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IS Support for Strategic Flexibility, Environmental Dynamism, and Firm Performance

Michael J. Zhang
Assistant Professor of Management
Sacred Heart University

For the past decade, strategic flexibility has been increasingly viewed as a critical organizational competency that enables a firm to achieve and maintain competitive advantage and superior performance (Sanchez, 1995; Hitt *et al.*, 1998). Correspondingly, there has been a growing research interest in the role of information systems (IS) in achieving strategic flexibility (Goldhar and Lei, 1995; Lei *et al.*, 1996; Byrd, 2001). While numerous conceptual frameworks, case studies and anecdotes have been offered to show IS can be used to support the development of strategic flexibility to gain competitive advantage, it remains unclear whether IS support for strategic flexibility can actually improve a firm's bottom-line performance, due to little prior empirical work on this issue. Without empirical research assessing the financial performance impacts of IS support for strategic flexibility, firms and their managers who are interested in investing in IS for achieving strategic flexibility have little evidence on which to base their IS investments. In this article, I seek to address this imbalance in the extant

literature by presenting the results from a study linking IS support for strategic flexibility to firm performance.

In investigating the relationship between IS support for strategic flexibility and firm performance, I drew on the resource-based perspective of competitive advantage and argued that, to the extent that strategic flexibility represents a rent-yielding, firm-specific and hard-to-copy organizational capability, firms using IS to support the development of strategic flexibility may enjoy competitive advantage and superior economic returns. Moreover, using a recent resource-based argument that a firm's resource or capability offers different strategic values in different contexts (Miller and Shamsie, 1996), I explored an environmental context (environmental dynamism) in which the strength of the relationship between IS support for strategic flexibility and firm performance is likely to vary across firms. While the fast-changing nature of a firm's external environment drives the interest in strategic flexibility and, hence, IS support for strategic flexibility (Sanchez,

JOURNAL OF MANAGERIAL ISSUES Vol. XVIII Number 1 Spring 2006

(84)

1995; Hitt *et al.*, 1998), little research attention has been paid to whether such an external environment may affect the performance impacts of IS support for strategic flexibility. Given the potential high costs of using IS to achieve strategic flexibility (Upton, 1995; Aggarwal, 1997) and the growing skepticism towards the unconditional pursuit of strategic flexibility (Pine *et al.*, 1993; Gerwin, 1993; Upton, 1995), discerning the moderating effects of external dynamism on the performance impacts of IS support for strategic flexibility would enhance our understanding of the conditions under which firms are more likely to reap the benefits from using IS to build strategic flexibility.

The remainder of the article is structured as follows. The next section (1) offers a review of the concept of strategic flexibility and its competitive value, (2) discusses the linkages among IS, distinctive organizational competencies including strategic flexibility, and competitive advantage from the resource-based perspective, (3) elaborates on the IS role in building strategic flexibility, and (4) explores the moderating effects of environmental dynamism on the relationship between IS support for strategic flexibility and firm performance. Together, this discussion provides the conceptual foundation for the development of the research hypotheses. The following section presents the research methodology, including the sample and data collection procedure, the measurement of the variables of interest, and the results. The next section discusses the implications of the research findings, the limitations of the study, and some suggestions for future research and practice. The last section pro-

vides a summary and conclusions for the study.

THEORETICAL BACKGROUND AND HYPOTHESIS

Strategic Flexibility and Competitive Advantage

The subject of flexibility has been dealt with extensively in several disciplines (e.g., manufacturing management, economics, strategic management, information technology management) and various conceptualizations of flexibility have been advanced during the past two decades, reflecting a wide range of research interests and theoretical perspectives. There are a number of excellent reviews of different definitions and typologies of flexibility, especially in the manufacturing management literature (Sethi and Sethi, 1990; Hyun and Ahn, 1992; Gerwin, 1993; Upton, 1994). In keeping with the current strategic perspective of flexibility (Sanchez, 1995; Hitt *et al.*, 1998), I adopted a broad (strategic) view of flexibility in the current study, referring to "a firm's ability to proact or respond quickly to a changing competitive environment and thereby develop and/or maintain competitive advantage" (Hitt *et al.*, 1998: 26). Indeed, the concept of strategic flexibility has been increasingly embraced by researchers in other fields such as manufacturing management and IT management, given the growing recognition of the strategic importance of strategic flexibility to firms competing in a fast-changing business environment (Boynton, 1993; Gerwin, 1993; Upton, 1994).

