Corporate Synergy and Strategy Implementation:

A Behavioral Simulation Approach

Michael Shayne Gary
Australian Graduate School of Management
UNSW Sydney NSW 2052
Australia
Phone: +61 2 9931 9247
Fax: +61 2 9663 4672
Email: shayneg@agsm.edu.au

April 2003

Corporate Synergy and Strategy Implementation:
A Behavioral Simulation Approach

Abstract

Strategy research has a long-standing interest in the performance consequences of corporate diversification. Although the diversification-performance stream of research has slowed, the matter is far from resolved. In theory, resource sharing should yield economic benefits in related multi-business firms, but the empirical research remains equivocal. While most research in this area has focused on defining and measuring relatedness correctly, this paper takes a fresh look at corporate diversification by exploring the implementation process issues of resource sharing. A mathematical model is developed that integrates content and process issues to simulate the operational consequences of related diversification. The analysis suggests economic gains are not realized simply by adopting product and resource relatedness strategies, but also require the coordinated implementation of resource sharing to extract potential synergies.

Key words: diversification, synergy, implementation, resource sharing, simulation

INTRODUCTION

Strategy research has long asserted the potential economic gains of related corporate diversification. Economic theory suggests that when the costs of producing separate outputs exceed the costs of joint production, firms can achieve economies of scope, or synergies (Panzar and Willig, 1981). These synergies can potentially result when a firm shares input factors of production across multiple products or lines of business, giving rise to the hypothesis that product and resource related diversification generates greater economic value than unrelated-diversified strategies (Bettis, 1981; Markides and Williamson, 1994, 1996; Palepu, 1985; Rumelt, 1974, 1982).

This logic is attractive, but the empirical data have not complied. The evidence from a substantial body of empirical research does not conclusively find the related strategy superior to unrelated diversified firms, and this remains an unexplained paradox. On one hand, there are numerous studies that find support for the superiority of related over unrelated diversification (Bettis, 1981; Markides and Williamson, 1994, 1996; Rumelt, 1974, 1982). On the other hand, there are many studies which have found no significant relationship between diversification strategy and performance after controlling for industry effects, prior performance, or measuring relatedness differently (Amit and Livnat, 1988; Christensen and Montgomery, 1981; Grant et al., 1988; Hill, 1983; Hill et al., 1992; Montgomery, 1985).

Overall, the findings are equivocal, and this line of research has slowed. However, a growing stream of research suggests that implementation process mechanisms may be crucial for the success of strategies motivated by potential synergy benefits. Increasingly, the evidence from mergers and acquisitions research suggests that realizing potential synergy benefits requires appropriate implementation processes (Larsson and Finkelstein, 1999; Pablo, 1994). A similar theme has emerged from diversification research, with scholars suggesting that firms often adopt diversification strategies by focusing primarily on the potential benefits, without sufficient consideration of implementation difficulties (Nayyar, 1993). As a result, many diversified firms find that expected synergy or business growth does not materialize, and then divest the business (Markides, 1995).

In addressing these implementation issues, a number of studies have explored the fit between diversification strategy and organization control mechanisms and structures (Gupta and Govindarajan, 1986; Hill and Hoskisson, 1987; Hill et al., 1992; Kazanjian and Drazin, 1987; Pitts, 1977). These studies have advanced our thinking about the appropriate organisational structures for diversified firms, but have not delved down into the operational level detail of resource sharing to understand the implementation difficulties that undermine economies of scope benefits of related strategies. Recent research also suggests that decision making and managerial policies at the business level are an important determinant of the performance of diversified firms (Stimpert and Duhaime, 1997). Business level policies and decision making contribute to implementation success or failure of diversification strategies, and this suggests the next essential step, in developing a deeper and more complete understanding of this important strategic issue, is to extend the analysis below the macro-level implementation issues and effectively integrate both the content and process issues in related diversification.

This paper synthesizes content and process issues by exploring the operational consequences of a related diversification move. This emphasis directs the focus away from the relatedness debate that has characterized a great deal of the research on this topic over the last three decades. A simulation approach is adopted to enable a tractable analysis of resource sharing and decision making in the related diversifying firm.

Simulation modeling has become increasingly popular in strategic management and organization theory and simulation experiments have been used to test and refine established theories (Lant and Mezias, 1990; Lomi and Larsen, 1996; Sastry, 1997), build new theory (Adner, 2002; Rudolph and Repenning, 2002), conceive novel theoretical propositions (Lin and Carley, 1997; Rivken, 2000; Zott, 2003), and provide new explanations for empirical results about complex organizational phenomena (Oliva and Sterman, 2001).

ECONOMICS OF RELATED DIVERSIFICATION

Over the last 30 years, research on diversification has focused primarily on the superiority of related diversification over unrelated diversification (Bettis, 1981; Christensen and Montgomery, 1981; Grant et al., 1988; Hill et al., 1992; Markides and Williamson, 1994, 1996; Palepu, 1985; Rumelt, 1974, 1982). This stream of relatedness research began with Rumelt's (1974) study, in which he tested the hypothesis that the nature of a firm's diversification strategy has more impact on performance than the overall degree or level of diversification. Relatedness scholars argue that related diversification allows the corporate center to exploit interrelationships among different SBU's (Strategic Business Units) or lines of business to achieve cost or differentiation advantages over rivals.

A variety of potential benefits from these SBU interrelationships have been identified, including market power, economies of scope, economies of scale, and organizational learning (Markides, 1995). Much of the previous research on related diversification has focused on the potential benefits of economies of scope or operating synergy.

Opportunities for resource sharing across the multi-business portfolio underpin the potential operating synergy benefits, and these opportunities are driven by the extent or degree of relatedness among underlying resources. More related SBU's result in more opportunities for resource sharing. Sharing increases resource utilization and is expected to yield economies of scope. Related diversifiers should outperform unrelated diversifiers, using this logic, since unrelated firms do not have access to inter-business unit operating synergy.

However, as mentioned previously, the empirical results are mixed regarding profitability differences between related versus unrelated strategies. While there are numerous studies that find support for the superiority of the related strategy (Bettis, 1981; Markides and Williamson, 1994, 1996; Rumelt, 1974, 1982), there are many studies that find no such support. For example, after controlling for industry structure characteristics, Christensen and Montgomery (1981) and Montgomery (1985) found no statistically significant differences in performance across diversification strategies. The results indicated that industry structure moderates or confounds performance differences due to diversification strategy. In another study, Grant et al. (1988) found a nonlinear relationship between the level of diversification and performance, but found that relatedness did not have a significant affect on profitability. The findings suggested that previous research that found related diversifiers outperformed unrelated firms may not be due to the superiority of a related diversification strategy, but rather to the fact that the unrelated category typically contains the most diverse companies (Grant et al., 1988). Studies by Amit and Livnat (1988) and Hill et al. (1992) also found that related diversifiers do not statistically outperform unrelated firms.

The results do not allow definitive conclusions regarding whether and how diversification strategy affects performance. The primary area of focus in trying to account for the mixed empirical findings, has been on defining and measuring relatedness correctly. In addition, a number of studies have investigated diversification strategy fit with organisational control systems and structure. These studies suggest that more widespread resource sharing among SBU's within a diversified firm, requires more centralised operating decisions in order to achieve inter-SBU co-ordination (Hill and Hoskisson, 1987; Hill et al., 1992; Markides and Williamson, 1996; Pitts, 1976, 1977). Another finding in this line of research is that managerial performance measurement and evaluation systems for controlling divisions should be different depending on the diversification strategy of the firm (Kerr, 1985). These studies have focused on identifying the appropriate organizational structures for diversified firms, but have not explored the operational level detail of resource sharing to understand the implementation difficulties that may undermine economies of scope benefits of related strategies.

MODELING CORPORATE SYNERGY

This section formalizes a mathematical model of resource sharing to explore the operational consequences of a related diversification move. The model is developed in stages, with additional assumptions and complexity added only after simulating the model at each stage to ensure understanding of the implications of the existing assumptions. The model begins with an established single-business firm with an existing set of resources- including tangibles such as plant and equipment and intangibles such as manufacturing and marketing capabilities- to perform the tasks required for the smooth operation of the business. At the beginning of the simulation, the firm either remains a focused single-business, or embarks on a diversification move into a new, related business.

The evolution of the firm is simulated over fifteen years, and throughout this time period the core business is mature and is neither growing nor shrinking. It is assumed that the firm is endowed with excess resources beyond what are required for normal, efficient operations in the core business, and that the firm cannot trade its excess resources in factor markets. Under these conditions, theory suggests that the firm's excess resources provide an economic justification to diversify into a new, related business (Teece, 1982; Williamson, 1985). To the extent that the firm's existing stock of resources can be shared or leveraged to enter a new business, utilization of these shared resources increases and the firm captures economies of scope synergies resulting in improved financial performance.

The resources that can be shared with the new business are represented in the model as an asset stock that accumulates or depletes over time (Dierickx and Cool, 1989; Markides and Williamson, 1994; Penrose, 1959; Teece et al., 1997; Thomke and Kuemmerle, 2002; Winter, 1987). This aggregate stock of resources represents any set of factors that can be shared in a diversifying firm; including tangibles and intangibles. Examples of shared resources include the senior management team responsible for strategic or financial budget decisions across businesses, a group of engineers or scientists using their expertise to advance new products in multiple businesses, or an experienced shared sales force cross-selling multiple products. An asset stock cannot be adjusted instantaneously, but rather evolves in response to the time path of investment flows (Dierickx and Cool, 1989). Equation 1 formalizes this stock of shared resources (R_t) as the initial value of shared resources (R_0) plus the integral of investment in shared resources over time (i_t).

$$R_t = R_0 + \int_0^t i_t \; dt \tag{1}$$

For the moment, the net investment rate in shared resources (i_t) is zero, such that the firm's stock of shared resources remains constant at the initial value. This assumption is consistent within the context of a mature core business with excess resources.

