

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

**by**

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

## ABSTRACT

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

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

## 1.0 Introduction

Information and information technologies have long been considered critical for effective management (Ackoff 1967; King 1978). Traditionally, information systems were used to provide support for individual decision-making or automation of routine information processing tasks within an organization. However, new and improved information processing technologies enable managers to redefine firm strategies by changing the products or the market segments and scope of the firm. Beginning in the 1980s, information technology was increasingly applied for these "strategic" purposes, transforming the organization of work within the firm, the social and economic relationships among actors within organizational and inter-organizational networks, and the boundaries of 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 technology vendors and managers as they would indicate the most likely candidates for, and probability of successful adoption of, a new strategic information technology system or application. In addition it would

illuminate decision making about information technology investments in organizations and clarify potential biases.

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? We examined this question by studying the experiences of managers with electronic filing of tax returns in the return preparation and filing industry. Electronic filing of tax returns was first tested in 1986, and introduced nationwide by the Internal Revenue Service in 1990. As noted by Venkatraman and Kambil (1991), and Kambil and Short (1994), electronic filing has had a major strategic impact on structure, market participants, product and market scope of firms in the tax preparation industry. Given the plans of the Internal Revenue Service and various industry participants to implement new information technology based services, we surveyed industry managers to determine how previous experiences with information technology condition their perceptions of new applications in the industry.

This paper is organized into seven sections. In addition to the current section, section 2 provides the motivation for this research and the background on 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. Section 6 and 7, discuss the key finding and present the conclusions of this study.

## **2.0 Background**

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 determinant of the time required to adopt a new and related technology. 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 either lead to missed business opportunities (strategic oversight) or over optimistic investments in information technology with little subsequent pay-off (technological oversight).

This research examines how prior experience shapes managerial interpretations of new technologies by surveying managers about technologies in the tax preparation industry. The tax preparation industry was uniquely suited to this study as it is characterized by clear and distinct information technology innovations and applications.

Annually the U.S professional tax return preparation and filing services serve over 40 million taxpayers . This marketplace is highly fragmented and can be broken down into four categories:

- Nationwide and regional, "commodity services" tax preparation firms. H&R Block leads this segment with over one third of the market.

- Individual and/or small CPA services firms, generally specializing in individual tax return preparation services.
- Nationwide, professional accounting firms providing a wide range of accounting, investment, and tax advice services to their clients (examples: Arthur Andersen, Coopers & Lybrand, Price-Waterhouse, etc.). These firms primarily focus on business returns.
- Boutique investment services firms, offering custom services for high-income clients.

In 1990 the Internal Revenue Service (IRS) made electronic tax return filing available nationwide creating major changes in the tax preparation marketplace. 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. This decision by the IRS created a major technological discontinuity in the industry enabling firms to differentiate their tax return services through electronic filing, and to provide refund anticipation loans and other new services in the tax preparation market (Venkatraman and Kambil 1991). 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

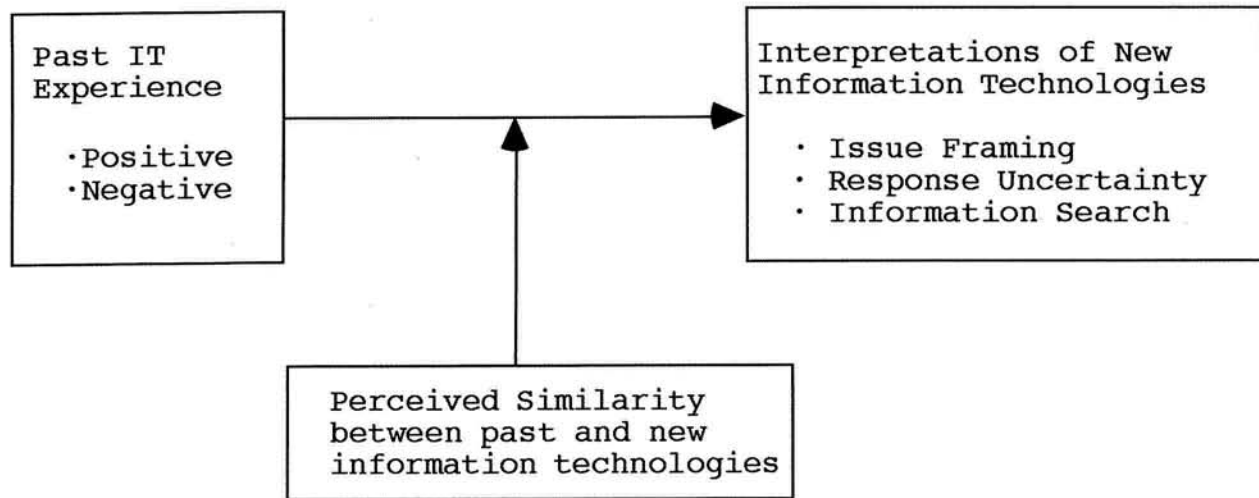
has dropped substantially to encourage new strategic uses of information technologies. The Internal Revenue Service was testing telephone filing of tax returns. Some firms were using on-line networks to communicate with customers, advanced personal computer-based income tax return preparation and planning 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 technology applications, given their prior experience with electronic filing.