Research examining the strategic impact of strategic flexibility has shown that strategic flexibility can

contribute to competitive advantage at different organizational levels. At the tactical or functional level, strategic flexibility is now known to be vital to several value-creating operational or manufacturing strategies, including mass customization, time-to-market, operational excellence, lean manufacturing, and stockless inventory (Stalk *et al.*, 1992; Treacy and Wiersema, 1993; Kotha, 1995; Byrd, 2001). At the business level, strategic flexibility enables the firm to avoid the trade-off between low cost and differentiation and offer high-quality products or services at low costs (Boynnton, 1993; Lei *et al.*, 1996). At the corporate level, since the development and implementation of strategic flexibility involve constant improvements in a firm's organizational processes and technologies as well as its continuous learning of new organizational knowledge, capabilities and skills (Hayes and Pisano, 1994; Goldhar and Lei, 1995), strategic management researchers rooted in the resource-based view of competitive advantage consider strategic flexibility as a higher-order (dynamic) capability that enables the firm to adapt and change over time to maintain its long-term competitiveness (Amit and Schoemaker, 1993; Collis, 1994; Teece *et al.*, 1997).

Furthermore, ample recent research suggests that the competitive advantage derived from strategic flexibility may be sustainable in that its development entails effective utilization and coordination of complex sets of firm-specific and hard-to-copy resources and capabilities (Sanchez, 1995; Ahmed *et al.*, 1996). For example, several researchers argue that realizing strategic flexibility requires a firm's strategic leaders to cultivate nonlinear and learning skills (for

conceptualizing different information and situations) and apply them along with other critical managerial skills to develop new thinking in strategic visions, strategies, structures, systems, logics and practices (Ahmed *et al.*, 1996; Hitt *et al.*, 1998). Hitt *et al.* (1998) also posit that firms capable of leveraging their dynamic core competencies (unique sets of resources to gain competitive advantage) to build linkages and share resources across geographic and product units can not only respond rapidly to unpredicted changes in the external environment, but also create causal ambiguity about their flexibility capability, thus making it difficult for their competitors to imitate. In addition, research on the organizational impacts of flexible manufacturing technologies has shown that firms with the ability to develop highly skilled and flexible employees and effectively integrate them with flexible manufacturing techniques are in a better position to reap greater economic gains (Parthasarthy and Sethi, 1992; Upton, 1995).

Another type of organizational resources crucial to the successful development of strategic flexibility is the "loosely coupled" (Orton and Weick, 1990) or "modular" (Sanchez, 1995) design of organizational structures. Loosely coupling of products and organizational processes not only increases a firm's ability to utilize flexible advanced manufacturing technologies to offer a large product variety at faster speed and lower costs, but also facilitates accumulation and cross-functional sharing of information and knowledge important to the rapid development and implementation of strategic actions (Lei *et al.*, 1996; Sanchez, 1997). Moreover, strategic flexibility derived from modular products and processes can be diffi-

cult to imitate since they have increasingly become tacit, firm-specific and knowledge-intensive (Lei *et al.*, 1996).

The Resource-based View of the Strategic Impact of IS

As a popular theoretical perspective in the strategic management literature, the resource-based view of competitive advantage suggests that firms with unique and difficult to imitate or substitute resources and capabilities can gain and maintain competitive advantage and superior performance (Barney, 1991). While early resource-based analysis of the strategic role of IS views IS as commodity-like resources that are unlikely to have any direct impact on firm performance (Clemons, 1986; Mata *et al.*, 1995), more recent research indicates that, despite lacking characteristics that are unique or difficult to imitate, IS may play an indirect (supporting or enabling) role in influencing firm performance (Clemons and Row, 1991; Powell and Dent-Micaleff, 1997; Bharadwaj, 2000). Based on the concept of complementary assets—resources whose presence enhances the values of other resources (Tece, 1986)—IS and strategy researchers who examine the supporting role of IS argue that IS can contribute to competitive advantage when they are used to create or leverage distinctive organizational competencies (rent-yielding and firm-specific resources and capabilities) that are hard to imitate or substitute (Lado and Zhang, 1998; Bharadwaj, 2000; Byrd, 2001). Bharadwaj (2000) further argue that firms whose IS complement their distinctive organizational competencies may be able to create a complex set of

complementary resources that are not easily matched by competitors.

Recent evidence seems to support the supporting role of IS. In their investigation of how firms in the U.S. retail industry used IT to achieve competitive advantage, Powell and Dent-Micaleff (1997) reported that firms that merged their IT with complementary human and business resources enjoyed higher levels of performance compared to firms that failed to do so. In another study, Bharadwaj (2000) compared a group of IT-leading firms (firms that used IT to develop certain intangible resources such as customer orientation, knowledge assets and synergy) to a matched control sample of firms with regards to several key profit and cost ratios, and she found that the IT leaders outperformed the control firms.

Since strategic flexibility, as noted above, represents a valuable, firm-specific and hard-to-copy organizational capability, firms using IS to support the development of strategic flexibility may generate competitive advantage and superior firm performance (Byrd, 2001). Information systems support for strategic flexibility and its performance impacts are examined next.

