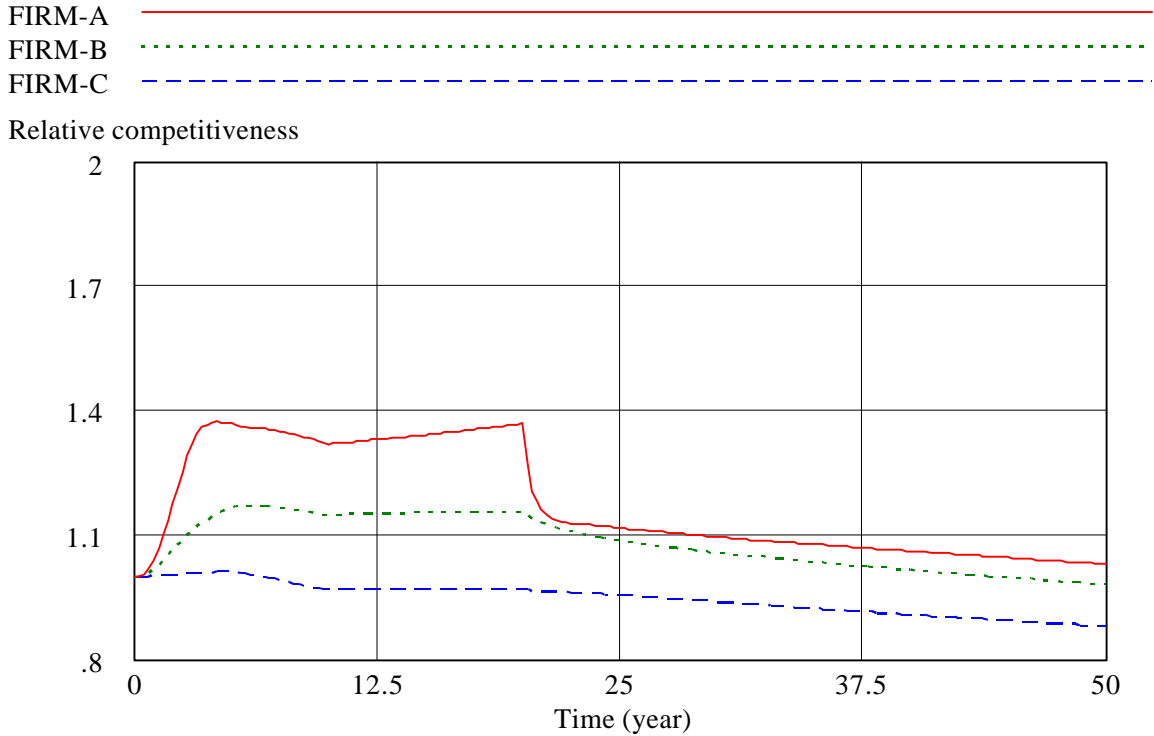
Figure 7 The relative competitiveness of Firms A, B, and C

The previous analyses may lead us to ask a question: Why cannot the most flexible organization perform better than the other organizations? To answer this question, we may need to rethink the issue of flexibility in a more holistic manner. Since it is *relative competitiveness* that determines *sales volume* which in turn determines *market share*, it may suffice to trace back to the factors that are related to *relative competitiveness*. The behavior changes of the three related factors (i.e., *relative price*, *relative speed*, and *relative quality*) are exhibited in Figures 8, 9, and 10.

As shown in Figures 8, 9, and 10, although the largest organization, Firm A, does not have the highest *relative quality*, it has the best *relative price*, and the fastest *relative speed*. The medium-sized organization, Firm B, on the other hand, surpasses Firms A and C in terms of its *relative quality*. Its *relative price* and *relative speed* are, however, below those of Firm A. When aggregating all these three factors together, it seems clear why Firm A performs better than Firm B. Therefore, we may assume that flexibility is not a matter of simply responding to an uncertain environment by innovation. The improvement of the production processes which can lower the price and speed up the production is