### **3.0 RESEARCH OVERVIEW AND HYPOTHESES**

This study sought to understand the effects of a tax preparer or filer's experiences with electronic filing technology for tax return filing on the cognitive managerial tasks associated with interpreting new information technologies in the industry. In particular, we were interested in assessing the effects of both positive and negative experiences on the framing of new information technologies as threats or opportunities (Dutton & Jackson, 1987), on the uncertainty associated with responding to new information technologies (Milliken, 1987; 1990), and on the seeking of information about new information technologies (Aguilar, 1967). 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.





**Figure 1: Research Model**

### **Issue Framing**

In the process of interpreting ambiguous issues, managers can use a variety of schemata (Taylor & Crocker, 1981) to categorize the issues. Of these, two schemata have received much attention in previous research. These schemata used routinely by managers, are "opportunity" and "threat" (Dutton & Jackson, 1987; Jackson & Dutton, 1988). Jackson and Dutton (1988: 384) 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." Discerning threats from opportunities is important because it has consequences for firm level actions and outcomes (Nutt, 1984; Staw, Sanderlands & 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 & Dutton, 1988).

In this study, we used three forms of framing issues as opportunities or threats. The first focused on general opportunity versus threat framing. The latter two focused on specific elements of opportunity and threat framing identified by Jackson and Dutton (1988). Under opportunity framing, we focused on expectations of financial gains and under threat framing, we focused on expectation of increased financial costs.

Theories of managerial learning argue that past experiences affect subsequent strategic decision making (Milliken & Lant, 1991; Lant, Milliken & Batra, 1992). One of the processes that individuals engage in as a part of learning is categorization. However, in the process of categorization, individuals are susceptible to what Tversky and Kahneman (1973) called the availability heuristic, or what Kiesler & Sproull (1982:554) referred to as "reasoning by analogy and similarity." In addition individuals are susceptible to representative bias which is the tendency of individuals to generalize about a category or population of elements from their knowledge about few elements from that population. Applying these arguments to our analysis, we expected that managers who had more positive past experiences and fewer negative past experiences with a strategic information technology will be more inclined to interpret new information technologies as opportunities rather than threats. Further, arguments for representativeness bias would suggest that this tendency would be greater for those managers who perceived their existing technology as similar to, or closely related to a new information technology. Thus, we propose the following hypotheses.

*Hypothesis 1:* Companies that indicate greater positive experiences and lesser negative experiences with electronic filing technology will tend to frame new information technologies as opportunities. This effect will be stronger for companies that judge electronic filing technology as similar to new information technologies.

*Hypothesis 1a:* Companies that indicate greater positive experiences and lesser negative experiences with electronic filing technology will indicate greater expectation of profit increases from new information technologies. This effect will be stronger for companies that judge electronic filing technology as similar to new information technologies.

*Hypothesis 1b:* Companies that indicate greater positive experiences and lesser 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 companies that judge electronic filing technology as similar to new information technologies.