IS Support for Strategic Flexibility and Firm Performance

As noted previously, the development of strategic flexibility requires the support from other organizational resources and capabilities. A review of the manufacturing management and IS management literature linking IS to operational flexibility also indicates that IS are an indispensable factor in achieving strategic flexibility (Boynton, 1993; Sanchez, 1995; Upton, 1995; Lei *et al.*, 1996;

Byrd, 2001). Research on the flexibility impacts of advanced manufacturing technologies (AMT) shows that the computer-aided design (CAD) system, through its support for product design, engineering, simulation, testing and rapid prototyping, enables a firm to significantly reduce its costs of creating and evaluating different product designs and shorten product design cycles (Sanchez, 1995; Lei *et al.*, 1996; Hitt *et al.*, 1998). Moreover, flexible manufacturing systems (FMS) using the computer-aided manufacturing (CAM) technology can greatly increase the speed of introducing new tools and dyes as well as integrating previously separated workstations and machining centers into an interdependent manufacturing system (Clark, 1989; Lei *et al.*, 1996).

As a result of using IS-based AMT, firms can radically reduce the cost vs. variety and speed vs. variety trade-offs, thus achieving economies of scope—"the capacity to efficiently and quickly produce any of a range of parts or products within a family" (Zammuto and O'Connor, 1992: 702). In other words, firms can derive the simultaneous benefits of greater product variety, faster response and increased productivity from IS (Chase and Garvin, 1989; Pine, 1993; Hayes and Pisano, 1994; Goldhar and Lei, 1995). Economies of scale can also be gained from the IS-derived economies of scope in that the multi-product operations supported by CAD and CAM eliminate the risk of rendering the investment in a high-volume, single-product plant obsolete due to changes in market demand (Bakos and Treacy, 1986; Goldhar and Lei, 1995). Because of these operational benefits, IS-based operational flexibility has been found

instrumental to the development of mass customization (a widely recognized value-creating organizational competency), whereby firms customize products of high variety to customers' special needs at low costs (Pine *et al.*, 1993; Kotha, 1995; Byrd, 2001).

While research on IS support for strategic flexibility has mostly focused on the use of IS in manufacturing settings, there is emerging anecdotal evidence that service firms can also benefit from using IS to achieve strategic flexibility. Boynton *et al.* (1993) reported an IS (dubbed as the CS90) designed by Westpac (a South Pacific financial service conglomerate) to consolidate its knowledge and expertise about the processes of developing new financial products into a set of highly flexible software modules. By allowing Westpac to combine different sources of its knowledge rapidly and efficiently, the system enabled the company to handle a greater variety and range of customer and marketplace needs at low cost and fast speed. In a more recent study, Sawhney (2001) described how Thomson Financial (a subsidiary of Thomson Corporation, an electronic information provider) used IS to increase its market responsiveness and new product offering speed. Thomson Financial accomplished this through installing a software called "middleware," which allowed the company to represent legacy IS applications and products as "objects" (modular components) that can be easily combined and flexibly assembled to create tailored solutions for the customers.

Proposition 1: IS support for strategic flexibility is positively related to firm performance.

The Moderating Role of Environmental Dynamism

Environmental dynamism describes the rate and the unpredictability of changes in a firm's external environment (Dess and Beard, 1984). Recent IS research suggests a firm's ability to reap the benefits from its IS investments may be conditioned by the firm's external environment (Jones *et al.*, 1996; Li and Ye, 1999). In a recent study of IT impacts on firm performance in different (dynamic vs. stable) external environments, Li and Ye (1999) found IT investments exerted a stronger positive effect on corporate financial performance in a dynamic environment.

Environmental dynamism may affect the performance impacts of IS support of strategic flexibility in that the value of strategic flexibility to a firm may vary under different environmental conditions. Resource-based researchers in the strategic management literature have increasingly entertained the notion that the strategic value of a firm's resource or capability depends on specific market contexts (Miller and Shamsie, 1996; Eisenhardt and Martin, 2000; Priem and Butler, 2001). For example, in a historical study of the major U.S. film studios from 1936 to 1965, Miller and Shamsie (1996) found that certain property-based resources (e.g., exclusive long-term contracts with stars and theaters) improved financial performance in a predictable environment, but not in an uncertain environment. They also found that certain knowledge-based resources such as production and coordinative talent boosted financial performance only in a changing and unpredictable environment.

