

12-31-1995

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LEARNING FROM EXPERIENCE: MANAGERIAL INTERPRETATIONS OF PAST AND FUTURE INFORMATION TECHNOLOGIES

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Abstract

This paper reports the results of an empirical study that examines how managers' experiences with a specific strategic information technology in their industry influences cognitive managerial tasks associated with new information technologies. Specifically, we sought to assess the relationships of positive and negative experiences with managers' framing of new information technologies as threats or opportunities for their firms, and with their perceived uncertainty about how to respond to new information technologies. We undertook this study in the tax preparation and filing industry and examined how managerial perceptions of new information technologies were shaped by managers' previous experiences with electronic filing technology for tax returns.

1. INTRODUCTION

Information and information technologies have long been considered critical for effective management (Ackoff 1967; Huber 1990; King 1978). Traditionally, information systems were used to provide support for individual decision-making or automation of routine information processing tasks within an organization. Beginning in the 1980s, information technology was increasingly applied for strategic purposes, transforming the organization of work within the firm. This has led to major new investments in information technology as firms seek competitive advantage, or respond to competitor or customer based technology initiatives out of competitive necessity. Today IT investments are estimated to be 50% of all new capital investments made annually by major U.S. corporations (Kriebel 1989).

As investments in information technologies become more important to the firm, it is critical to understand how managers interpret the potential of new information technologies for use in their organizations and industries. Does prior experience with strategic information systems condition managerial interpretations, choices and actions with regard to new information technologies? If so, in what direction, and what are the consequences of any specific modes of interpretation? The

answers to these questions are important to managers as they would illuminate decision making about information technology investments in organizations.

Research on information technology adoption has generally neglected how prior managerial experiences with technology shape expectations and intentions to adopt. However, more recent research by Pennings and Harianto (1992) suggests that prior experience with information technology is a critical factor in the adoption of new and related technologies. Their explanation for this observation is that prior investments in technology build expertise within the firm to cope with and absorb new technologies into the firm. This view is consistent with an evolutionary learning perspective (Nelson and Winter 1982) which views firm adoption of new technology as conditioned by prior knowledge and routines developed through experience in the firm. While these studies consider previous experience with strategic information technologies as an important construct, they focus on the accumulation of expertise. Thus prior studies do not consider how positive or negative experiences with technology condition the interpretation and framing of future investments in new technologies. This is important as biases in managerial interpretations of new technologies can potentially lead to missed business opportunities

(strategic oversight) or to over-optimistic investments in information technology with little subsequent pay-off (technological oversight) (Garud, Nayar and Shapira 1994).

Building on prior research efforts on managerial cognition and learning, this study asks the question: How do managers' experiences with one specific information technology impact their interpretations of new information technology applications and systems in their industry? In particular, we were interested in the latter two stages of Daft and Weick's (1984) scanning-interpretation-learning model — viz., giving meaning to data, and taking action — that are critical in responding to issues arising from the business environment.

This paper is organized into seven sections. In addition to the current section, section 2 provides the background of the industry and context for the study. Section 3 provides an overview of prior research, critical constructs and frames the hypotheses tested in this study. Section 4 provides details about the study method and section 5 provides the results. Sections 6 and 7 discuss the key findings and present the conclusions of this study.

2. BACKGROUND

We examined our research question by studying the experiences of managers with electronic filing of tax returns in the tax return preparation and filing industry. The tax preparation and filing industry was uniquely suited to this study as it is characterized by clear and distinct information technology innovations and applications. The specific past information technology we studied was electronic filing of tax returns.

Electronic filing of tax returns was first tested in 1986, and introduced nationwide by the Internal Revenue Service in 1990. Electronic filing allowed return preparers or return filers authorized by the IRS to electronically transmit an individual's return to the IRS using a pre-authorized electronic transmission protocol. The filer can obtain confirmation of receipt and arrange for direct deposit of any refund. As noted by Venkatraman and Kambil (1991) and Kambil and Short (1994), electronic filing has had a major strategic impact on structure, market participants, products, and market scope of firms in the tax preparation industry. Annually the U.S. professional tax return preparation and filing services serve over 40 million taxpayers. By 1994, 12 million users out of 100 million individual filers chose electronic filing. Many purchase services related to electronic filing such as refund anticipation loans.