### **Response Uncertainty.**

A key managerial problem is dealing with uncertainty arising out of an organization's task environment (Duncan, 1972; Dutton & Duncan, 1987). This uncertainty typically arises from the unpredictability of an organization's environment (Clark, Vardarajan, & Pride, 1994). One of the key aspects of organizational learning is analyzing response options in the face of uncertainty (Daft & Weick, 1984). Milliken (1990: 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 or each possible strategy for achieving desired organizational outcomes." As firms 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.

Building on a discussion of biases in judgment in the previous section, we propose that the effects of experience on response uncertainty will be greater for those companies that indicated that they perceived the technology that they had

experience with as similar to new information technologies. Thus managers positive experiences with a strategic information technology can lead to a sense of confidence where the managers' feel they have a certain degree of mastery over the domain of information technology relevant to their businesses. This confidence will lead to a perception of lower response uncertainty.

*Hypothesis 2:* Companies that indicate greater positive experiences and lesser negative experiences with electronic filing technology will tend to display lower response uncertainty about new information technologies. This effect will be stronger for companies that judge electronic filing technology as similar to new information technologies.

### **Information Search**

Organizations routinely search their environments for information relevant to the conduct of their business (Aguilar, 1967; Daft & Weick, 1984). Further, managers who know the consequences of past actions tend to engage in retrospective sense-making that credits positive outcomes to correct actions and negative outcomes to incorrect actions (Starbuck & Milliken, 1988).

In discussing the effects of prior experiences on information search regarding new information technologies, we assume that organizations are goal-driven systems (Katz & Kahn, 1978). Using this assumption, we propose that organizations that fail to meet their goals will tend to engage in more active searching of their environments for opportunities. In contrast, organizations that have met or are close to meeting their goals will tend to maintain their course of action and scan less for opportunities. Instead they will primarily seek information to identify threats to be avoided.

Biases in judgment also influence the relationship between past experience with information technologies and information search about new information

technologies. Kiesler and Sproull (1982:554) state that "once judgment is made concerning the causes of events, this judgment is used as a basis for later judgments". Starbuck and Milliken (1988) proposed that the observers of bad outcomes go through a sequence of analyses that judge these outcomes as consequences of faulty perceptions. Individuals may seek to correct these faulty perceptions by acquiring more information to make a better informed choice. Combining the above models of information search and decision making with models of the availability heuristic (Tversky & Kahneman, 1983), we argue that negative experience will tend to be associated with higher information search, and positive experience will lead to lower information search, about new information technologies.

*Hypothesis 3:* Companies that indicate greater positive experiences and lesser negative experiences with electronic filing technology will tend to engage in lower information seeking about new information technologies. This effect will be stronger for companies that judge electronic filing technology as similar to new information technologies.

## 4.0 METHOD

### Sample

In August of 1994, we mailed surveys to a random sample of 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

responding companies was 4 employees. On average, the responding companies filed 27.67% of income tax returns using electronic filing technology.

### Measures of Independent Variables

**Experiences with electronic filing technology.** 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 disagree, 7 = strongly agree]. In formulating the 18 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; **Cash Improvement** is made up of items measuring the perceived improvements in the company's revenues, profit margins, market share, and ability to diversify; **Cost Reduction** includes items for perceived reductions in wages for tax preparation staff and reductions in time expenditures on tax return preparation and filing; **Cost Increases** included items measuring perceived increases in average cost of return preparation and filing; **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; **Retraining** indicated the perceived need for substantial retraining employees following the introduction of electronic filing of income tax returns thereby increasing the costs to the firm.

**Similarity judgments.** 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, viz., 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. 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].

### 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 of 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 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 tool. 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.

**Information search.** A company's score on this variable was the average of its responses to four items asking (1) whether the company regularly surveyed its customers about what they expected in terms of information technology-based services [1 = strongly agree, 7 = strongly disagree]; (2) whether it regularly monitored developments in information technologies that had the potential to impact the company [1 = strongly agree, 7 = strongly disagree]; (3) about the extent to which the company monitored what information technologies its competitors in the industry were developing or adopting [1 = not at all, 7 = to a great extent]; and (4) the extent to which the company kept in touch with the IRS on development in information technologies for tax return filing [1 = not at all, 7 = to a great extent].