Research on strategic flexibility also suggests that strategic flexibility may not confer equal value to firms under different external conditions (Gerwin, 1993; Pine *et al.*, 1993; Upton, 1995). Firms facing rapid changes in technologies, markets, and competition need the capacity to respond quickly to changing competitive conditions and thereby survive and/or prosper in the new environment (Hitt *et al.*, 1998). Hence, firms are more likely to benefit more from the flexibility to produce a large variety of products at low costs in such an environment (Pine *et al.*, 1993). On the other hand, such flexibility is of lesser value to firms operating in stable markets because it is excessive or even unnecessary under those conditions (Hayes and Pisano, 1994). When flexibility is greater than what is required by the market conditions, it represents a waste (Gerwin, 1993) or a cost burden (Winter, 2003), and may even create a backlash from consumers who are confused by too many product choices (Pine *et al.*, 1993). Given higher value offered by strategic flexibility in a dynamic environment and potential high costs of using IS to achieve strategic flexibility (Upton, 1995; Aggarwal, 1997), it is reasonable to expect a stronger positive effect of IS support for strategic flexibility on firm performance in a dynamic environment.

Hypothesis 1: Environment dynamism positively moderates the relationship between IS support for strategic flexibility and firm performance.

METHODS

Sample and Data Collection

I collected the data for this study from two sources. I gathered the data

tapping the independent and moderating variables via a mail survey and obtained the data about the performance and control variables from the Research Insight (formerly known as Compustat) database. The target respondents of the mail survey were senior IS executives in leading (Fortune and Forbes) firms in the U.S. Most of the respondents held the positions of either vice president in IS or chief information officer (CIO). I chose senior IS executives as the single informants in this study because of their familiarity with both IS and strategic management issues. Previous studies have found increasing involvement of senior IS executives in strategic planning and control activities of firms (Applegate and Elam, 1992; Earl and Feeny, 1994). Applegate and Elam (1992), for example, found a growing number of CIOs reporting directly to the CEO, and nearly half of the CIOs in their survey were members of the senior management/strategic policy committee. Moreover, there is evidence that the information offered by key IS executives is consistent with the insights obtained from other senior management executives (Palmer and Markus, 2000). Accordingly, IS researchers have increasingly relied on senior IS executives as single informants in gathering data about strategic IS issues (Sethi and King, 1994; Palmer and Markus, 2000).

I obtained the contact information of the senior IS executives from the Directory of Top Computer Executives compiled by Applied Computer Research Inc. From this source, I identified a sample of 879 firms that had financial data in the Research Insight database. Before mailing the questionnaires, I pre-tested and refined the survey instrument for con-

tent validity and item clarity with CIOs from five Fortune companies headquartered in a mid-western state. One hundred and one questionnaires were undelivered or returned because the IS executives were no longer with the companies. Twenty-nine firms declined to participate in the survey in writing, on the phone, or through e-mail. To boost the response rate, I initiated two follow-up mailings and one reminder letter after the first mailing. Of the 778 firms that received the questionnaires, a total of 164 responses were received, out of which 11 responses were unusable. The effective response rate was thus 20 percent (153 responses). Although somewhat low, such a response rate is comparable to those reported in other studies using senior IS executives in large firms as target respondents (Mahmood and Soon, 1991; Sethi and King, 1994; Powell and Dent-Micallef, 1997).

To test for potential non-response bias, I first compared the respondent firms to the non-respondent firms with respect to sales, number of employees, sales to employees and return on sales (ROS). T-test results showed no significant differences between the two groups in these characteristics. Following Armstrong and Overton (1977), I conducted another non-response bias check by comparing early with late respondents. T-tests of the mean differences for each of the constructs used in the study failed to reveal any significant differences. Together, these checks suggest that non-response bias did not appear to be a significant problem in the data.

Measures

Independent Variable. In this study, IS support for strategic flexibility was

defined as the various types of support a firm's IS provided for the development of strategic flexibility. To measure this variable, I adopted three items from Mahmood and Soon (1991) and developed five items based on the ideas of Bakos and Treacy (1986), Goldhar and Lei (1995), and Sanchez (1995). For each of the eight items, the respondents were asked to indicate the extent to which their IS had provided a particular type of support during the previous three years on a five-point, Likert-type scale with anchors ranging from "Very great extent" (= 5) to "No extent" (= 1). To assess the construct validity and unidimensionality of the scale, I performed a principal components factor analysis with varimax rotation on the eight items. The factor analysis results shown in Table 1 revealed a single factor explaining about 51 percent of the total variance and thus supported the unidimensionality of the scale.

Moderating Variable. I adopted four items from Leuthesser and Kohli (1995) and Judge and Miller (1991) to measure environmental dynamism. For each item, the respondents were asked to indicate the frequency of changes in a particular area during the past year on a five-point, Likert scale with anchors ranging from "Very Frequent Change" (= 5) to "No Change" (= 1). As depicted in Table 2, a factor analysis of these four items revealed a single factor explaining about 63 percent of the total variance, confirming the unidimensionality of the scale.