equally important for organizations. In this sense, flexibility is determined not only by *generalizable resources*, *response capability*, and *resistance to change*, but also by the ability of reengineering the processes, which is in turn determined by specialized resources and the total resources available to an organization.
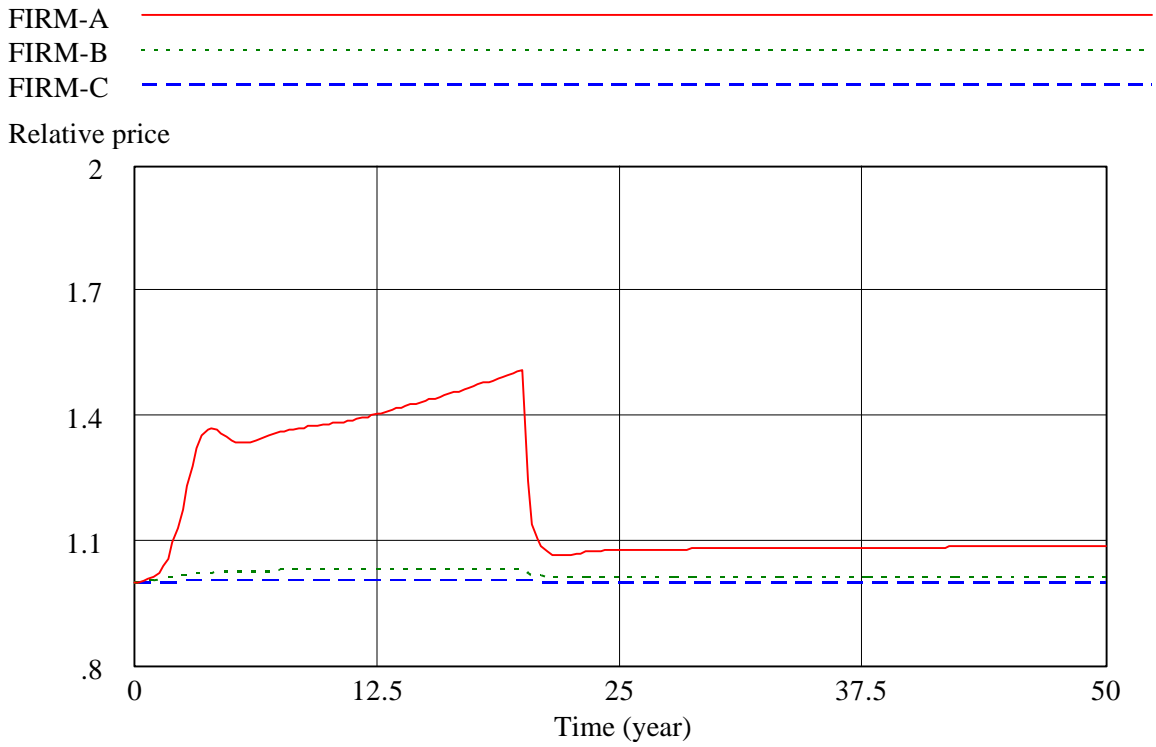
FIRM-A ——————————————
FIRM-B ·······························
FIRM-C – – – – – – – – – – – –