Electronic filing encouraged many tax preparers to adopt the use of computers in the front office and apply the technology for other related purposes. Previously, there was limited use of computers in the industry due to the seasonal nature of the business which did not justify high fixed costs and the limited availability of personal computer hardware and tax software. In the 1990s, the cost of computing has dropped substantially to encourage new

strategic uses of information technologies. The Internal Revenue Service was testing telephone filing of tax returns. Some firms were using on-line networks to communicate with customers, advanced personal computer-based income tax return preparation and planning software, and imaging technologies to capture, store and archive customer information.

Our study sought to understand how managers in the tax preparation industry framed these new information technology applications, given their prior experience with electronic filing. Examining this question is especially important given the plans of the Internal Revenue Service and various industry participants to implement new information technology based services.

3. RESEARCH OVERVIEW AND HYPOTHESES

The strategic issue interpretation paradigm in organizational theory offers a useful framework for understanding the relationships between tax preparers' or filers' experiences with electronic filing technology and their cognitive managerial tasks associated with responding to new information technologies in the industry (e.g., Ansoff 1980; Dutton and Duncan 1987; Dutton and Jackson 1987; Ginsberg and Venkatraman 1992; Johnson 1983; Milliken 1990). Strategic issues have been defined as "forthcoming development(s), either inside or outside an organization, which [are] likely to have an important impact on the ability of the enterprise to meet its objectives" (Ansoff 1980, p. 133). Using research on strategic issue interpretation, we sought to assess the relationship of both positive and negative experiences with the framing of new information technologies as threats or opportunities (Dutton and Jackson 1987), and with the uncertainty associated with responding to new information technologies (Milliken 1987, 1990). This section overviews each of these outcomes in turn and proposes hypotheses about how they may be predicted by past experiences with electronic filing technology. Our research model is illustrated in Figure 1.

3.1 Issue Framing

A basic premise of the strategic issue interpretation perspective in organizational theory is that when members perceive a stimulus from their environment, they engage in making sense of (interpreting) it. Interpretation or framing of stimuli is guided by schemata (Fiske and Taylor 1991; Gioia 1986; Taylor and Crocker 1981). Thus, one can assume that when individuals interpret and frame new information technologies, they employ schemata. Schemata are the product of past individual and social experiences (Taylor and Crocker 1981). Schemata function as filters for information in that they are used in processing information from the environment. In particular, once schemata are established, individuals give more weight to information that is consistent, and resist information that is inconsistent, with their schemata (Markus 1977).