Dependent Variables. I used profitability and labor productivity to assess the bottom-line impacts of IS support for strategic flexibility. To measure profitability, I chose a popular profit ratio, ROS, which has frequently

been used in previous studies of the strategic impacts of IS (Kettinger *et al.*, 1994; Brown *et al.*, 1995; Li and Ye, 1999). Labor productivity represents an intermediate measure of firm performance. In view of the potential time lag in gauging IS impacts on firm performance (Brynjolfsson, 1993), IS researchers have recommended the use of labor productivity to capture potential IS impacts (Barua *et al.*, 1995). Following convention, I operationalized labor productivity as sales to employees. To smooth annual fluctuations and average out short-term effects, I used a three-year average for ROS and sales to employees.

Control Variables. Since the firms participating in this study came from a variety of industries, it was necessary to control, to some degree, the different industry conditions under which the firms operated. To control for the industry effects, I first used SIC codes to classify the firms into four groups: 1) manufacturing, 2) transportation and public utilities, 3) wholesale and retail, and 4) service. Where a firm operated in more than one industry, I determined the firm's SIC code by identifying the industry where the firm received the largest percentage of sales and the corresponding SIC code. I then created three dummy variables (each with values of 0 or 1) for the second (transportation/public utilities), third (wholesale/retail) and fourth (service) groups of firms. For each dummy variable, I assigned a firm a value of 1 if it belonged to a group.

Besides industry conditions, I used three variables to control firm size and organizational slack, which measures a firm's ability to generate cash flow for reinvestment (Chakravarthy, 1986). Firm size and organizational

Table 1
Factor Analysis of IS Support for Strategic Flexibility

Item Description	Loadings
<i>To what extent have your company's IS provided each of the following support during the past three years?</i>	
1. Reduce the cost of tailoring products/services to market segments	.761
2. Reduce the cost of modifying or adding features to existing products/services	.755
3. Increase the flexibility of business processes	.568
4. Make product-line changeover easy	.747
5. Improve product/service adaptability	.758
6. Allow economies of scale from small production runs	.592
7. Reduce the cost of designing new products/services	.754
8. Shorten product design cycles	.733
Eigen Value	4.06
% of common variance explained	50.78
Cronbach Alpha	.86

slack need to be controlled due to their influence on a firm's financial performance as well as the firm's ability to invest in and develop IS (Kettinger *et al.*, 1994; Li and Ye, 1999). Following convention, I used the natural logarithm of the number of full-time employees to measure firm size. In keeping with Bourgeois (1981), I used two ratios (current assets to current liabilities and debt to equity) to control organizational slack. The former ratio measures available organizational slack, while the latter reflects potential organizational slack.

Analysis

To test the main effects and the moderating effects, I performed two sets of hierarchical regression analyses using ROS and sales to employees as the dependent variables. In the first step of each set of the analyses, I entered the six control variables as a set into the regression model. In the second step, I added the independent variable and the moderating variable to the equation. In the third step, I added the interaction term to the equation. Before creating the in-

Table 2
Factor Analysis of Environmental Dynamism

Item Description	Loadings
<i>Please indicate the frequency of changes in each of the following areas during the past year.</i>	
1. The product/service features desired by your customers	.903
2. The product/service features offered by your competitors	.886
3. The product/process technologies in your industry	.780
4. The price sensitivity of customers	.540
Eigen Value	2.50
% of common variance explained	62.49
Cronbach Alpha	.78

teraction term, I mean-centered both variables (by subtracting the means from the variables) to reduce potential multicollinearity between the interaction term and the independent variable or the moderating variable (Aiken and West, 1991).

RESULTS

Prior to the hierarchical regression analyses, I examined the zero-order correlations among all the variables included in the study. As shown in Table 3, there was no significant correlation between IS support for strategic flexibility and either ROS or sales to employees. It is worth noting that IS support for strategic flexibility was moderately correlated with environmental dynamism ($r = .38, p < .001$), indicating possible multicollinearity between the two variables.

In the first stage of the hierarchical regression analyses (Models 1 and 4 of Table 4), the second industry dummy was found significantly related to both ROS and sales to employees, but in opposite directions. More specifically, the wholesale and retail firms, on average, had higher sales to employees, but lower ROS than the other firms in the sample. Model 1 also shows that the third industry dummy had a significant positive association with ROS. In other words, the service firms, on average, outperformed other firms in the sample with regard to ROS.

Results from the second stage of the hierarchical regression analyses (Models 2 and 5) show that there was no significant association between IS support for strategic flexibility and either ROS or sales to employees, hence providing no support for Prop-

osition 1 which states that IS support for strategic flexibility is positively related to firm performance. Examination of the variance inflation factors (VIFs) associated with the regression coefficients of the independent and moderating variables show a range of 1.21 to 1.28, suggesting that the moderate correlation between the two variables noted above did not pose serious problems with multicollinearity.