Relative price

Figure 8 The relative price of Firms A, B, and C

FIRM-A
FIRM-B
FIRM-C
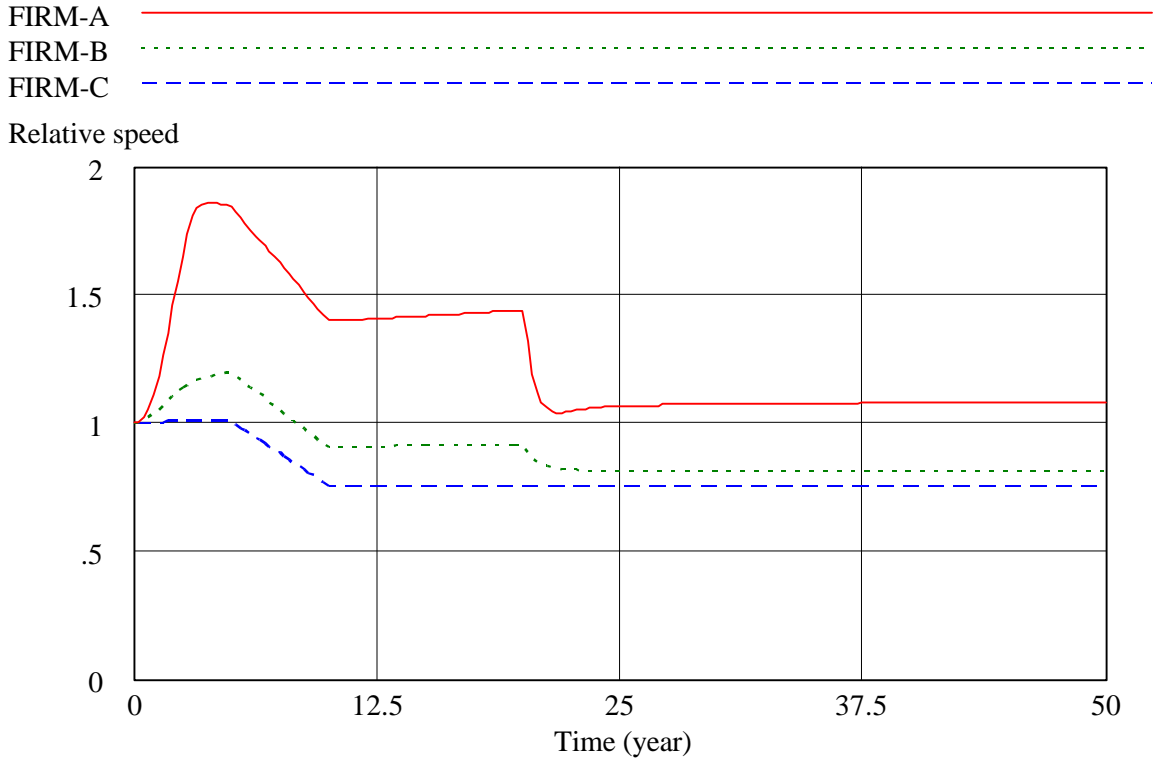
Relative speed

Figure 9 The relative speed of Firms A, B, and C

FIRM-A
FIRM-B
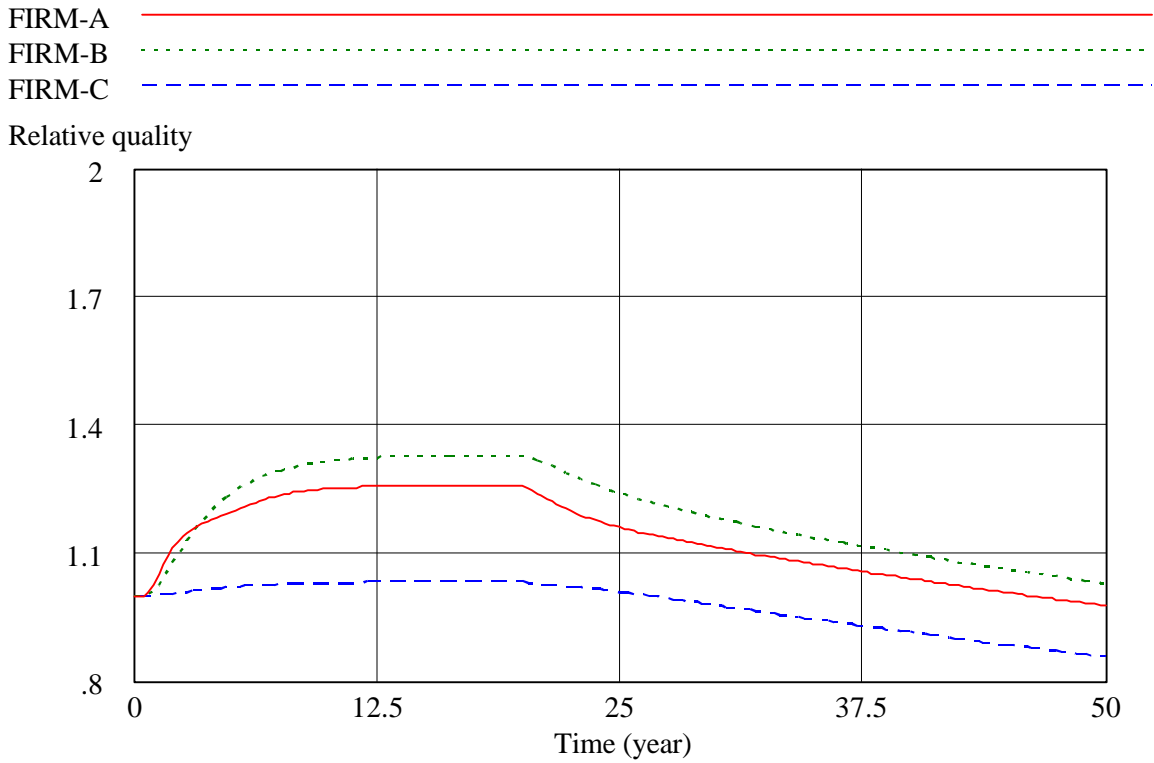FIRM-C

Relative quality

Figure 10 The relative quality of Firms A, B, and C

Discussion and Conclusions

The analyses of the model behaviors show that medium-sized organizations tend to possess a higher level of flexibility only if we perceive flexibility as attributed by *generalizable resources*, *capability to respond to change*, and *resistance to change*. However, when we further expand the response capability to include the ability to cope with price wars and competition for faster production speed, the argument that medium-sized organizations are more flexible will not necessarily hold. In contrast, large organizations tend to be more flexible in the sense that they possess more resources that can be used to improve both their production processes and response capability. Large organizations, however, also encounter a higher level of resistance which may cause a part of their efforts to improve organizational response capability to be counterbalanced by the growing resistance. Finally, small organizations are more likely to fail in the process of implementing change because they lack sufficient resources to protect themselves from environmental disturbances and to invest in the process of improving their response capability. The findings in this research suggest that any organization which intends to increase its flexibility may need first to accumulate sufficient resources so as to possess a greater ability to invest in both innovation and specialization. In addition, it suggests that organizations which intend to improve their response capability by allocating more generalizable resources should also pay more attention to their employees' welfare and needs. If an organization can focus on both improving response capability and the employees' willingness to cooperate, and maintain a balance between the two investments, it is more likely to benefit from greater organizational flexibility.