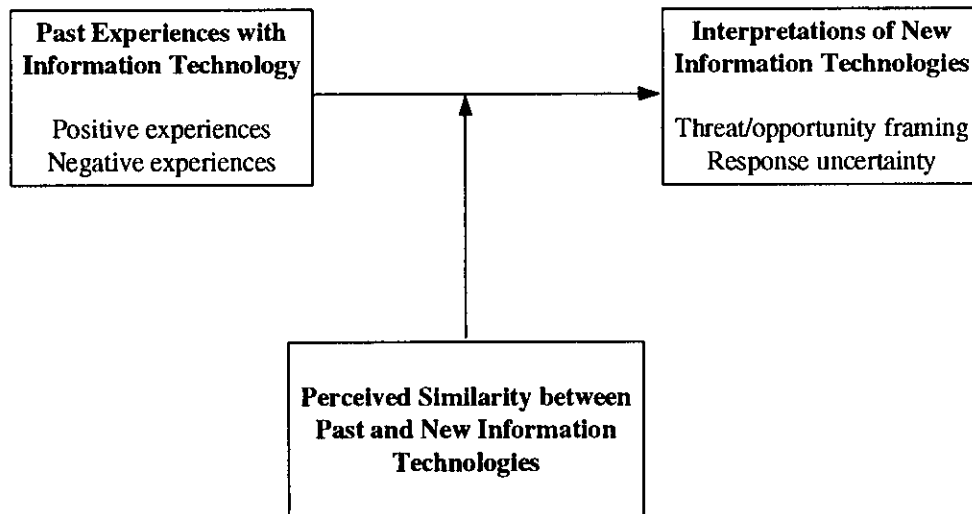


Figure 1. Research Model

Of the various schemata that are available to managers, two schemata have received much attention in previous research. These schemata used routinely by managers, are “opportunity” and “threat” (Dutton and Jackson 1987; Jackson and Dutton 1988). Analyses of threat and opportunities from issues in their environments have featured prominently in most strategic management frameworks (e.g., Ansoff 1980).

Theories of managerial learning argue that past experiences affect subsequent strategic decision making (Milliken and Lant 1991; Lant, Milliken and Batra 1992). These arguments are consistent with discussions in social psychology about how individuals’ past experiences affect their development of schemata (Taylor and Crocker 1981). In terms of strategic issue interpretation, we could argue that negative past experiences with an issue may lead managers to develop schema associated with “threat,” and positive past experiences may lead them to develop schema associated with “opportunity,” from the issue. Thus, when managers interpret new information on the issue, they will tend to apply these schemata in making sense of the new information. Therefore, in our current case, we would expect that managers who reported negative experiences with electronic filing would interpret new information technologies as threats and those that reported positive experiences would interpret new information technologies as opportunities.

It must be noted, however, that the extent to which managers use their past experiences to interpret new information technologies should depend on the extent to which they felt that the past technology was similar to the new information technologies. That is because individuals are susceptible to what Kiesler and Sproull

(1982, p. 554) referred to as “reasoning by analogy and similarity.” In addition, individuals tend to generalize about a category or population of elements from their knowledge about few elements from that population (Tversky and Kahneman 1971). Applying these arguments to our analysis, we expected that perceived similarity between past and new information technologies would moderate the relationship between past experiences and framing of new information technologies. Thus, we propose the following hypothesis.

Hypothesis 1: Managers who indicate greater positive experiences and fewer negative experiences with electronic filing technology will tend to frame new information technologies as opportunities. This effect will be stronger for managers who judge electronic filing technology as similar to new information technologies.

Jackson and Dutton note that

Threat is distinct from opportunity in that threat has a negative connotation, and is associated with lack of control and the expectation of loss. Opportunity, on the other hand, has a positive connotation, and it is associated with a feeling of control and the expectation of gain. [1988, p. 384]

Discerning threats from opportunities is important because it has consequences for firm level actions and outcomes (Nutt 1984; Staw, Sanderlands and Dutton 1981). Further, opportunity and threat framings follow different cognitive rules; managers tend

to be more sensitive to threat-consistent information than to opportunity consistent information (Jackson and Dutton 1988).

To allow for this possibility that threat and opportunity may be in fact two different dimensions and not two ends of the same continuum, we developed separate hypotheses for threat and opportunity. Consistent with specific elements of opportunity and threat framing identified by Jackson and Dutton, under opportunity framing we focused on expectations of financial gains, and under threat framing we focused on expectation of increased financial costs.

Hypothesis 1a: Managers who indicate greater positive experiences and fewer negative experiences with electronic filing technology will indicate greater expectation of profit increases from new information technologies. This effect will be stronger for managers who judge electronic filing technology as similar to new information technologies.

Hypothesis 1b: Managers who indicate greater positive experiences and fewer negative experiences with electronic filing technology will tend to indicate lower expectations of cost increases from new information technologies. This effect will be stronger for managers who judge electronic filing technology as similar to new information technologies.