### **Control Variables**

**Company size.** To control for any biases arising due to variation in the size of companies responding to the questionnaire, 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.

## 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.

## 5.0 RESULTS

Table 1 presents the means, standard deviations, and correlations for the variables used in the analysis.

[Insert Table 1 here from Appendix A]

Table 2 presents the results of hierarchical regressions for the issue framing, issue-related uncertainty, and information search variables respectively. Four different regression models were specified. Model 1, only includes the control variables as independent variables. Model 2, includes the control variables as well as other independent variables excluding judgements about the similarity in technologies. Model 3 includes assessments of similarity between prior and future technologies, and model 4 includes interaction terms as independent variables.

[Insert Table 2 series here from Appendix A]

Hypothesis 1 stated that companies that indicated greater positive experiences and lesser negative experiences with electronic filing technology will tend to frame new information technologies as opportunities. The hypothesis was supported

( $\Delta R^2 = .30$ ;  $\Delta F = 5.85$ ,  $p < .001$ ). Of the experience variables, cash improvement was the most significant predictor. Companies that had experienced cash improvement following the introduction of electronic filing technology tended to frame new information technologies as opportunities. Support was not found for the prediction that the interaction of similarity judgment in combination with past experiences would affect framing of new information technologies as opportunities. The interaction terms did not add to explained variance in the dependent variables.

Partial support was also found for Hypothesis 1a ( $\Delta R^2 = .24$ ;  $\Delta F = 4.13$ ,  $p < .001$ ), which predicted that companies indicating greater positive past experiences and lesser negative past experiences 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 the interaction of similarity judgment and past experiences would affect expectations of profit increases from new information technologies.

Hypothesis 1b, which predicted lower expected cost increases from new information technologies, for companies that experience greater positive and fewer negative past experiences, was supported ( $\Delta R^2 = .19$ ;  $\Delta F = 3.05$ ,  $p < .01$ ). Experienced cost reduction (i.e., the cost reduction experienced by the firm from implementing electronic filing) was the most significant predictor in this equation. The predictions about the interaction of similarity judgments and experience were also supported ( $\Delta R^2 = .17$ ;  $\Delta F = 3.17$ ,  $p < .01$ ). 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 firms that 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.

Overall, we found strong support for the hypotheses using past experiences to predict 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 for only expectations of cost increases from similar new information technologies. The latter result suggests risk aversion, which prior research (Kahneman & Tversky, 1979) has found is more valued by individuals over gain.

Hypothesis 2 predicted that companies that had greater positive experiences and lesser negative experiences with electronic filing technology would perceive lower response uncertainty about new information technologies. This hypothesis was supported ( $\Delta R^2 = .23$ ;  $\Delta F = 3.78$ ,  $p < .01$ ). Employee increase, Retraining, and Cash Improvement (negative) 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 effect of experiences with electronic filing technology on response uncertainty about new information technologies will be stronger for companies that judge electronic filing technology as similar to new information technologies. Strong support was found for this hypothesis ( $\Delta R^2 = .17$ ;  $\Delta F = 3.30$ ,  $p < .01$ ).

The first part of Hypothesis 3 stated that companies that had greater positive experiences and lesser negative experiences with electronic filing technology would tend to engage in lower information seeking about new information technologies. This hypothesis was not supported. Strong support was found, however, for the moderated relationship proposed in the second part of Hypothesis 3: ( $\Delta R^2 = .15$ ;  $\Delta F = 2.46$ ,  $p < .05$ ). The effect of experiences with electronic filing technology on seeking

information about new information technologies was stronger for companies that perceived electronic filing technology as similar to new information technologies. Interaction terms for both positive and negative experiences were significant. Companies that had greater negative experiences and lesser positive experiences with electronic filing technology tended to engage in more information seeking. Thus Hypothesis 3 was partially supported.