At the beginning of the simulation, the firm either remains a focused single-business, or embarks on a diversification move into a new, related business. The diversification move couples the established core business and a growing new business that will grow for several years before reaching equilibrium- typical logistic growth. For simplicity, let us assume firm growth will be measured by the size of the customer base. Equation 2 specifies growth in new business customers (N_t) over time using a logistic growth equation, where *PC* is the number of potential customers in the market, N_0 is the number of initial new business customers, *g* is the normal growth rate of the customer base, and σ is a simulation parameter that can take on values of zero or one to determine whether the firm remains a focused single-business firm ($\sigma = 0$) or embarks on a related diversification move ($\sigma = 1$).

$$N_t = \frac{PC \cdot \sigma}{1 + \left[\frac{PC}{N_0} - 1 \right] \exp(-g \cdot t)} \tag{2}$$

Performance of the firm is operationalized in Equation 3, where firm profit margin (π_t) includes the economic implications of the diversification move. Revenue of the core business (κ) is constant over time, and new business revenue is determined by the number of new business customers (N_t) and the average revenue per customer each quarter (ε). The cost structure for the firm includes fixed costs (ψ), the costs of shared resources, and variable costs of servicing new business customers. The costs of shared resources are a function of the stock of shared resources (R_t) and the variable cost of each unit of shared resources (ν). The variable costs of servicing new business customers are a function of the number of new business customers (N_t) and the variable cost per new business customer each quarter (θ).

$$\pi_t = \frac{\kappa + (N_t \cdot \varepsilon) - \left[\psi + (R_t \cdot \nu) + (N_t \cdot \theta) \right]}{\kappa + (N_t \cdot \varepsilon)} \tag{3}$$

Customers in the new business are modeled as subscribers, where each customer generates recurring revenue and costs of service each quarter. Total firm revenue is the term in the denominator, and the term in brackets in the numerator is total firm costs. Economies of scope arise through spreading the existing fixed costs (ψ) over both the established and new businesses through a related diversification move.

SIMULATING A RELATED DIVERSIFICATION MOVE

While simulation is not necessary to derive the implications of the simple model described so far, the results of two simulation experiments will be presented in this section to ensure an understanding of the existing assumptions. The two different simulation experiments discussed are: 1) Single Business Focus and 2) Ideal Related Diversification. The experiments cover a time period of 15 years with results reported quarterly, and all financial values are in constant $'s. Model parameters have been chosen to represent a generic firm and are provided in the Appendix.

The Single Business Focus experiment, as shown in Figure 1, represents a single business firm focused entirely on its core business. The core business is mature and is neither growing nor shrinking over the entire time horizon. Profitability for the Single Business Focus experiment is in a stable equilibrium at 19.75% profit margin, and will serve as a benchmark for value creation for all subsequent simulations. In this experiment, the firm starts with 5% excess resources and this organizational slack is maintained throughout the simulation.

In the Ideal Related Diversification experiment, also shown in Figure 1, the firm exploits these excess resources by embarking on a diversification move into a related, new business. This diversification move couples the original core business and a growing new business that grows for several years before reaching equilibrium. The Ideal Related Diversification simulation illustrates an experiment in which resource sharing between the two businesses yields significant economies of scope benefits, and profitability approaches 23.5% by the end of the simulation.

Figure 1 about here

For illustrative purposes, the numerical point values of the simulation results in Figure 1 and in all remaining simulation experiments will be provided. However, the qualitative shape of the graphs and the relative values for the different experiments should be the focus instead of the point values. The exact point values will vary depending on the initial conditions and parameter values, but the relative positions of the simulation experiments are robust to such changes.

To get a complete understanding about the factors driving profitability in the Ideal Related Diversification experiment, Figure 2 illustrates the underlying dynamics of this simulation for three key variables. As shown in the top of Figure 2, the new business customer base follows a logistic growth curve over time; starting near zero and ultimately saturating the potential customer base of 500,000. Initially, corporate revenues and earnings reflect only revenues and earnings from the core business. As shown in the bottom of Figure 2, corporate revenues and earnings rise over time with the growth of the new business customer base. When the customer base reaches equilibrium, corporate revenues and earnings also reach equilibrium.

Figure 2 about here

Organizational Slack and Overstretching Costs

Consistent with theory (Teece, 1982; Williamson, 1985), the firm in the Ideal Related Diversification simulation experiment is assumed to have excess resources prior to diversifying into the new business. The concept of excess resources refers to the services of factor inputs available after the requirements for the continuing profitable operation of the core business have been met (Teece, 1982). This is very similar to the concept of slack, where organizational slack is the cushion of resources above the combination of work demands within the organization (Cohen et al., 1972; Cyert and March, 1963; Bourgeois, 1981). Excess resources are crucial for achieving economic gains in a related diversification move, and the next step is to incorporate the construct of organizational slack into the formal model.

In order to operationalize organizational slack, it is first necessary to specify the work demands within the firm and the level of resources required to meet these work demands. Organizational slack can then be defined as the level of resources in excess of what is required for the "normal" efficient operation of the firm (Bourgeois, 1981). In Equation 4, the firm's total work demands (d_t) are defined as the workload of the core business (χ) plus the workload of the new, related business. The work demands of the core business (χ) remain constant throughout the simulation time horizon, consistent with a mature core business in equilibrium. Work demands in the new business are proportional to the number of customers in the new business (N_t). The work demands of each new business customer (λ) are modeled as a constant; each quarter every new business customer generates a fixed amount of work for the firm.

$$d_t = \chi + (N_t \cdot \lambda) \tag{4}$$

There is an assumption that all work demands must be satisfied every quarter and that work demands cannot be carried over to the next quarter. Under such circumstances, the servicing capacity of the firm's shared resources (R_t) is spread over the total work demands (d_t) each quarter. This attention level of shared resources per unit of work (a_t) is operationalized in Equation 5. This is consistent with previous organizational theory research that has examined the attention capacity and allocation of managerial attention (Seshadri and Shapira, 2001).

$$a_t = \frac{R_t}{d_t} \tag{5}$$

The firm's level of excess or slack shared resources (s_t) is operationalized in Equation 6 as the percentage difference between the attention from shared resources per unit of work or per task (a_t) and the normal 'efficient' attention level per task (ρ). The normal attention level per task reflects the productivity of shared resources for the efficient and smooth operations of the firm. A value of slack greater than zero indicates excess resources. If organizational slack is zero, the stock of shared resources is perfectly sized to match the total work demands for the efficient operation of the firm. A value of slack less than zero signifies that the stock of shared resources is overstretched or overextended, and cannot adequately cope with the total work demands. This formulation is consistent with definitions of slack in previous research (Bourgeois, 1981).

$$s_t = \frac{a_t - \rho}{\rho} \tag{6}$$

Theory suggests that increased utilization of excess resources should result in improved financial performance (Teece, 1982). However, increased utilization only improves firm performance if there are shared resources in excess of what is required for the normal efficient operation of the firm. Rapid growth, through diversification into a new business, may result in steeply rising work demands that quickly outstrip the initial organizational slack that motivated the diversification move in the first place. If shared resources within the firm are scarce, one or more of the businesses will receive less attention from shared resources than required for the smooth operation of the business.

As the demand for shared resources increases in the firm, “bottlenecks in the form of over-extended scientists, engineers, and managers can be anticipated” (Teece, 1982: 53).

Overextended managers, engineers and scientists, with too many demands on their time, will reduce the attention given to each individual task. Spending less time and effort on individual tasks allows the engineers, scientists and managers to keep up with increasing work demands, but almost certainly reduces thoroughness and the overall quality of work and decision making in the long run (Oliva and Sterman 2001). Such costs of overstretching shared resources are consistent with previous research on the administrative diseconomies of coordination and control (Coase, 1952; Leibenstein, 1966; Pondy, 1969; Pugh et al., 1969; Williamson, 1985) and escalating opportunity costs or losses associated with increasing decision errors (Sutherland, 1980). Generally, these costs are expected to arise from limited managerial spans of control (Hill and Hoskisson, 1987; Sutherland, 1980). Information processing demands increase as the size and complexity of the firm increases, eventually overwhelming the cognitive limitations of management to make effective decisions and to coordinate and control the organization. The same argument holds for scientists, engineers, and other human factors of production that are subject to these cognitive limitations.

Equations 7, 8, and 3.1- a modified version of Equation 3- incorporate the costs of overstretching shared resources into the formal model. The costs of overstretching are represented with two distinct stages, to distinguish between the unrealized costs of overstretching and the current impact of overstretching shared resources on costs.