3.2 Response Uncertainty

In addition to framing a strategic issue, managers must determine strategies for responding to the issue. A key managerial problem in developing response strategies is dealing with uncertainty (Aguilar 1967; Daft and Weick 1984; Duncan 1972; Dutton and Duncan 1987). Uncertainty typically arises from the unpredictability of an organization's environment (Clark, Vardarajan, and Pride 1994). Milliken (1990, p. 45) used the term *response uncertainty* to label managers' uncertainty about

how to respond to some environmental change, because he or she is either not sure what the response options are or is unsure about the likely effectiveness of each possible strategy for achieving desired organizational outcomes.

As managers accumulate positive prior experiences with information technologies, thereby learning to effectively deploy them, their response uncertainty should decrease. Similarly accumulations of negative experience indicate inadequate prior strategies, thereby increasing response uncertainty due to a lack of prior guidelines for successful information technology investments.

Response uncertainty is greater when dealing with novel issues than with issues that are familiar (Martins and Milliken 1994). Thus, we expected that the relationship between past experiences with electronic filing and response uncertainty would be stronger for those managers who indicated that they perceived electronic filing technology as similar to new information technologies.

Hypothesis 2: Managers who indicate greater positive experiences and fewer negative experiences with electronic filing technology will tend to display lower response uncertainty about new information technologies. This effect will be stronger for managers who judge electronic filing technology as similar to new information technologies.

4. METHOD

4.1 Sample

In August of 1994, we mailed surveys to a random sample of the senior-most managers of 500 tax preparation and filing companies throughout the United States. We selected the sample from an Internal Revenue Service (IRS) database of tax preparation and filing companies that had filed with the IRS for approval to provide electronic filing services. In a cover letter accompanying the questionnaire, we explained the purpose of the study and promised the respondents confidentiality of all responses. Participants were offered a copy of the results of the study in return for responding. We received 103 usable responses for a response rate of 24 percent after subtracting surveys returned by the post office as undeliverable. The average size of the respondents' companies was four employees. On average, the respondents' companies filed 27.67% of income tax returns using electronic filing technology.

4.2 Measures of Independent Variables

Experiences with electronic filing technology. Since we could not find an existing measure for experiences with information technologies, we developed our own. The measure was distributed to "competent judges" to test its content validity (Kerlinger 1986, p. 418) and was revised based on their suggestions. Subjects were asked to what extent they agreed with eighteen statements about their experiences with the use of electronic filing technology for income tax return filing. Respondents used a seven-point scale to indicate their responses [1 = strongly agree, 7 = strongly disagree]. In formulating the eighteen questions about experiences with electronic filing technology, we expected that they would fall into two categories: positive and negative experiences. However, factor analysis of the items indicated that the items loaded onto six factors, three of them capturing positive experiences of varying kinds and the other three capturing varying negative experiences.

Thus, we constructed six variables for experiences with electronic filing technology: **Work Improvement** includes items that measure the perceived improvement in efficiency and quality of the service provided by the company ($\alpha = .86$); **Cash Improvement** is made up of items measuring the perceived improvements in the company's revenues, profit margins, market share, and ability to diversify ($\alpha = .81$); **Cost Reduction** includes items for perceived reductions in wages for tax preparation staff and reductions in time expenditures on tax return preparation and filing ($\alpha = .60$); **Cost Increases** included items measuring perceived increases in average cost of return preparation and filing ($\alpha = .54$); **Employee Increase** measured the perceived increase in the number of employees needed for tax return preparation and filing following the introduction of electronic filing technology (single item); **Retraining** indicated the perceived need for substantial retraining of employees following the introduction of electronic filing of income tax returns (single item).

Similarity judgments. Using two items, subjects were asked to indicate the extent to which they perceived electronic filing technology as similar to, and compatible with, five new advanced information technologies that are likely to affect the industry in the near future: telephone-based filing of income tax returns, electronic mail-based filing of income tax returns, on-line networks, personal computer-based income tax return preparation and filing technology, and imaging technologies to capture, store and archive information ($\alpha = .84$). Our interviews with top level executives in the Internal Revenue Service and others in financial services and tax preparation industries suggested these five technologies as likely to have major impacts on the tax return preparation and filing industry. Respondents used 7-point scales to mark their similarity judgments (1 = extremely dissimilar, 7 = extremely similar).