This study has, based on related existing research, built a rudimentary model to illuminate the interwoven relationships among organizational size, flexibility, and performance. To integrate different theories which involve various intertwined relationships into a single model is not, however, an easy task. Although the model behaviors are consistent with some of the arguments and findings in the field of organizational change, the model has limitations illustrating and interpreting the complex phenomena in real organizations for several reasons.

First, this model lacks empirical data to support the results obtained from the simulations. Since real organizations can alternate their policies for allocating resources, preparing people for change, and shifting strategic positions, the graphic functions formulated in this model may vary in different organizations. Therefore, before applying this model to real world organizations, empirical data should be collected and used to reformulate the relationships between related variables and to test the appropriateness of this model.

Second, this model only focuses on the behaviors of private organizations. It cannot be applied to the public sector due to the different measures of organizational performance. Future work for improving the usefulness of this model will need to consider using variables that are applicable in both the private and the public sectors.

Finally, the major variables of organizational flexibility such as response capability and resistance to change may need to be further differentiated. For example, the capability to respond to change may be divided into two parts. The first part may be used to deal with discontinuous changes such as innovating new dominant designs and improving learning ability. The second part may focus on dealing with continuous changes such as reengineering existing processes and building sufficient inventories. Resistance to change, on the other hand, can also be differentiated so as to deal with organizational defensive routines and people's willingness to change, respectively. Although the further differentiation will inevitably result in a more complex system, the advantages provided by computer simulations suggest that such explorations are well worthwhile.

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Appendix   The Organizational Flexibility Model