## 6.0 DISCUSSION

This paper examined the effects of prior experience on managerial interpretations and the framing of future information technologies. We predicted that managers prior experience will condition their opportunity/threat framing, response uncertainties and information seeking behaviors.

Our key results are as follows:

- all our hypotheses received some support
- we found positive past experiences and negative past experiences were significant predictors of interpretations regarding new information technologies.

In particular financial gain from one information technology led managers to frame new information technologies as opportunities, and to report 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 similarity of technology that we hypothesized were not supported. This suggests that managers who had prior positive experiences with technology may be over optimistic about the potential to

effectively implement new and dissimilar technologies. This pattern of framing can result in greater technical risk of system failure.

Our results lead to a number of different implications. First prior technology experience can bias managerial decision making and actions on future technology investments. For example negative prior experiences can bias managers to negatively interpret the strategic opportunities presented by new technologies. This can lead to under investment or delayed investments in a new information system, thereby missing market opportunities or increasing business risk. However strong positive prior experience can lead to the opposite framing bias of expecting good results from new information technologies that can be very different from the prior technologies used by the firm. This framing bias and over optimism about new technologies which are dissimilar to prior technologies used by the firm, can lead managers to assume greater technical and hence business risk. Hence managers must take into account these biases as they evaluate new strategic investments in information technology.

Second, research on the adoption and implementation of new technologies in the firm should examine how managers construct and use cognitive filters and schemata for the interpretation of new technologies and the decision to adopt the new technology. Our research suggests that these filters and schemata are the consequence of prior experiences. This is consistent with an evolutionary learning perspective of organizations. The cognitive filters applied to decision making can affect the time to adoption as well as the implementation processes and system designs that are implemented. Our study contributes to the literature on technology adoption by highlighting how prior expertise helps managers interpret new technologies through specific filters. This is in addition to 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)).

Our study also leads to a number of practical implications for vendors or organizations that would like others to adopt a specific technology. Vendors would be better off knowing the prior experiences of the firm and its managers, in framing a marketing strategy. Agencies such as the IRS similarly may want to consider different strategies to encourage the adoption of new filing or tax related technologies. These strategies would evaluate and account for a managers prior experience, in order to better assure that the manager will favorably frame the adoption of new industry wide systems. Otherwise industry wide initiatives may fail.

## 7.0 CONCLUSIONS

This study has illustrated how managerial experiences with specific technologies lead to specific biases in the interpretation of new technology opportunities available to the firm. This result has important consequences for how managers evaluate new technologies, and how vendors and organizations design strategies for the widespread adoption of new technologies. More detailed reseach 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 need to be done on how framing effects may alter implementation processes and outcomes.

## Appendix A

**Table 1: Correlations**

	1	2	3	4	5	6	7	8	9	10	11	12	13
<b>1. PCTEFILE</b>													
<b>2. PERSONEL</b>	-.05												
<b>3. COSTMORE</b>	-.21	-.19											
<b>4. WORKIMPR</b>	.38	-.14	.00										
<b>5. COSTREDN</b>	.21	-.11	.12	.47									
<b>6. CASHIMPR</b>	.35	-.21	-.12	.63	.32								
<b>7. EXP9</b>	.17	-.07	.20	.22	.20	.07							
<b>8. EXP12</b>	.00	-.06	.30	.15	.15	-.14	.32						
<b>9. COMPARE</b>	.14	-.10	.04	.30	.01	.31	.00	.00					
<b>10. OPPFRAME</b>	.07	-.02	-.08	.36	.11	.57	.03	-.15	.33				
<b>11. RESPOND</b>	.02	-.01	-.01	-.17	-.04	-.28	.33	.25	-.10	-.34			
<b>12. COSTINC</b>	-.20	-.21	.18	-.11	-.23	-.18	.07	.20	.01	-.08	.18		
<b>13. PROFITIN</b>	.08	-.10	-.25	.28	.10	.38	.10	.04	.33	.36	-.11	.01	
<b>14. INFOSEEK</b>	-.06	.02	.13	.15	.05	.14	.21	.20	.14	.18	-.11	.25	.11

Correlations above 0.197 are significant at the 0.5 level.