4.3 Measures of Dependent Variables

Issue framing. We used three variables to measure framing of new information technologies. The first variable, **Opportunity Framing**, was the average of five items: the extent of expected positive or negative impacts of new advanced information technologies (1 = extremely negative impacts, 7 = extremely positive impacts), perceived competitive benefits from adoption (1 = strongly disagree, 7 = strongly agree), perceived competitive disadvantage from non-adoption (1 = strongly disagree, 7 = strongly agree), perceived threat from the introduction of new advanced information technologies (1 = strongly disagree, 7 = strongly agree; reverse coded), and perceived opportunity from the introduction of new advanced information technologies (1 = strongly disagree, 7 = strongly agree) (the coefficient alpha for this scale was .77). In constructing this measure, we followed procedures to ensure its content validity (Kerlinger 1986).

The other two variables measuring framing were single-item measures. **Profit Increase** measures on a 7-point scale the extent to which the respondent agreed that new information technologies would increase company profits, and **Increased Costs** measures the extent to which the respondent agreed that they would lead to increased costs for the company.

Response uncertainty. To measure response uncertainty, we used a modified version of Milliken's (1990) measurement instrument. Response uncertainty was the average of responses on three questions asking about (1) the perceived difficulty in weighing various alternatives in responding to the introduction of new advanced information technologies, (2) the respondent's confidence in their awareness of how to respond if these new technologies became important, and (3) needing to guess for lack of indications about what to do (reverse coded). Responses to all three questions were on a 7-point scale: 1 = strongly agree, 7 = strongly disagree ($\alpha = .67$).

4.4 Control Variables

Company size. To control for any biases arising due to variation in the size of respondents' companies, we controlled for company size in our analysis, using the number of employees as an indicator of size.

Use of electronic filing technology. Since the extent of use of electronic filing technology has the potential to bias responses about experiences with using the technology, we controlled for it using the percentage of returns filed electronically by the company.

4.5 Analysis

The hypothesized relationships were tested using hierarchical regression analysis. To test the moderated relationships proposed, we computed interaction terms for interactions between the experiences variables and similarity judgments.

5. RESULTS

Table 1 presents the correlations for the variables used in the analysis.

Table 2 presents the results of hierarchical regressions for the issue framing (2a, 2b and 2c) and issue-related uncertainty (2d) variables respectively. Four different regression models were specified. Model 1 only includes the control variables as independent variables. Model 2 includes the control variables and the variables measuring experiences with electronic filing. In Model 3, the variable measuring perceived similarity between prior and future technologies is added to the variables in Model 2. Model 4 includes interaction terms to test the moderated effects proposed.

Table 1. Correlations

	1	2	3	4	5	6	7	8	9	10	11	12
1. % returns filed electronically												
2. Number of Personnel	-.05											
3. Cost increases	-.21	-.19										
4. Work Improvements	.38	-.14	.00									
5. Cost Reductions	.21	-.11	.12	.47								
6. Cash Improvements	.35	-.21	-.12	.63	.32							
7. Employee increases	.17	-.07	.20	.22	.20	.07						
8. Increased Retraining	.00	-.06	.30	.15	.15	-.14	.32					
9. Similarity to e-filing	.14	-.10	.04	.30	.01	.31	.00	.00				
10. Opportunity Framing	.07	-.02	-.08	.36	.11	.57	.03	-.15	.33			
11. Response Uncertainty	.02	-.01	-.01	-.17	-.04	-.28	.33	.25	-.10	-.34		
12. Expectations of Cost Increases	-.20	-.21	.18	-.11	-.23	-.18	.07	.20	.01	-.08	.18	
13. Expectations of Profit Increases	.08	-.10	-.25	.28	.10	.38	.10	.04	.33	.36	-.11	.01

Correlations above 0.197 are significant at the 0.5 level.