Overstretching costs may take several months or even years to impact performance, and the two stages account for this time delay. This formulation is consistent with long-standing models capturing staged or delayed impacts over time (Montgomery et al., 1971; Nerlove and Arrow, 1962). As shown in Equation 7, the current impact of overstretching on costs (O_t) is formulated as an exponential smooth of the unrealized cost of overstretching shared resources (u_t), with a time lag of $\frac{1}{\beta}$. The unrealized cost of overstretching shared resources (u_t), defined in Equation 8, is a piecewise linear function of organizational slack (s_t). Values of slack $s_t \geq 0$ indicate excess or perfectly balanced resources, and there are no costs of overstretching. When slack $s_t < 0$, the unrealized cost of overstretching (u_t) increases.

$$O_t = O_{t-1} + \beta(u_{t-1} - O_{t-1}) \tag{7}$$

$$u_t = f(s_t) \;\; ; \;\; where \;\; f(s_t) = 1 - \frac{2}{3}s_t \;\; \{0 \geq s_t \geq -0.75\}; \tag{8}$$

$$f(s_t) = 1 \;\; \{s_t > 0\} \;\; ; \;\; f(s_t) = 1.5 \;\; \{s_t < -0.75\}$$

There are many alternatives to the simple piecewise linear function specified in Equation 7. For example, Sutherland (1980) suggests a more sophisticated function to represent the minimum feasible unit cost for a firm with known coefficients of economies of scale and elasticity of administrative diseconomies. However, the piecewise linear function has been used here for simplicity. The exact specification of the slope, intercept and transition points of the function have been chosen to represent a generic firm, and the qualitative results of the model are not sensitive to changes of this function.

Overstretching shared resources results in a percentage increase in the total costs of the firm depending upon the degree of overstretching. In Equation 3.1, O_t has been added into the profit margin equation as a multiplier. When the firm maintains slack resources ($s_t \geq 0$), the impact of overstretching shared resources on costs is 1; indicating no impact. When slack drops below zero ($s_t < 0$), the impact of overstretching shared resources on costs can increase the total costs of the firm by as much as 50%.

$$\pi_t = \frac{\kappa + (N_t \cdot \varepsilon) - [\psi + (R_t \cdot \nu) + (N_t \cdot \theta)] \cdot O_t}{\kappa + (N_t \cdot \varepsilon)} \tag{3.1}$$

The next simulation experiment will help clarify the consequences of adding these new assumptions to the mathematical model. In Figure 3, The Related Diversification with Overstretching Costs simulation exploits the exact same potential synergy benefits of the Ideal Related Diversification experiment. In addition, this experiment also includes the costs of overstretching the firm's stock of shared resources if resources are overextended. Total work demands, shown in the top of Figure 3, increase as the customer base grows to 500,000 customers over the time horizon. Total Work Demands are shown as an index, and the growth of the new business customer base is not shown because it is identical to the Ideal Related Diversification experiment already discussed. Organizational slack, also shown in the top of Figure 3, steadily declines from an initial value of 5% down to -16% as total work demands rise and ultimately exceed the capacity of shared resources. This negative value indicates that, on average, tasks receive 16% less attention from shared resources than the normal efficient level; shared resources are considerably overstretched.

It takes time for overstretching shared resources to have an impact on performance. The impact of overstretching shared resources on costs, shown in the bottom part of Figure 3, indicates that overstretching costs start rising around the fourth year and continue rising gradually over the rest of the simulation. Overstretching costs are expressed here as a multiplier of the total operating costs of the firm, so that by the end of the simulation overstretching burdens the firm with an additional 10% over the ordinary operating costs.

For the first fifteen quarters of the simulation, there is no distinguishable difference between the profitability of the Ideal Related Diversification and Related Diversification with Overstretching Costs experiments. However, after this point the Related Diversification with Overstretching Costs experiment shows a dramatic collapse in profitability as the rising costs of overextending shared resources undermines firm performance. By the sixth year, profitability was declining rapidly even as the new business continued to grow. After appearing to create value for the first several years, by the end of the time horizon the related diversification move destroys value compared to the Single Business Focus simulation and the Ideal Related Diversification experiments.

Figure 3 about here

The Related Diversification experiment demonstrates how a firm can destroy value in a related diversification move with significant potential synergy benefits. These simulations reveal the important role of management in coordinating the implementation of resource sharing to avoid undermining potential benefits. The next step is to incorporate management's role into the formal model.

Purposive Management and Learning

In a related diversifying firm, the implementation challenge for managers is to increase utilization of excess resources while maintaining an adequate stock of shared resources to meet changing work demands. As shown in the Related Diversification with Overstretching Costs experiment, unless the implementation of resource sharing is managed properly, overstretching shared resources may undermine the economies of scope benefits for a related diversification move. To maintain a level of shared resources that meets the requirements for the normal efficient operations of the firm, management's role is to choose the appropriate time path of investment flows in shared resources over time (Diericks and Cool, 1989). Capturing this implementation process, in the formal model, requires an explicit representation of managerial decision making in determining the investment in shared resources. Formulations should reflect our existing understanding of behavioral decision making and should correspond with real world observations or measurable observable relationships. There is substantial evidence from behavioral research indicating that managers use simple, purposive, goal-directed heuristics, or routines, for a large variety of administrative decisions (Cyert and March, 1963; Morecroft, 1985).

Organizational routines capture the standard operating procedures or rules of thumb managers use to make and implement choices. Such organizational rules of thumb are boundedly rational and consistent with the computational limits of normal, human decision makers under time pressure (Allison, 1971; Simon, 1976, 1979). A salient component of these rules of thumb are operational targets and goals that are set in organizations to simplify decision making and to provide a concrete link to managerial actions (March and Simon, 1958). In the context of choosing the level of investment in shared resources over time, we can represent the process of decision making within the diversifying firm with a managerial policy that includes a goal for the desired level of shared resources and a rule of thumb that determines the investment rate in shared resources when the actual level of shared resources deviates from the goal.

The managerial policy guiding the net resource investment flow (i_t) in the formal model is operationalized in Equations 9 and 10. In Equation 9, the current level of shared resources (R_t) is subtracted from the desired level of shared resources (R_t^*) to compute the gap between the desired and actual values. Net resource investment (i_t) is equal to this resource gap divided by the average time to correct shared resources (τ^R), which represents time lags inherent in collecting, assembling, and interpreting data and delays in taking action. The desired shared resources goal (R_t^*) requires a determination from management about the level of shared resources needed to cope with current total work demands at any point in time. As specified in equation 10, management determines this goal using two pieces of information: 1) the current total work demands of the firm (d_t) and 2) the target attention level per task (a_t^*); a reflection of the perceived productivity of shared resources. This control mechanism represents management's attempt to maintain an adequate stock of shared resources to meet varying workload demands. It is a simple decision making heuristic or routine consistent with previous research modeling managerial decision policies (Cyert and March, 1963; Morecroft, 1985;

Nelson and Winter, 1982; Sastry, 1997).

$$i_t = \frac{R_t^* - R_t}{\tau^R} \tag{9}$$

$$R_t^* = d_t \cdot a_t^* \tag{10}$$

There is still the issue about how management determines the target attention level per task (a_t^*). Organizational learning research has established that organizational targets or aspiration levels, are incrementally adjusted in response to experience (Lant, 1992; Lant and Mezias, 1990; Levitt and March, 1988). Firms that are in a position to diversify typically have routines that have proven effective in their core business over time (Kazanjian and Drazin, 1987). Through extensive operating experience, the firm has detailed knowledge about the productivity of core business resources, and this experience enables management to determine the target attention level per task (a_t^*). This target becomes embedded in organizational routines as a norm or goal, and may be either tacit or explicit. Examples of such norms include knowledge about the sales attention needed per account from sales representatives, the marketing attention required for each product category from marketing managers, or the attention required from scientists to make progress on each R&D project.

However, as the firm diversifies into a new business the established routines for choosing appropriate investment flows in shared resources will evolve as the organization learns about the new business. Management learns over time how productive shared resources are in the new business, and will update target attention levels through an organizational learning process. Empirical research indicates the attainment discrepancy model provides the most robust description of the evolution of targets or aspirations (Lant, 1992).

The target attention level per task (a_t^*) is formulated as an aspiration that adjusts over time, and this aspiration adjustment process is captured in Equation 11. Adjustments to the target are based on the discrepancy between the actual and target attention levels. Past aspiration of the target attention per task (a_{t-1}^*) is an anchor from which incremental changes are made based on the deviation between prior aspiration and actual attention level each quarter (a_t). The attainment discrepancy coefficient (ω) determines how quickly the target is adjusted towards the actual value. Examples of this process include the adjustment of unit sales objectives (Lant, 1992), the adjustment of service quality in service intensive industries (Oliva and Sterman, 2001), and the adjustment of target organizational profitability or return on investment (March and Simon, 1958). Equation 11 specifies a purely behavioral assumption about how individuals and organizations adapt aspiration levels and incrementally adjust their behavior without necessarily being consciously aware of the adjustment process.

$$a_t^* = a_{t-1}^* + \omega(a_t - a_{t-1}^*) \tag{11}$$

The next set of simulation experiments present the consequences of adding these new assumptions to the model. Figure 4 shows the results for the Related Diversification with Investment and Learning (RDIL) experiment. This experiment represents a diversifying firm with purposive management of the stock of shared resources through investment flows. Choosing the appropriate levels of investment in shared resources is represented as an organizational learning process in which managers adjust target attention levels based on experience. As in previous simulation experiments, Total Work Demands, shown in the top of Figure 4, grow over time as the customer base exhibits logistic growth. In response to rising work demands, management invests in additional shared resources. However, as shown in Figure 4, the stock of shared resources rises much less than total work demands. The reason for this behavior is that the target attention level per task, also shown in the top of Figure 4, falls over time, indicating that shared resources are absorbing increasing amounts of work- by devoting less attention to each task- as work demands increase within the firm. All three of these variables have been indexed, in Figure 4, relative to their initial values.

Figure 4 about here

Over the time horizon, organizational slack, shown in the bottom part of Figure 4, declines from an initial 5% to roughly –11%. The firm continues to operate with negative organizational slack over time, because there is no signal for the need to invest in additional shared resources. It has become usual standard operating procedure for shared resources to cope with higher workloads, and the target attention level per task reflects this established norm. As a consequence, the impact of overstretching shared resources on costs, shown in the bottom part of Figure 4, rises to just over 7% of total costs by the end of the fifteenth year.