Hypothesis 1 posits that environmental dynamism positively moderates the relationship between IS support for strategic flexibility and firm performance. Results from the third stage of the hierarchical regression analyses (Models 3 and 6) support this hypothesis. The interaction term between IS support for strategic flexibility and environmental dynamism was significant in predicting both ROS ($b = .17, p < .05$) and sales to employees ($b = .16, p < .05$) in the expected direction. To further probe the nature of these relationships, I plotted the significant interactions using one standard deviation above and below the means of the interacting variables (see Figure 1). Both plots indicate that IS support for strategic flexibility was positively related to ROS and sales to employees when environmental dynamism was high. The interaction plots, thus, provide further support for Hypothesis 1.

DISCUSSION

Overview and Research Implications of Findings

The purpose of the current study was to investigate the relationship between IS support for strategic flexibility and firm performance as well as the moderating effects of environmental dynamism on that relation-

ship. The results reveal that IS support for strategic flexibility had no main effect on either profitability or labor productivity, but interacted with environmental dynamism in predicting both performance measures. Taken together, these findings indicate that IS support for strategic flexibility was positively associated with firm performance only when there was a high degree of environmental changes and uncertainty. While consistent with the normative literature that links IS to strategic flexibility and competitive advantage (Sanchez, 1995; Hitt *et al.*, 1998; Byrd, 2001), the findings suggests that there is an external context in which firms can expect IS support for strategic flexibility to generate positive returns. Absent such a context, IS support for strategic flexibility has no effect on firm performance.

By highlighting the role of environmental dynamism in linking IS support for strategic flexibility to firm performance, the results from this study make two contributions to the literature on the performance impacts of IS. First, they add to a growing body of evidence which indicates that the external environment of a firm may affect the bottom-line impacts of its IS investments (Jones *et al.*, 1996; Li and Ye, 1999). The influence of the external context on the performance impacts of IS provides an alternative explanation for the "productivity paradox" regarding the strategic impacts of IS (Brynjolfsson, 1993). That is, certain IS investments and applications make less contribution to a firm's financial performance because they are less suitable for the external environment faced by the firm. Hence, future studies assessing the performance impacts of IS may need to incorporate or control the

Table 3
Means, Standard Deviations and Correlation Coefficients^a

Variable	Mean	s. d.	1	2	3	4	5	6	7	8	9
1. Return on sales	.05	.06									
2. Sales to employees	348	384	-.07								
3. Industry dummy 1	.08	.28	.01	-.11							
4. Industry dummy 2	.16	.37	-.27	.20	-.14						
5. Industry dummy 3	.26	.44	.43	-.02	-.18	-.26					
6. Firm size (log of employees)	2.61	1.31	-.09	-.30	.10	.22	-.27				
7. Current assets to current liabilities	1.89	3.02	.01	.11	-.09	-.04	.22	-.24			
8. Debt to equity	1.47	5.30	.01	.23	.04	.06	.02	-.04	-.05		
9. IS support for strategic flexibility	2.98	.78	.10	.06	-.05	-.08	.01	.06	-.06	.11	
10. Environmental dynamism	3.59	.78	.07	.07	.02	.01	.23	.03	.05	.09	.38

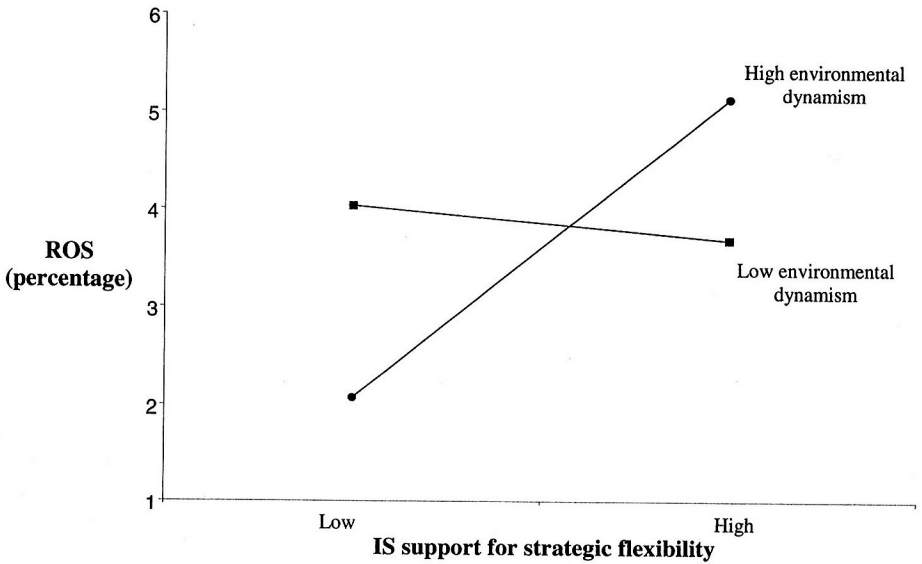
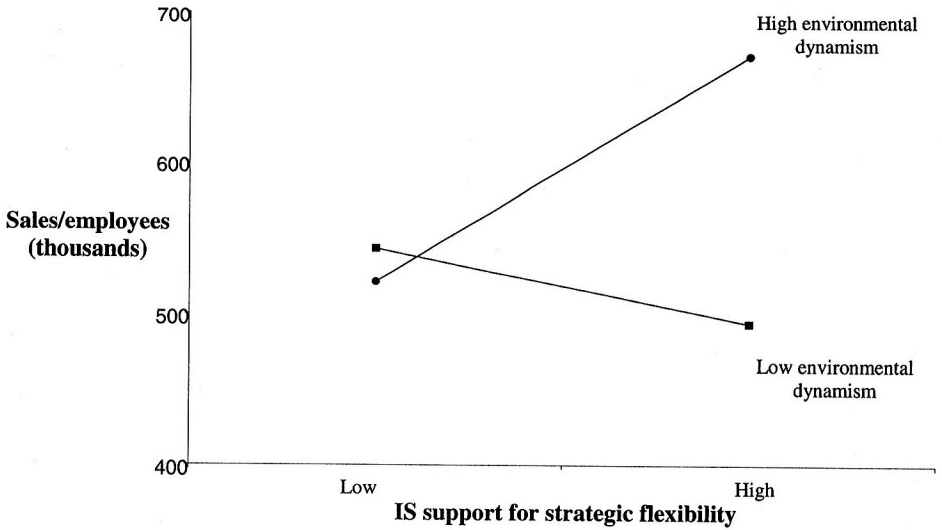
^a N = 153. Correlations greater than or equal to .14 are significant at the .10 level; $r \geq .16$ are significant at the .05 level; $r \geq .21$ are significant at the .01 level; $r \geq .26$ are significant at the .001 level; all two-tail tests.