Hypothesis 1 stated that managers who indicated greater positive experiences and fewer negative experiences with electronic filing technology would tend to frame new information technologies as opportunities. The hypothesis was supported (2a - Model 2; $\Delta R^2 = .30$, $p < .001$). Of the experience variables, cash improvement was the only significant predictor. Managers whose companies had experienced improvements in their revenues, market share, profit margin, or ability to diversify following the introduction of electronic filing technology tended to frame new information technologies as opportunities. Support was not found for the prediction that the perceived similarity of new information technologies to electronic filing would moderate the relationship between past experiences and framing of new information technologies as opportunities. The interaction terms did not add to explained variance in the dependent variables (2a - Model 4). Thus, Hypothesis 1 was partially supported.

Partial support was also found for Hypothesis 1a (2b - Model 2; $\Delta R^2 = .24$, $p < .001$), which predicted that managers indicating greater positive past experiences and fewer negative past experiences with electronic filing would expect greater profit increases from new information technologies. In this equation, cash improvement and experienced cost increases (negatively related) emerged as significant predictors. Support was not found

for the prediction that perceptions of similarity between electronic filing and new information technologies would moderate the relationship between past experiences and expectations of profit increases from new information technologies (2b - Model 4).

Hypothesis 1b, which predicted lower expected cost increases from new information technologies for managers whose companies experience greater positive and fewer negative past experiences, was fully supported (2c - Model 2; $\Delta R^2 = .19$, $p < .01$). Experienced cost reduction (i.e., the cost reduction experienced by managers from implementing electronic filing) was the only significant predictor in this equation and was negatively related to expected cost increases from future information technologies. The predictions about the moderating role of perceptions of similarity of electronic filing to new information technologies were also supported (2c - Model 4; $\Delta R^2 = .17$, $p < .01$). The interaction terms of similarity judgments with experienced need for retraining staff and with experienced reduction in costs (negatively related) were the strongest predictors. These results suggest that those managers whose companies had negative financial experiences with one advanced information technology tended to frame new information technologies as sources of increased costs for the company, provided they perceived the technologies as similar.

Table 2. Results of Hierarchical Regressions

2a) Opportunity Framing

	MODEL 1	MODEL 2	MODEL 3	MODEL 4
% returns filed electronically	.15	-.09	-.11	-.08
Number of Personnel	-.18*	-.02	-.02	-.03
Work Improvements		.10	.05	-.20
Cash Improvements		.58****	.54****	.11
Cost Reductions		-.13	-.09	.07
Cost Increases		.04	.02	-.05
Employee Increases		.08	.08	.55
Increased Retraining		-.08	-.09	-.19
Similarity to e-filing			.23**	-.21
Work Improvements X Similarity				.42
Cash Improvements X Similarity				-.24
Cost Reductions X Similarity				.65
Cost Increases X Similarity				.12
Employee Increases X Similarity				-.54
Increased Retraining X Similarity				.11
ADJ R SQUARE	.03	.29	.33	.30
F	2.49*	5.23****	5.55****	3.40****
ΔR SQUARE		.30****	.04**	.03

*p < .01; **p < 0.05; ***p < 0.01; ****p < 0.001

Overall, we found strong support for the hypotheses relating past experiences to issue framing. Positive experiences with one information technology were positively related, and negative experiences negatively related, to framing of new information technologies as opportunities. The interaction effects predicted were supported only for expectations of cost increases from similar new information technologies. The latter result suggests risk aversion, which prior research (Kahneman and Tversky 1979) has found is more valued by individuals over gain.

Hypothesis 2 predicted that managers who had greater positive experiences and fewer negative experiences with electronic filing technology would perceive lower response uncertainty about new information technologies. This hypothesis was supported (2d - Model 2; $\Delta R^2 = .23$, $p < .01$). Three experience variables —

Employee Increase, Retraining, and Cash Improvement (negatively related) — had significant betas. These results suggest that positive experiences were associated with lower response uncertainty, and negative prior experiences were positively related to response uncertainty. The second part of Hypothesis 2 modified the argument by proposing that the relationship between experiences with electronic filing technology and response uncertainty about new information technologies will be stronger for managers who judge electronic filing technology as similar to new information technologies. Strong support was found for this hypothesis (2d - Model 4; $\Delta R^2 = .17$, $p < .01$). Interactions of perceived similarity with experienced increases in employees needed as well as with experienced increases in costs (negatively related) were significant predictors.