Figure 5 provides a comparison for the performance consequences of the RDIL experiment relative to the Single Business Focus and Ideal Related Diversification experiments. Performance in the RDIL simulation reveals no ill-effects of overstretching shared resources in the first four to five years, but then profitability declines dramatically as the delayed consequences of overstretching shared resources come to light. In the end, this RDIL experiment destroys substantial value relative to the Single Business Focus strategy. The behavioral learning processes at work within the organization ensure the underlying resource inadequacy problems remain hidden and performance remains depressed throughout the rest of the simulation. This simulation experiment demonstrates how boundedly rational managerial policies for coordinating resource sharing can undermine the potential synergy benefits of related diversification. The managerial policy represented in the model is consistent with behavioral and organization learning research suggesting that organizations make decisions using simple, goal-directed heuristics and that goals are a reflection of past experience (Cyert and March, 1963; Lant, 1992; Levitt and March, 1988). Such behavior could explain why many related diversifiers fail to realize potential synergy.

Also shown in Figure 5 is the Very Related Diversification experiment, representing a scenario in which the new business is even more related to the core business than in the Ideal Related Diversification and RDIL simulations. In this experiment, the diversifying firm also benefits from leveraging the firm's reputation in the core business to access a larger pool of potential customers and to grow the customer base in the new business more rapidly. This revenue enhancing synergy is in addition to the potential economies of scope benefits captured in the previous experiments. In the Very Related Diversification experiment, the potential customer base is increased by 50% at the beginning of the simulation. As a result, the new business customer base grows more quickly and is ultimately 50% larger than in the RDIL simulation. Counter-intuitively, the Very Related Diversification experiment, results in lower profitability than the RDIL simulation- an experiment that represents a less related diversification move.

Figure 5 about here

Figure 6 shows that in the Very Related Diversification experiment, revenue enhancing relatedness in the form of a related reputation was not beneficial for the firm since leveraging a related reputation resulted in more rapid growth and ultimately a larger new business customer base compared with the previous experiments. This larger customer base only served to stretch the stock of shared resources even further. Organization slack falls to below –17% and consequently, the costs of overstretching shared resources were even higher in this more related experiment and undermined the larger potential synergy benefits.

Figure 6 about here

The simulation experiments presented thus far demonstrate how poor strategy implementation processes can undermine any potential synergy benefits of a related diversification move. In the next set of experiments, we examine how management can successfully tap the benefits of resource sharing. Figure 7 compares the performance of two new experiments with the Single Business Focus and Ideal Related Diversification performance benchmarks. The 10% Initial Slack experiment represents a policy in which management embarks on a diversification move only when there is at least 10% slack in the organization; compared with 5% initial slack resources in all previous simulations. The rationale for such a policy is that the additional organizational slack enables management to maintain the balance between shared resources and total workload demands with the extra buffer of excess resources before the diversification. Simulation allows us to test the impact of this management policy to see if it can turn the related diversification into a value creating success.

As shown in Figure 7, the 10% Initial Slack simulation starts with slightly lower profitability than the previous experiments due to higher initial shared resource costs. Performance improves as the new business grows and drives up resource utilization, but then performance begins a rapid descent around the fifth year of the simulation. By the end of the simulation, profitability is back down to the Single Business Focus benchmark resulting in a value neutral diversification strategy. This experiment demonstrates that additional initial slack resources can delay and limit overextending shared resources, suggesting there is substantial value in investing in slack shared resources, perhaps quite significantly, prior to a related diversification move. However, the additional initial slack was not sufficient in this case to prevent overstretching and aspiration adjustment, and ultimately the firm was no better off than simply remaining focused on the core business. In different competitive environments, the appropriate level of initial slack varies considerably and it is not obvious that management would be in a position to identify the appropriate level ex ante, indicating this is not a robust policy.

The final simulation included in Figure 7, the Fixed Target experiment, represents a policy in which management explicitly sets targets for the attention level required to adequately cope with workload demands. There is no aspiration adjustment whatsoever in this simulation, and the target remains fixed over the entire time horizon. The Fixed

Target experiment results in profitability that is substantially higher than the focused strategy performance benchmark, resulting in a successful diversification strategy. Profitability approaches but is still a bit below the profitability level of the Ideal Related Diversification experiment since additional shared resources are required to maintain target attention levels in this simulation.

Figure 7 about here

The time paths of total work demands, shared resources and target attention level per task for the Fixed Target experiment are shown in the top part of Figure 8. Growth in new business customers increases total workload demands, and management invests in shared resources to correct the resource shortfall. As the two lines diverge in Figure 8, we can see that total work demands grow more rapidly than shared resources over the first 30 quarters. However, target attention per task remains constant over the entire time horizon. These first three variables are all indexed relative to their initial values in order to compare them on the same left-hand vertical scale. The imbalance between total work demands and shared resources is reflected in declining organizational slack, shown in the bottom part of Figure 8, during the first 30 quarters. Slack declines from an initial 5% down to a low of roughly –3% in quarter 21 indicating resource overstretching. As organizational slack drops below 0%, overstretching costs reach nearly 1%, after a time lag, indicating a rise in total firm costs due to overstretching. However, since the target attention per task remains fixed, the signal for management to continue to invest in expanding the stock of shared resources remains strong over this entire period, and eventually the balance is restored between shared resources and total work demands. When this balance is restored, organizational slack recovers and overstretching costs slowly decay back towards zero.

Figure 8 about here

This successful diversification strategy demonstrates the debilitating effect aspiration adjustment can have in the organization, and management's role in coordinating resource sharing in related diversification. It is obvious from these simulation experiments that implementation process issues can be crucial in determining the success or failure of resource sharing.

DISCUSSION AND CONCLUSIONS

The simulation analysis offers three contributions to understanding the performance of firms attempting to exploit resource sharing between related businesses. First, the simulation results demonstrate that even if significant economies of scope benefits exist for a related diversification move, these benefits may be wiped out if the implementation of resource sharing is not managed properly. Second, the results illustrate the importance of establishing explicit, fixed targets for attention levels within the firm and monitoring organizational slack as workload demands fluctuate. Firms should consciously plan for slack shared resources to prevent overstretching. This is consistent with the strategic planning literature that suggests setting goals and objectives is an essential part of strategic planning (Hofer and Schendel, 1978). Explicit targets can prevent aspiration adjustment and the unintended, long run costs of overstretching shared resources. This is also consistent with previous research that found adjusting behavior too quickly in response to feedback can be detrimental to organizational survival if it reduces the buffering effect of organizational slack (Levitt and March, 1988).

Third, a counterintuitive result is that a higher degree of relatedness between businesses may hurt financial performance. Traditional thinking posits that more related diversifiers should outperform less related firms. Simulation experiments demonstrate that a higher degree of relatedness may actually exacerbate resource overstretching and result in lower profitability compared with a less related case. Our analysis demonstrates these problems are most pronounced in cases where there is rapid growth in the new business. This is consistent with previous research indicating the problems of coordination and control are more serious during periods of expansion (Penrose, 1959).

Together, these three findings suggest that the management of diversification moves may be a more important factor in determining performance than the type and mode of diversification. The results direct the focus away from ex ante explanations for the success or failure of related diversification strategies and onto implementation process issues. Implementation difficulties may explain why synergy is so elusive and why related diversifiers often do not reap the full potential benefits from the strategy. We know from economic theory that firms must have excess resources in order to extract economic benefits from diversification. The implementation process is crucial because management's role is to choose the appropriate time path of investment flows to maintain adequate shared resources. Paradoxically, an important aspect of realizing synergy may be to invest in and maintain slack resources. One successful related diversifier, 3M, implements such a strategy by maintaining 15% slack in scientists and engineers so that they can use that excess time to explore their own ideas. Such an explicit target for slack resources ensures that the firm can absorb growth without overextending scientists and engineers, and then invest in additional scientists and engineers to maintain the desired level of slack.

Managers may be motivated to pursue related diversification by focusing primarily on the potential economies of scope, without adequate plans for the investment needed to extract these benefits or sufficient consideration of implementation difficulties (Nayyar, 1993; Stimpert and Duhaim, 1997). As a result, many diversified firms find that expected synergy or business growth does not materialize, and then divest the business (Markides, 1995). This refocusing strategy may be successful in improving profitability largely because it reduces resource overstretching, including overextended managers operating beyond their spans of control. If there really are substantial potential synergy benefits, investing in additional shared resources could unleash those benefits and may create more value for shareholders than divesting businesses.

There are a number of ways to extend the resource sharing model presented in this paper that may serve as a guide for future research. One such extension could be incorporating productivity improvements in the growing firm. Learning that occurs in the normal process of operating a business can result in productivity improvements and give rise to slack resources (Penrose, 1959). However, such gradual improvements are unlikely to prevent overstretching in the short and medium-term time scales.

Another avenue of extension might focus on including resource complementarity and interconnectedness into the analysis (Milgrom and Roberts, 1990; Thomke and Kuemmerle, 2002). Implementation difficulties can occur at any point in the firm's interconnected resource system, and complementarities may make resource shortfalls even more problematic. Functional area policies in R&D, marketing or manufacturing, are responsible for coordinating individual resources with workload demands and imbalances may have wide-ranging effects.