Table 4
Regression Results^a

Variables	ROS			Sales/Employees		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Industry dummy 1	.06	.07	.05	-.06	-.06	-.08
Industry dummy 2	-.16*	-.14+	-.15+	.23**	.23**	.23**
Industry dummy 3	.42***	.44***	.43***	-.08	-.10	-.11
Firm size (log of employees)	.03	.03	.03	-.34***	-.35***	-.35***
Current assets to current liabilities	-.08	-.08	-.08	.06	.06	.07
Debt to equity	-.01	-.01	-.04	.21**	.20**	.17*
IS support for strategic flexibility		.10	.11		.06	.07
Environmental dynamism		-.07	-.02		.06	.10
IS support for strategic flexibility X environmental dynamism			.17*			.16*
R ²	.22	.23	.26	.21	.22	.25
ΔR ²		.01	.03		.01	.03
F	6.81***	5.31***	5.38***	6.55***	5.10***	5.11***
ΔF		.85	4.80*		.82	4.28*

^a N = 153. Standardized regression coefficients are shown.
*p < .10, **p < .05, ***p < .001

Figure I
Moderating Effects



external conditions that may affect the effectiveness of IS investments.

Second, while the existing resource-based research on the strate-

gic role of IS has shown that the ability of IS to support or enable certain rent-yielding and idiosyncratic resources and capabilities can generate

competitive advantage (Clemons and Row, 1991; Bharadwaj, 2000; Byrd, 2001), little attention has been paid to the conditions under which such IS ability is more likely to lead to superior firm performance. Discerning such conditions is important because resource-based researchers have increasingly argued that the value of a resource or capability varies in different contexts (Miller and Shamsie, 1996; Eisenhardt and Martin, 2000; Priem and Butler, 2001). By identifying an external context in which the ability of IS to support strategic flexibility confers most value to firms, this study supports the contingency view of the strategic value of IS within the resource-based perspective. Future resource-based research on IS could then benefit from delineating different external and internal contexts that may influence the performance impacts of IS ability to support or enable distinctive organizational capabilities.

Managerial Implications

Firms these days are investing heavily in building and using IS to increase their strategic flexibility (Upton, 1995). However, such IS investments do not necessarily improve a firm's bottom-line performance. Although strategic flexibility is a potential source of sustainable competitive advantage, this study demonstrates that using IS to realize strategic flexibility may produce economic returns only under certain circumstances. Since strategic flexibility is more critical and thus more valuable to a firm facing rapid and unpredictable changes in its external environments, the firm is in a better position to reap economic benefits (gains in profitability and labor pro-

ductivity) from using IS to increase strategic flexibility in such an environment. On the other hand, firms operating in a stable and predictable environment are less likely to derive performance gains from such IS deployment. Accordingly, in contemplating their IS investment decisions, a firm and its managers need to pay close attention to the external environment in which the firm operates. In particular, they need to assess the rate and unpredictability of changes in the firm's external environment and should only invest in IS support for strategic flexibility when the firm faces a dynamic external environment.