Table 2. Results of Hierarchical Regressions (continued)**2b) Expected Profit Increases**

	MODEL 1	MODEL 2	MODEL 3	MODEL 4
% returns filed electronically	.12	-.17	-.20*	-.15
Number of Personnel	-.02	.05	.05	.04
Work Improvements		.27	.11	-.41
Cash Improvements		.34***	.29**	-.32
Cost Reductions		-.07	-.02	.34
Cost Increases		-.33***	-.35****	.34
Employee Increases		.17	.17	.21
Increased Retraining		.06	.04	.69
Similarity to e-filing			.28***	.19
Work Improvements X Similarity				.77
Cash Improvements X Similarity				-.43
Cost Reductions X Similarity				.98
Cost Increases X Similarity				-.83
Employee Increases X Similarity				-.08
Increased Retraining X Similarity				-.70
ADJ R SQUARE	-.01	.18	.24	.28
F	.62	3.29***	3.98****	3.20****
ΔR SQUARE		.24****	.07***	.09

*p < .01; **p < 0.05; ***p < 0.01; ****p < 0.001

6. DISCUSSION

This paper examined the effects of managers' prior experiences with one information technology on their framing of new information technologies and their uncertainties about responding to the new information technologies. We predicted that managers' prior experiences will condition their opportunity framing and response uncertainties. All our hypotheses received some support. We found that both positive and negative past experiences were significant predictors of opportunity framing of, and response uncertainty about, new information technologies.

In particular, financial gains from one information technology were associated with managers' framing new information

technologies as opportunities, and to their reporting greater expected profits from the new technologies. Experiences of cost increases from adopting a previous information technology were negatively related to manager's expectations of profit increases from new information technologies. For both opportunity framing and the expectations of a profit increase from new information technologies, the interaction effects with perceived similarity of past and new information technologies were not supported. The interaction effects were supported, however, for expectations of cost increases from new information technologies; this suggests that managers tend to display a "once bitten, twice shy" attitude toward new information technologies that they perceive as similar to ones that have resulted in increased costs for their companies. Our study contributes to the literature on technology adoption

Table 2. Results of Hierarchical Regressions (continued)**2c) Expected Cost Increases**

	MODEL 1	MODEL 2	MODEL 3	MODEL 4
% returns filed electronically	-.17	-.02	-.02	-.03
Number of Personnel	-.04	-.08	-.08	-.11
Work Improvements		.06	.07	.24
Cash Improvements		-.21	-.21	-.43
Cost Reductions		0.35***	-.35***	1.02**
Cost Increases		.11	.11	-.32
Employee Increases		.10	.10	.21
Increased Retraining		.13	.13	-1.12**
Similarity to e-filing			.00	-.20
Work Improvements X Similarity				-.09
Cash Improvements X Similarity				.23
Cost Reductions X Similarity				-1.65***
Cost Increases X Similarity				.56
Employee Increases X Similarity				-.13
Increased Retraining X Similarity				1.43***
ADJ R SQUARE	.01	.14	.13	.26
F	1.34	2.67***	2.35**	2.92****
ΔR SQUARE		.19***	.00	.17***

*p < .01; **p < 0.05; ***p < 0.01; ****p < 0.001

by highlighting how prior experience relates to aspects of managers' interpretations of new technologies. This is in addition to the role of prior experiences in providing technology and management skill resources within the firm which facilitate future technology adoptions by the firm (see Pennings and Harianto 1992).