An area requiring further investigation is the impact of resource allocation policies in resource sharing (Pitts, 1976 and 1977). There is recent empirical evidence to suggest diversification negatively impacts the core business due to the allocation of managerial attention to the new business (Schoar, 2001). At the same time, organization theory on inertia would suggest that new businesses might be starved of shared resources until organizational routines evolved to support both businesses. More work is needed to understand these process issues in diversifying firms.

REFERENCES

Adner R. 2002. When are technologies disruptive? A demand-based view of the emergence of competition. *Strategic Management Journal* 23: 667-688.

Allison GT. 1971. *Essence of Decision*. Little, Brown and Company: Boston MA.

Amit R, Livnat J. 1988. Diversification Strategies, Business Cycles and Economic Performance. *Strategic Management Journal* 9: 99-110.

Bettis RA. 1981. Performance differences in related and unrelated diversified firms. *Strategic Management Journal* 2(4): 379-393.

Bourgeois LJ. 1981. On the measurement of organizational slack. *Academy of Management Review* 6(1): 29-39.

Christensen HK, Montgomery CA. 1981. Corporate Economic Performance: Diversification Strategy Versus Market Structure. *Strategic Management Journal* 2: 327-343.

Coase RH. 1952. The Nature of the Firm. In Stigler and Boulding (eds). *Readings in Price Theory*. Richard D Irwin: Homewood IL.

Cohen MD, March JG, Olsen JP. 1972. A garbage can model of organizational choice. *Administrative Science Quarterly* 17(1): 1-25.

Cyert RM, March JG. 1963. *A Behavioral Theory of the Firm*. Blackwell Publishers Inc. Cambridge, MA.

Dierickx I, Cool K. 1989. Asset Stock Accumulation and Sustainability of Competitive Advantage. *Management Science*, 35(12): 1504-1511.

Gupta AK, Govindarajan V. 1986. Resource sharing among SBU's: strategic antecedents and administrative implications. *Academy of Management Journal* 29(4): 695-714.

Grant RM, Jammine AP, Thomas H. 1988. Diversity, Diversification, and Profitability Among British Manufacturing Companies 1972-1984. *Academy of Management Journal* 31(4): 771-801.

Hill CWL. 1983. Conglomerate Performance Over the Economic Cycle. *Journal of Industrial Economics* 32: 197-211.

Hill CWL, Hitt MA, Hoskisson RE. 1992. Cooperative Versus Competitive Structures in Related and Unrelated Diversified Firms. *Organization Science* 3(4): 501-521.

Hill CWL, Hoskisson RE. 1987. Strategy and structure in the multiproduct firm. *Academy of Management Review* 12(2): 331-341.

Hofer CW, Schendel DE. 1978. *Strategy formulation: analytical concepts*. West Publishing Co: St. Paul, Minn.

Kazanjian RK, Drazin R. 1987. Implementing internal diversification: contingency factors for organizational design choices. *Academy of Management Review* 12(2): 342-354.

Kerr JL. 1985. Diversification strategies and managerial rewards: an empirical study. *Academy of Management Journal* 28: 155-179.

Lant TK. 1992. Aspiration level adaptation: an empirical exploration. *Management Science* 38: 623-644.

Lant TK, Mezias SJ. 1990. Managing discontinuous change: a simulation study of organizational learning and entrepreneurship. *Strategic Management Journal* 11: 147-179.

Larsson R, Finkelstein S. 1999. Integrating strategic, organizational, and human resource perspectives on mergers and acquisitions: a case survey of synergy realization. *Organization Science* 10(1): 1-26.

Leibenstein H. 1966. Allocative efficiency vs. "X-Efficiency". *American Economic Review* 56(3): 392-415.

Levitt B, March JG. 1988. Organizational learning. *Annual Review of Sociology* 14: 319-340.

Lin Z, Carley K. 1997. Organizational response: the cost performance trade-off. *Management Science* 43: 217-234.

Lomi A, Larsen ER. 1996. Interacting locally and evolving globally: a computational approach to the dynamics of organizational populations. *Academy of Management Journal* 39(4): 1287-1321.

March JG, Simon HA. 1958. *Organizations*. Wiley: New York.

Markides CC. 1995. Diversification, restructuring and economic performance. *Strategic Management Journal* 16 (2): 101-118.

Markides CC, Williamson PJ. 1994. Related Diversification, core competencies and corporate performance. *Strategic Management Journal* 15: 149-165.

Markides CC, Williamson PJ. 1996. Corporate diversification and organizational structure: A resource-based view. *Academy of Management Journal* 39(2): 340-367.

Milgrom P, Roberts J. 1990. The Economics of Modern Manufacturing: Technology Strategy, and Organization. *The American Economic Review* 80(3): 511-528.

Montgomery CA. 1985. Product-Market Diversification and Market Power. *Academy of Management Journal* 28(4): 789-798.

Montgomery DB, Silk AJ, Zaragoza CE. 1971. A multiple-product sales force allocation model. Management Science 18(4): 3-24.

Morecroft JD. 1985. Rationality in the Analysis of Behavioral Simulation Models. *Management Science* 31(7): 900-916.

Nayyar PR. 1993. Performance effects of information asymmetry and economies of scope in diversified service firms. *Academy of Management Journal* 36(1): 28-57.

Nelson RR, Winter SG. 1982. *An evolutionary theory of economic change*. Harvard University Press: Cambridge, MA.

Nerlove M, Arrow KJ. Optimal advertising policy under dynamic conditions. *Economica* 29: 129-142.

Oliva R, Sterman JD. 2001. Cutting corners and working overtime: quality erosion in the service industry. *Management Science* 47(7): 894-914.

Pablo AL. 1994. Determinants of acquisition integration level: a decision-making perspective. *Academy of Management Journal* 37:803-836.

Palepu K. 1985. Diversification strategy, profit performance, and the entropy measure. *Strategic Management Journal* 6(3): 239-255.

Panzar JC, Willig RD. 1981. Economies of Scope. *American Economic Review* 71(2): 268-272.

Penrose E. 1959. *The Theory of the Growth of the Firm*. New York: Wiley.

Pitts RA. 1976. Diversification strategies and organizational policies of large diversified firms. *Journal of Economics and Business* 28: 181-188.

Pitts RA. 1977. Strategies and structure for diversification. *Academy of Management Journal* 20: 197-208.

Pondy LR. 1969. Effects of size, complexity, and ownership on administrative intensity. *Administrative Science Quarterly* 14(1): 47-60.

Pugh DS, Hickson DJ, Hinings CR, Turner C. 1969. The context or organizational structures. *Administrative Science Quarterly* 14(1): 91-114.

Ramanujam V, Varadarajan P. 1989. Research on corporate diversification: a synthesis. *Strategic Management Journal* 10: 523-551.

Rivken JW. 2000. Imitation of Complex Strategies. *Management Science* 46: 824-844.

Rudolph JW, Repenning NP. 2002. Disaster dynamics: understanding the role of quantity in organizational collapse. *Administrative Science Quarterly* 47: 1-30.

Rumelt R. 1974. *Strategy Structure and Economic Performance*. Harvard University Press: Cambridge, MA.

Rumelt R. 1982. Diversification Strategy and Profitability. *Strategic Management Journal* 3: 359-369.

Sastry A. 1997. Problems and Paradoxes in a Model of Punctuated Organizational Change. *Administrative Science Quarterly* 42: 237-275.

Schoar, A. 2001. Effects of diversification on productivity. MIT Working Paper.

Seshadri S, Shapira Z. 2001. Managerial allocation of time and effort: the effects of interruptions. *Management Science* 47(5): 647-662.

Simon HA. 1976. *Administrative Behavior*, third ed. The Free Press: New York.

Simon HA. 1979. Rational decision making in business organizations. *American Economic Review* 69: 493-513.

Stimpert JL, Duhaime IM. 1997. Seeing the big picture: the influence of industry, diversification, and business strategy on performance. *Academy of Management Journal* 40: 560-583.

Sutherland JW. 1980. A quasi-empirical mapping of optimal scale of enterprise. *Management Science* 26(10): 963-981.

Teece DJ. 1982. Towards an economic theory of the multiproduct firm. *Journal of Economic Behavior and Organization* 3(1): 39-63.

Teece DJ, Pisano G, Shuen A. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal* 18(7): 509-533.

Thomke S, Kuemmerle W. 2002. Asset accumulation, interependence and technological change: evidence from pharmaceutical drug discovery. *Strategic Management Journal* 23: 619-635.

Williamson OE. 1985. *The economic institutions of capitalism: firms, markets and relational contracting*. Free Press: New York.

Winter SG. 1987. Knowledge and Competence as Strategic Assets. In Teece D. (ed.) *The Competitive Challenge*. Ballinger, Cambridge, MA: 159-184.

Zott C. 2003. Dynamic capabilities and the emergence of intraindustry differential firm performance: insights from a simulation study. *Strategic Management Journal* 24: 97-125.