Limitations of the Study

The findings from this research need to be interpreted within its limitations. The first limitation of the study arises from the use of perceptual data collected from single informants in measuring the independent and moderating variables. Data collected in such a manner may be subject to the respondents' cognitive biases and distortions. One possible bias is that some responding IS executives might have given some credit to their IS for increased strategic flexibility even if the IS had actually contributed little to the improvement of strategic flexibility. If this is the case, some respondents might have overstated the positive impacts of IS. A related perceptual distortion is that some respondents might have equated IS support for strategic flexibility with strategic flexibility itself when filling out the survey. Therefore, an IS executive working for a highly flexible firm might have erroneously inferred that his or her firm's IS support for strategic flexibility

must be high, without realizing that high flexibility is often the result of efforts from multiple functional areas. Although the use of objective measures in this study has reduced similar biases and inaccuracies in collecting the data for the performance and control variables, employing more objective evaluations of IS support for strategic flexibility can lead to a more accurate assessment of such IS support and its impacts on firm performance.

The second limitation lies in the possibility that other variables that covary positively with IS support for strategic flexibility and also influence firm performance may explain away some of the positive effects of the IS support found in the study. Some potential determinants of firm performance that are also positive correlates of IS support of strategic flexibility include strategic orientation (Li and Ye, 1999), modular product design (Sanchez, 1995), R & D stock (Hitt and Brynjolfsson, 1996), technological infrastructure (Kettinger *et al.*, 1994), and human resource management (Youndt *et al.*, 1996). For example, a product innovation strategy which has been found as a determinant of firm performance in a turbulent environment (Li and Atuahene-Gima, 2001) is likely to benefit from IS support for strategic flexibility as conceptualized and operationalized here. The exclusion of this variable might have resulted in overestimating the contribution of IS support for strategic flexibility (Berry and Feldman, 1985). Additional research that includes other organizational and technological attributes related to both IS support for strategic flexibility and firm performance is needed to provide a more accurate

assessment of the performance impacts of such IS support.

The third limitation of the study is the response rate (20 percent) for the survey used in this research. While comparable to those of similar studies (Mahmood and Soon, 1991; Sethi and King, 1994; Powell and Dent-Micallef, 1997), this response rate was still relatively low. Obtaining high response rates for sensitive information concerning the strategic use of IS continues to be a challenge for IS researchers. Another limitation worthy of note concerns the time frame (one year) used for measuring environmental dynamism. Following Leuthesser and Kohli (1995), I chose to focus on and hence measure the current state of environmental dynamism (i.e., how often the external environment had changed within a one-year period prior to the study). The outcomes of the study could have been different if the respondents had been asked to assess environmental dynamism facing their firms during a longer period of time (e.g., in the past two to three years before the study).

SUMMARY AND CONCLUSIONS

In this study, I drew on the resource-based view of competitive advantage to examine the potential performance impacts of IS support for strategic flexibility and an external context in which the IS impacts might take place. Using both survey and archival data, I found that firms improved profitability and labor productivity from using IS to increase strategic flexibility only when they faced a high degree of environmental change and uncertainty. These findings caution us against the unconditional pursuit of IS support for stra-

tegic flexibility and call for a close alignment between the level of the IS support and the rate and unpredictability of changes in a firm's external environment. By highlighting the role of environmental dynamism in linking IS support to firm perform-

ance, this study not only helps explain the productivity paradox about the strategic impacts of IS, but also provides empirical support for the contingency view of the strategic value of IS resources within the resource-based framework.

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and firm performance is dependent on the flexibility in capital investments decisions.

IS Support for Strategic Flexibility, Environmental Dynamism, and Firm Performance.....

84

Michael J. Zhang

Increasingly, strategic flexibility has been viewed as a critical organizational competency that enables firms to achieve and maintain competitive advantage and superior performance. In this study, the relationship between IS support for strategic flexibility and the bottom-line performance of firms is investigated, as well as the moderating effects of environmental dynamism on that relationship. Using both survey and archival data, IS support for strategic flexibility was positively associated with profitability and labor productivity only when there was a high degree of environmental changes and uncertainty.

Organizational Transformation and Performance: An Examination of Three Perspectives

104

J. Daniel Wischnewsky and Fariborz Damanpour

Organizational transformation—defined as concurrent major changes in key organizational parameters, including strategy, structure, and the distribution of power—has sparked considerable interest among researchers and practitioners. However, the performance consequences of organizational transformation have barely been examined. Different conceptual streams present differing perspectives on the consequences of transformational change. We first review relevant arguments stemming from three theoretical perspectives—rational, population ecology, and institutional. Then, using 20 years of data from a sample of bank-holding companies in the United States, we examine the extent to which these perspectives explain the organizational transformation-performance relationship. The results of our study suggest that organizational transformation neither has a positive nor a negative impact on firms' financial performance. We discuss the research and managerial implications of our findings.