The results of this study suggest a number of implications. The relationships between prior experiences and managers' interpretations that we found may have implications for managerial decision making about future technology investments. For example, negative prior experiences may make managers wary of future information technologies. This can lead to under-

investment or delayed investments in new information systems, thereby missing market opportunities or increasing business risk. However, our result that managers who had experienced positive outcomes of past information technologies tended to frame new information technologies as opportunities regardless of the new technologies similarity to the past technology, suggests that strong positive prior experience can lead to managers' expecting good results from new information technologies that can be very different from the prior technologies used by the firm. This framing bias may lead to over-optimism about new information technologies which are very dissimilar to prior information technologies used by the firm, and can lead managers to assume greater business risk.

Table 2. Results of Hierarchical Regressions (continued)

2d) Response Uncertainty

	MODEL 1	MODEL 2	MODEL 3	MODEL 4
% returns filed electronically	-.01	.09	.09	.03
Number of Personnel	.12	.01	.01	.00
Work Improvements		-.21	-.20	-.18
Cash Improvements		-.22*	-.21	.48
Cost Reductions		.04	.04	.18
Cost Increases		-.10	-.10	.63
Employee Increases		.31***	.30***	-.75
Increased Retraining		.19*	.19*	-.33
Similarity to e-filing			-.04	.57
Work Improvements X Similarity				-.05
Cash Improvements X Similarity				-.08
Cost Reductions X Similarity				-1.16
Cost Increases X Similarity				-1.00*
Employee Increases X Similarity				1.20**
Increased Retraining X Similarity				.63
ADJ R SQUARE	-.01	.16	.15	.28
F	.59	3.01**	2.66**	3.20***
ΔR SQUARE		.23***	.00	.17***

*p < .01; **p < 0.05; ***p < 0.01; ****p < 0.001

The results of our study also suggests implications for those who may wish to introduce new information technologies into an industry, such as information technology vendors and industry regulators. Understanding the prior experiences of managers with information technologies in the industry may be useful in predicting their potential attitudes toward new information technologies and, therefore, for designing strategies for successful introduction and implementation of new information technologies in an industry.

Understanding how managers are affected by their past experiences with information technologies provides a fruitful area

for study. We have attempted to elucidate one aspect of such effects: their relationship to how managers interpret new information technologies. Many questions remain about managers' past experiences with information technologies. For example, along what dimensions should managers' experiences of information technologies be measured? We did not find a pre-existing measure, and therefore developed our own. Our measure, however, was based on judgments of content validity and may not necessarily apply outside the industry. Other such measures, possibly ones that may apply across industries must be developed and validated to measure the content of managers' experiences.

With regard to the effects of managers' experiences, one important question is how experiences affect future adoption of information technologies. We have proposed one link, based on the strategic issue interpretation paradigm. Other models of how these variables may relate must be developed and possibly tested in combination with interpretive explanations. This suggests a need for longitudinal research methods of the kind conducted by Ginsberg and Venkatraman. Additionally, future research could also test for relationships between managerial characteristics such as functional background, type of education, etc., and the effects of past experiences with information technologies.

In using the results of this study, some of its limitations must be kept in mind. First of all, the size of companies in our sample is an important issue. Our companies averaged four employees. Results of past experiences may be different for large organizations. In small companies, the owner/manager tends to exert full control on the company. In large companies, on the other hand, there is a greater diversity of views and therefore, the interpretation patterns found in this study may not apply to them. Secondly, we focused only on the threat versus opportunity framing aspect of issue framing. However, several other framings are also possible (e.g., Tversky and Kahneman 1981). One important framing which we did not measure is ambivalence toward new information technologies, which is a distinct possibility, and is in fact common practice.

7. CONCLUSIONS

Information technologies play a central role in business today. That fact, coupled with the boom in the number and variety of information technology options available to managers, suggests that it is useful to understand managerial interpretations and decision making about new information technologies. In this vein, this study examined how managers' experiences with a specific information technology were related to interpretations of new technology opportunities available to the firm. More detailed research needs to be done to understand how managerial framing of new technologies changes over time and how they influence the timing of new information technology adoptions. Research also needs to be done on how framing effects may alter implementation processes and outcomes.

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