APPENDIX

Model Parameters and Initial Values

PARAMETER	**DESCRIPTION**	**UNITS OF MEASURE**	**VALUE**
a_0^*	Initial target attention level per task	Resource Months / Work Unit	$\rho \cdot (1 + IS)$
ε	Revenue per new business customer	$ / Customer / Quarter	150
g	Normal new business customer base growth rate	1 / Quarter	0.35
θ	Variable cost per new business customer	$ / Customer / Quarter	100
κ	Core business revenue	$ / Quarter	200 million
λ	New business customer work demands	Work Units / Customer / Quarter	0.0005
υ	Variable cost of each unit of shared resources	$ / Resource Month	50,000
N_0	Initial new business customers	Customers	1,000
O_0	Initial impact of overstretching on costs	Dimensionless	1.00
ρ	Normal efficient attention per task	Resource Months / Work Unit	0.2
R_0	Initial shared resources	Resource Months / Quarter	R_0^*
τ^R	Time to correct shared resources	Quarters	6
χ	Core business work demands	Work Units / Quarter	1000
ψ	Fixed costs	$ / Quarter	150 million

Simulation Experiment Parameter Settings

Parameter	ω	β	PC	IS	σ
Description	Attainment discrepancy coefficient	Overstretching cost realization delay	Potential new business customers	Initial slack	New Business Switch
Units	1 / Quarter	1 / Quarter	Customers	Dimensionless	Dimensionless
Single Business Focus	-	-	-	1.05	0
Ideal Related Diversification	-	-	500,000	1.05	1
Related Diversification with Overstretching Costs	-	1/12	500,000	1.05	1
RDIL	1/2	1/12	500,000	1.05	1
Very Related Diversification	1/2	1/12	750,000	1.05	1
10% Initial Slack	1/2	1/12	500,000	1.10	1
Fixed Target	0	1/12	500,000	1.05	1

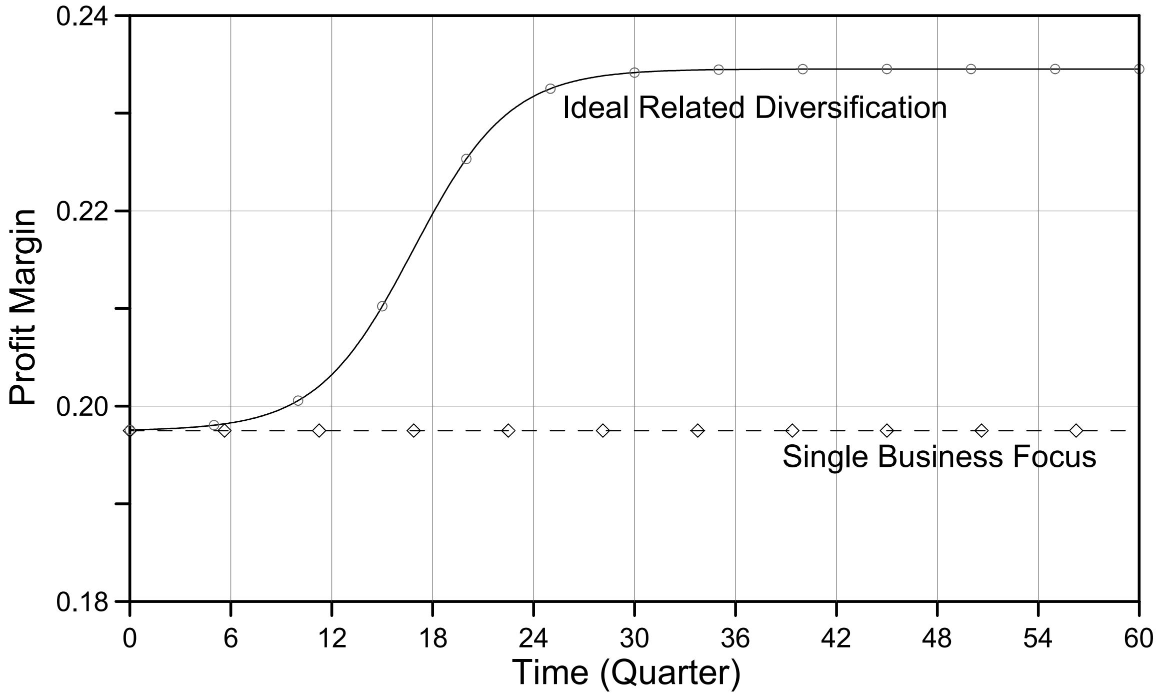

Figure 1. Simulation results for Single Business Focus & Ideal Related Diversification