<b>Variables</b>	<b>Variable Definitions</b>
1. PCTEFILE	% of returns electronically filed
2. PERSONEL	Number of personnel
3. WORKIMPR	Work Improvement
4. CASHIMPR	Cash Improvement
5. COSTREDU	Cost Reduction
6. COSTINCR	Cost Increases
7. EXP9	Employee Increases
8. EXP12	Retraining Increases
9. COMPARE	Similarity with electronic filing
10. OPPFRAME	Opportunity Framing
11. RESPOND	Response Uncertainty
12. COSTINC	Cost Increase
13. PROFITIN	Profit Increase
14. INFOSEEK	Information Seeking



**Table 2: Results of Hierarchical Regressions**

Variables	Variable Definitions
PCTEFILE	% of returns electronically filed
PERSONEL	Number of personnel
WORKIMPR	Work Improvement
CASHIMPR	Cash Improvement
COSTREDU	Cost Reduction
COSTINCR	Cost Increases
EXP9	Employee Increases
EXP12	Retraining Increases
COMPARE	Similarity with electronic filing
WORKIMPR *SIMILARITY	Work Improvement and Similarity
CASHIMPR *SIMILARITY	Cash Improvement and Similarity
COSTREDU *SIMILARITY	Cost Reduction and Improvement
COSTINCR*SIMILARITY	Cost Increases and Improvement
EMPLOYEE INCREASE* SIMILARITY	Employee Increases and Improvement
RETRAINING	Retraining and Improvement

**2a) Opportunity Framing**

	MODEL 1	MODEL 2	MODEL 3	MODEL 4
PCTEFILE	.15	-.09	-.11	-.08
PERSONEL	-.18 *	-.02	-.02	-.03
WORKIMPR		.10	.05	-.20
CASHIMPR		.58 ****	.54 ****	.11
COSTREDU		-.13	-.09	.07
COSTINCR		.04	.02	-.05
EXP9		.08	.08	.55
EXP12		-.08	-.09	-.19
COMPARE			.23 **	-.21
WORKIMPR *SIMILARITY				.42
CASHIMPR *SIMILARITY				-.24
COSTREDU *SIMILARITY				.65
COSTINCR*SIMILARITY				.12
EMPLOYEE INCREASE* SIMILARITY				-.54
RETRAINING				.11
<b>ADJ RSQUARE</b>	<b>.03</b>	<b>.29</b>	<b>.33</b>	<b>.30</b>
<b>F</b>	<b>2.49*</b>	<b>5.23****</b>	<b>5.55****</b>	<b>3.40****</b>
<b>Δ R SQUARE</b>		<b>.30</b>	<b>.04</b>	<b>.03</b>
<b>Δ F</b>		<b>5.85****</b>	<b>5.57**</b>	<b>.52</b>

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01; \*\*\*\*p<0.001



**2b) Expected Profit Increases**

	MODEL 1	MODEL 2	MODEL 3	MODEL 4
PCTEFILE	.12	-.17	-.20*	-.15
PERSONEL	-.02	.05	.05	.04
WORKIMPR		.17	.11	-.41
CASHIMPR		.34 ***	.29**	-.32
COSTREDU		-.07	-.02	.34
COSTINCR		-.33 ***	-.35****	.34
EXP9		.17	.17	.21
EXP12		.06	.04	.69
COMPARE			.28***	.19
WORKIMPR *SIMILARITY				.77
CASHIMPR *SIMILARITY				-.43
COSTREDU *SIMILARITY				.98
COSTINCR*SIMILA RITY				-.83
EMPLOYEE INCREASE* SIMILARITY				-.08
RETRAINING				-.70
<b>ADJ RSQUARE</b>	<b>-.01</b>	<b>.18</b>	<b>.24</b>	<b>.28</b>
<b>F</b>	<b>.62</b>	<b>3.29***</b>	<b>3.98****</b>	<b>3.20****</b>
<b>Δ R SQUARE</b>		<b>.24</b>	<b>.07</b>	<b>.09</b>
<b>Δ F</b>		<b>4.13****</b>	<b>7.35***</b>	<b>1.69</b>