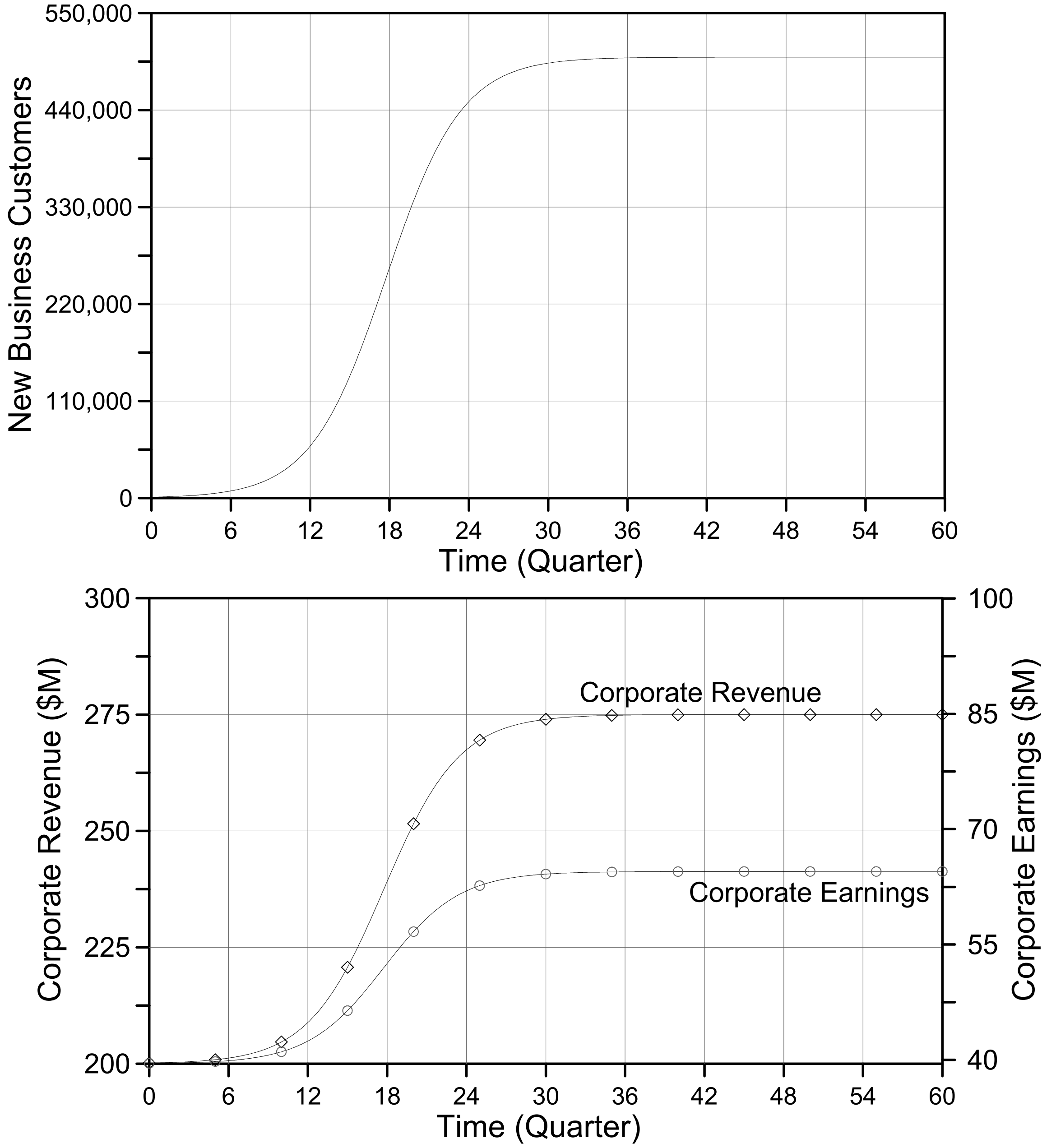

Figure 2. Simulation results for the Ideal Related Diversification experiment

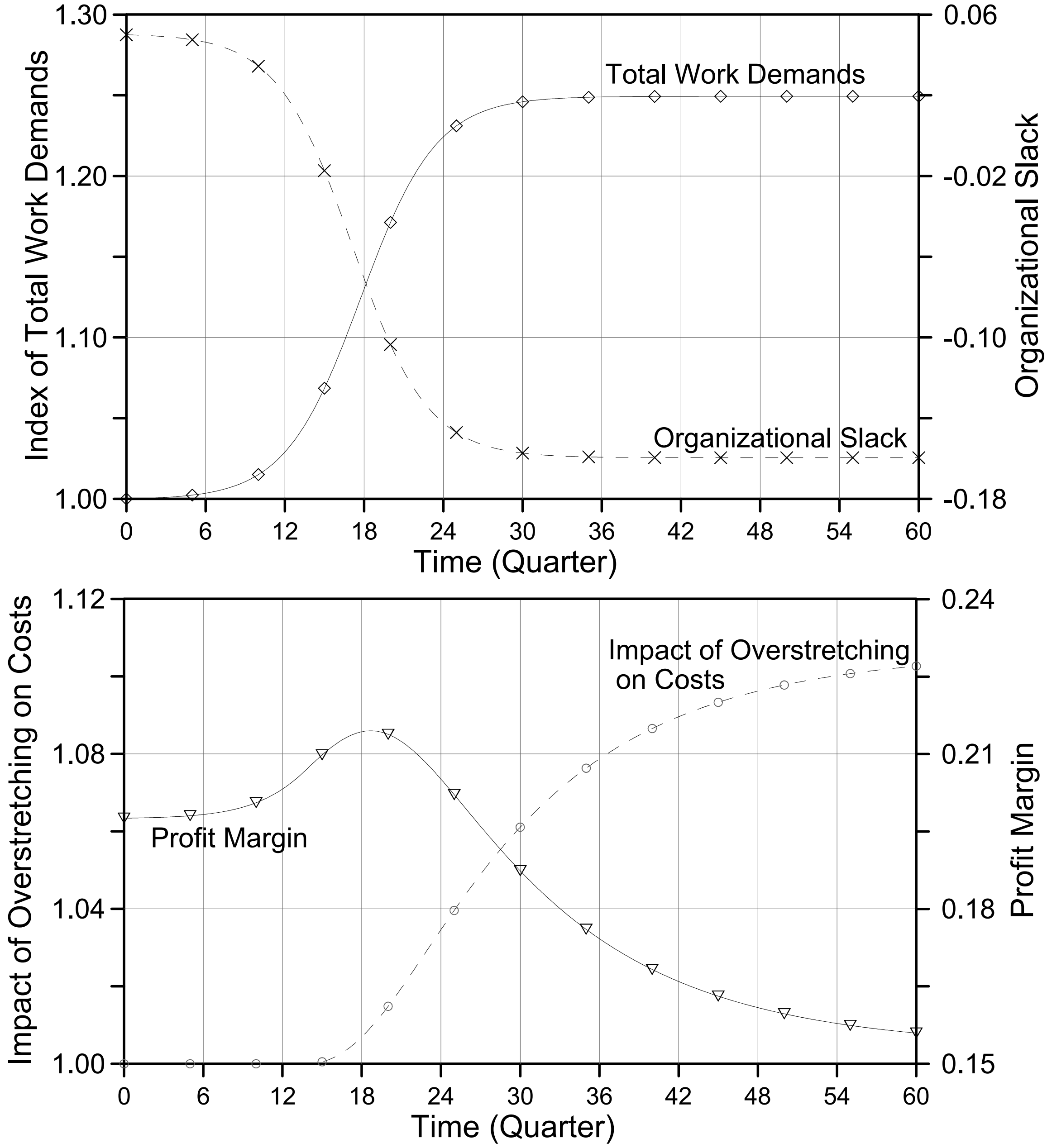

Figure 3. Related Diversification with Overstretching Costs Experiment

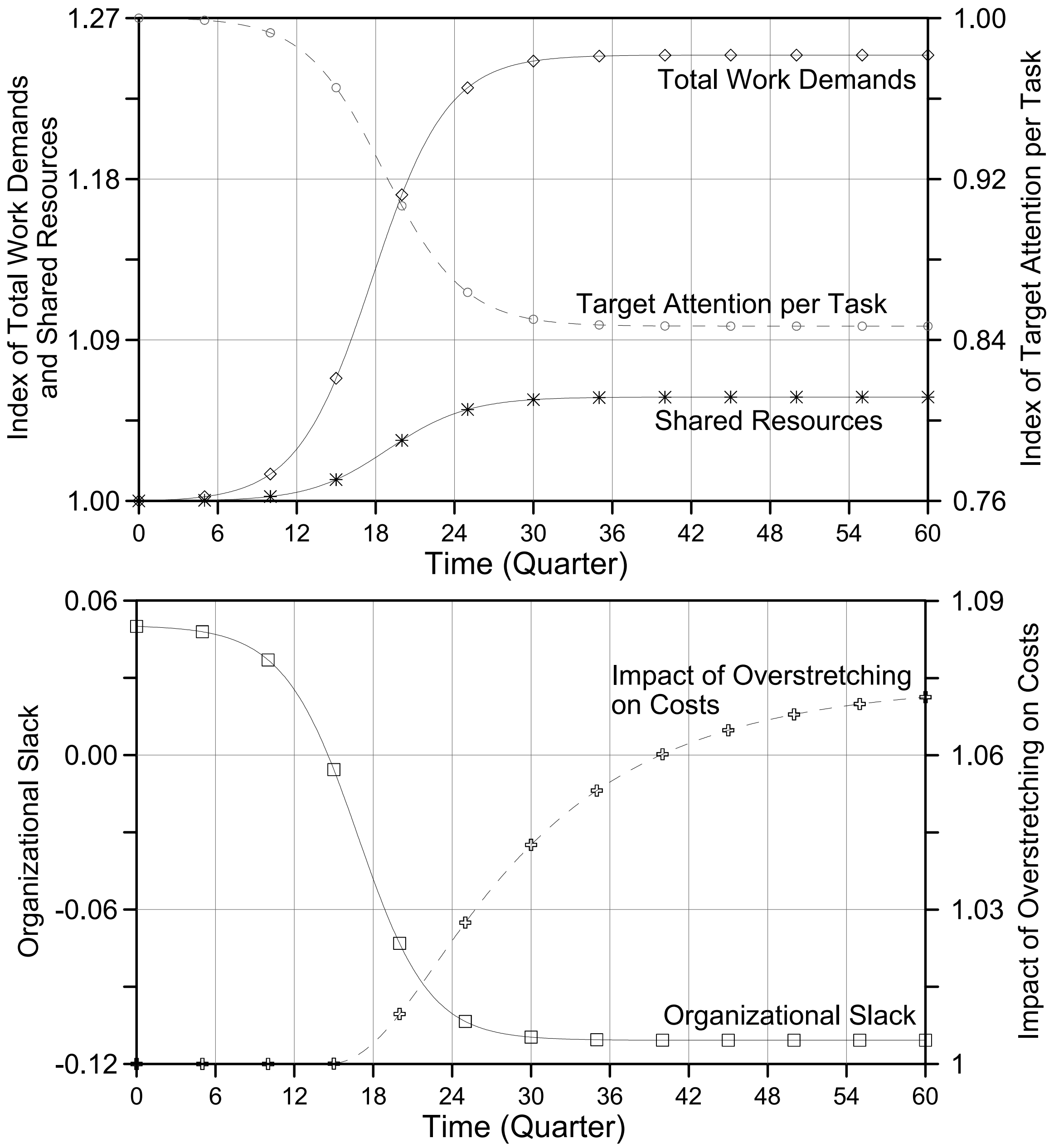

Figure 4. Simulation results for Related Diversification with Investment & Learning

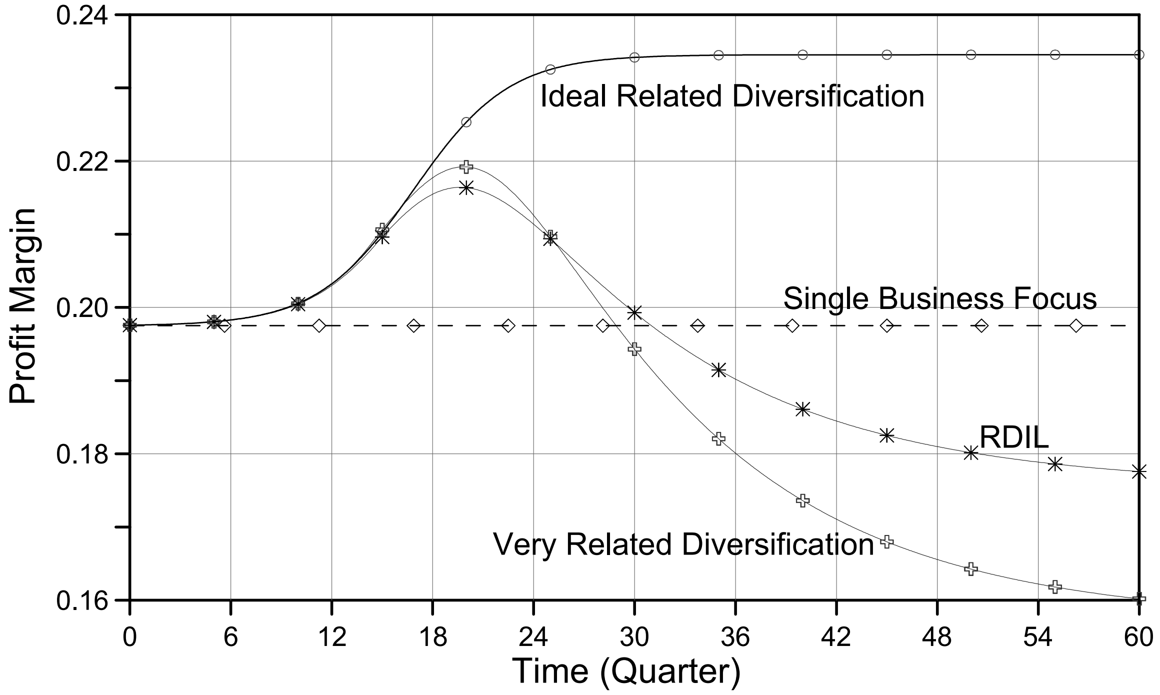

Figure 5. Simulation results comparing profit margin across experiments

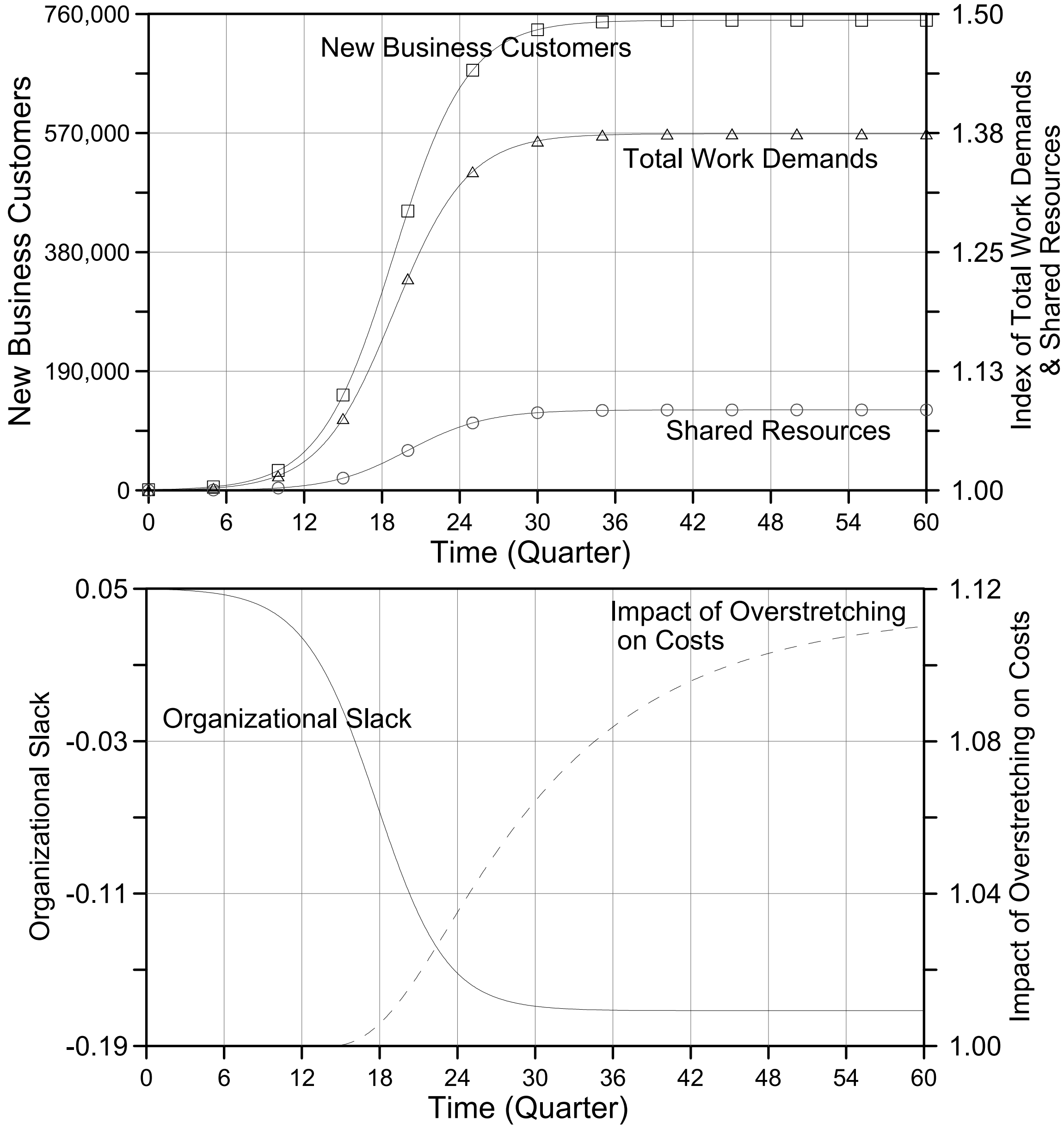

Figure 6. Simulation results for Very Related Diversification Experiment

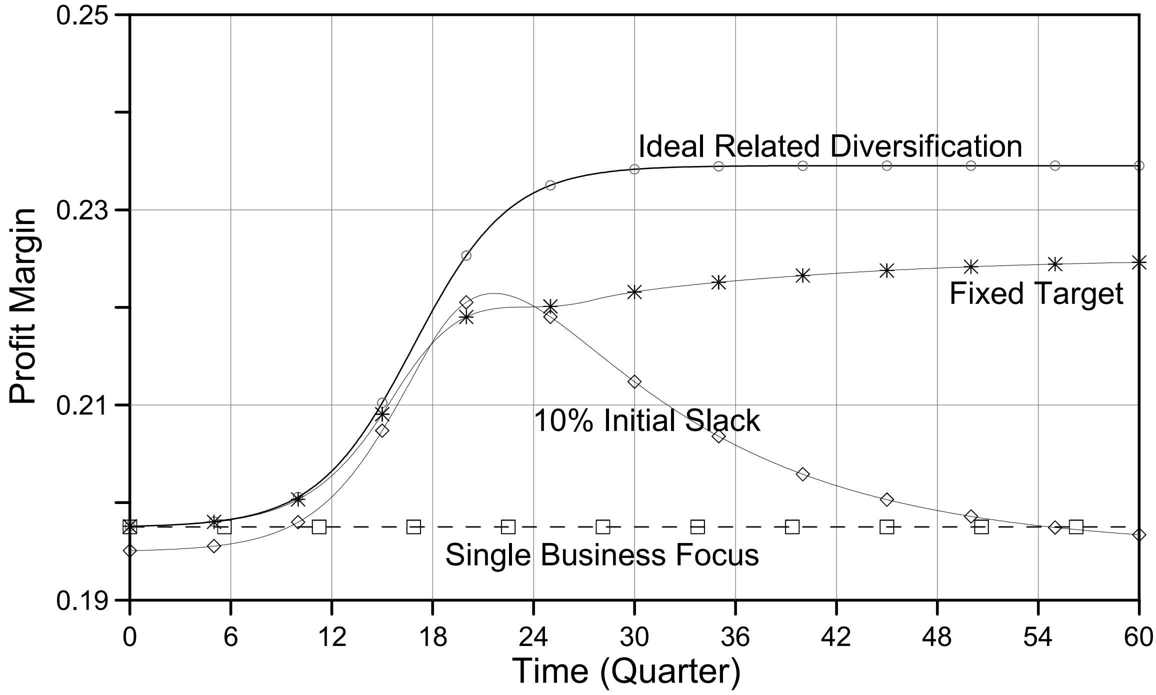

Figure 7. Realizing the potential benefits of resource sharing

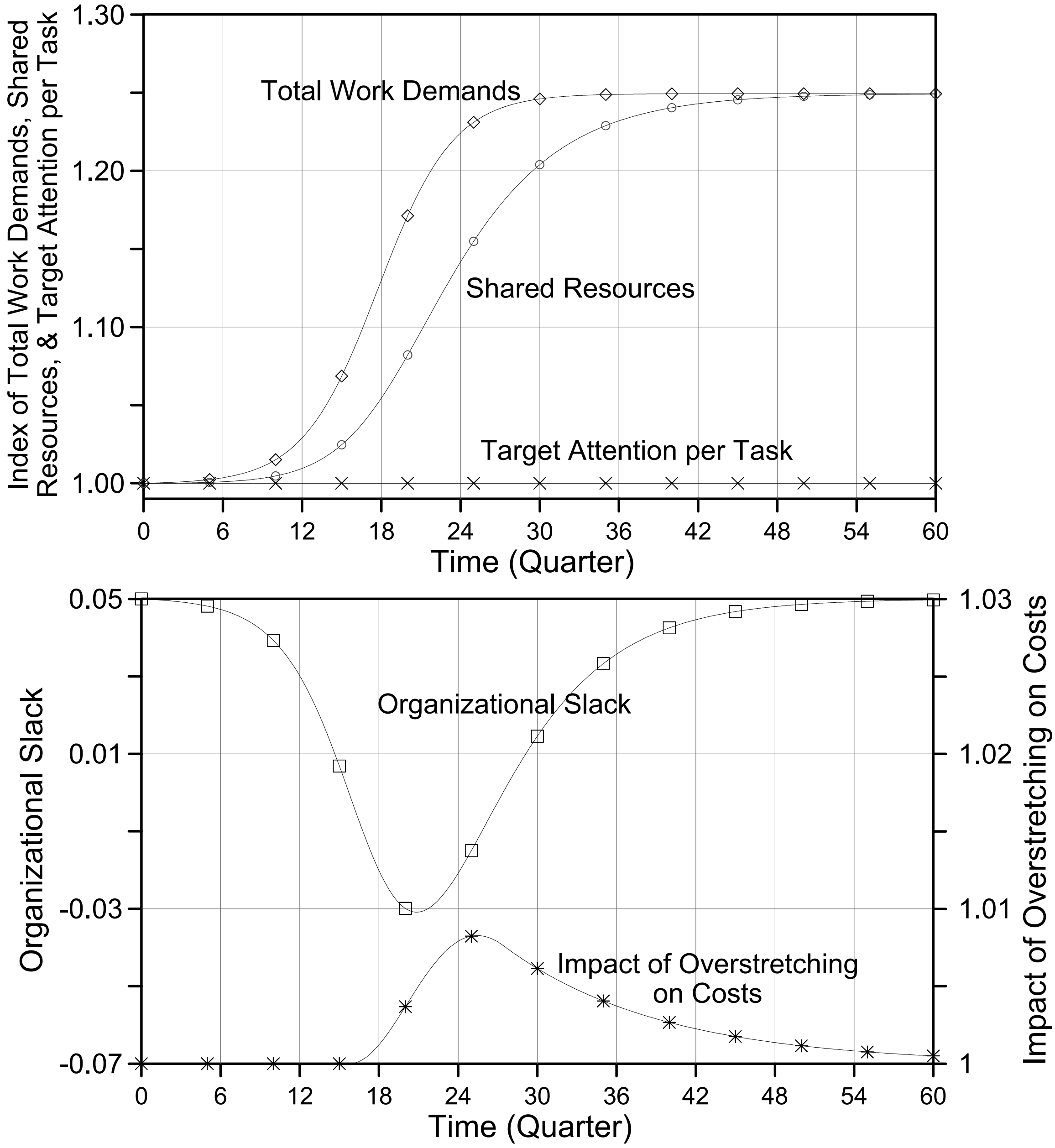

Figure 8. Dynamics of the Fixed Target Experiment

Back to the Top