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01; \*\*\*\*p<0.001

2c) Expected Cost Increase

	MODEL 1	MODEL 2	MODEL3	MODEL4
PCTEFILE	-.17	-.02	-.02	-.03
PERSONEL	-.04	-.08	-.08	-.11
WORKIMPR		.06	.07	.24
CASHIMPR		-.21	-.21	-.43
COSTREDU		-.35***	-.35***	1.02**
COSTINCR		.11	.11	-.32
EXP9		.10	.10	.21
EXP12		.13	.13	-1.12**
COMPARE			.00	-.20
WORKIMPR *SIMILARITY				-.09
CASHIMPR *SIMILARITY				-1.65***
COSTREDU *SIMILARITY				.23***
COSTINCR*SIMILA RITY				.56
EMPLOYEE INCREASE* SIMILARITY				-.13
RETRAINING				.23
<b>ADJ RSQUARE</b>	<b>.01</b>	<b>.14</b>	<b>.13</b>	<b>.26</b>
<b>F</b>	<b>1.34</b>	<b>2.67***</b>	<b>2.35**</b>	<b>2.92****</b>
<b>Δ R SQUARE</b>		<b>.19</b>	<b>.00</b>	<b>.17</b>
<b>Δ F</b>		<b>3.05***</b>	<b>0.00</b>	<b>3.17***</b>

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01; \*\*\*\*p<0.001

## 2d) Response Uncertainty

	MODEL 1	MODEL 2	MODEL 3	MODEL 4
PCTEFILE	-.01	.09	.09	.03
PERSONEL	.12	.01	.01	.00
WORKIMPR		-.21	-.20	-.18
CASHIMPR		-.22*	-.21	.48
COSTREDU		.04	.04	.18
COSTINCR		-.10	-.10	.63
EXP9		.31***	.30***	-.75
EXP12		.19*	.19*	-.33
COMPARE			-.04	.57
WORKIMPR *SIMILARITY				-.05
CASHIMPR *SIMILARITY				-.08
COSTREDU *SIMILARITY				-1.16
COSTINCR*SIMILA RITY				-1.00*
EMPLOYEE INCREASE* SIMILARITY				1.20**
RETRAINING				.63
<b>ADJ RSQUARE</b>	<b>-.01</b>	<b>.16</b>	<b>.15</b>	<b>.28</b>
<b>F</b>	<b>.59</b>	<b>3.01**</b>	<b>2.66**</b>	<b>3.20***</b>
<b>Δ R SQUARE</b>		<b>.23</b>	<b>.00</b>	<b>.17</b>
<b>Δ F</b>		<b>3.78***</b>	<b>0.11</b>	<b>3.30***</b>

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01; \*\*\*\*p<0.001

**2e) Information Search**

	Model 1	Model 2	Model 3	Model 4
PCTEFILE	-.04	-.07	-.08	-.11
PERSONEL	.06	.09	.09	.11
WORKIMPR		.04	.02	1.16**
CASHIMPR		.10	.09	.50
COSTREDU		-.07	-.05	.00
COSTINCR		.08	.08	-1.08**
EXP9		.20*	.21*	-.91*
EXP12		.20*	.20*	.57
COMPARE			.08	.31
WORKIMPR *SIMILARITY				-1.75**
CASHIMPR *SIMILARITY				.01
COSTREDU *SIMILARITY				-.61
COSTINCR*SIMILA RITY				1.47**
EMPLOYEE INCREASE* SIMILARITY				1.28**
RETRAINING				-.49
<b>ADJ RSQUARE</b>	<b>-.02</b>	<b>.04</b>	<b>.03</b>	<b>.13</b>
<b>F</b>	<b>.20</b>	<b>1.4</b>	<b>1.29</b>	<b>1.85**</b>
<b>Δ R SQUARE</b>		<b>.12</b>	<b>.01</b>	<b>.15</b>
<b>Δ F</b>		<b>1.80</b>	<b>0.44</b>	<b>2.46**</b>

\* p<0.1; \*\* p<0.05; \*\*\* p<0.01; \*\*\*\*p<0.001

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