ABSTRACT

There is often tremendous hype accompanying the launch of new information technology (IT) products, which can inflate the value of new IT. We examine this from an information-theoretic standpoint where complexity and uncertainty in the information available to the decision-maker investing in new IT results in inflated expectations about that IT. We have developed the survey instrument for this study. A small pilot to assess the content validity of the instrument was done with 17 firms in South Dakota and Minnesota participating in the survey. The next stage will be to use this instrument to test our value distortion model.

KEYWORDS: Value of IT, Management fads and fashions, Managerial decision making, Survey research

INTRODUCTION

Investments in information technology (IT) have been plagued with a well-known problem for decades, which is that these investments often don’t result in the kind of returns that firms expect from them. While companies invest heavily in IT, there is often little improvement in the bottom-line measures of the firm and the economy at large (Strassmann, 1985; Roach, 1987). There are estimates that as much as 20% of all IT spending is wasted and 40% does not contribute to business performance (Willcocks & Lester, 1993). Another disturbing report (Hochstrasser & Griffiths, 1990) showed that 70% of all IT investment provides no return on the investment (ROI). More recently, researchers have argued that IT has no more value than any other type of utility such as electricity (Carr, 2003). However, there is also much evidence on the other side of the argument and many researchers firmly aver that IT indeed brings much value to firms (Robey & Boudreau, 1999; Brynjolfsson & Hitt, 1998).

The debate on the value of IT has led researchers to search for better metrics and methods of measuring its value, such as the use of real options (RO) theory for developing better valuation models for IT investments. Bardhan, Bagchi, and Sougstad (2004) apply RO to valuing a portfolio of 31 information technology (IT) projects spread over three phases, where the phase transitions are checkpoints for taking stock about the success of the program. Here, the next phase is implemented only if the returns from the previous phases are satisfactory and the future outlook is bright. Benaroch, Shah, and Jeffrey (2006) and Benaroch et al. (2007) also build an RO model for the phased implementation of multiple IT projects, though they employ a different methodology than Bardhan et al. (2004). Ghosh and Li (2013) employ RO theory in assessing a value for migrating a firm’s application infrastructure to a service-oriented architecture (SOA). Dimakopoulou, Pramatari, and Tsekrekos (2014) apply RO to valuing investments in radio frequency identification (RFID) technology.
Research on non-financial metrics or process variables as measures of IT performance continues unabated. Since the impact of IT often does not show up in broad firm-level financial measures such as profit, the justification of IT investments is often sought in improvements in metrics of business process performance. Ghobakhloo and Hong (2014) justify investments in IT in manufacturing not so much because of any direct impact on profit but because these investments result in competence in lean manufacturing – an entirely desirable capability for the firm. Löfsten (2014) explores the link between investing in creating systematic information structures for knowledge creation and dissemination within the firm and the firm’s innovation performance as measured by the number of patents filed by the firm. It is understood that the creation of systematic information structures will involve IT such as knowledge management systems (KMS). Guillemette, Laroche, and Cadieux (2014) develop a novel and general metric called decision-making process performance (DMPP) for measuring the impact of IT in improving decision-making processes in general.

Newer methods of valuation such as RO or new metrics such as DMPP are all targeting finding the elusive value of IT. An entirely different explanation for the elusive value of IT could lie in the theory that users build up expectations about the value of IT that is quite a bit above and beyond its true value. Consequently, they are frequently disappointed with what IT actually delivers. This explanation is rooted in the theory of management fads and fashions (Abrahamson, 1991, 1996). This theory avers that managers are often quick to jump on the bandwagon of something novel in order to look good and appear to be innovative and also because they fear being left behind when they see their fellow managers adopting that trend. Although management fads and fashions is a broad notion (Abrahamson, 1991, 1996) and is not necessarily restricted to IT fads and fashions, it is being increasingly applied to IT. Fichman (2004) exhorts IS researchers to go beyond the dominant paradigm of technology adoption models, which focus primarily on value-based constructs such as usefulness and ease of use as drivers of technology adoption.

Fichman (2004) recommends broadening our understanding of the technology adoption phenomenon by including other theories such as that of management fads and fashions as additional antecedents to technology adoption. Grant (2010, 2011) in fact applies this theory to knowledge management (KM) within a firm. He concludes from his analysis that knowledge management should not be regarded as a management fad or fashion. It also should be noted based on Löfsten’s work (2014) on systematic information structures that KMS’s play a role in creating structures for knowledge capture and dissemination. Grant (2010, 2011) and Löfsten (2014) together reaffirm a value-based justification for KMS’s.

Although some of this research appears to buttress the notion that some forms of IT innovation do indeed bring enduring value and they are not ephemeral things that are best eschewed than invested in by the firm, this strand of research does bring the notion of management fads and fashions fully into the discourse on IT adoption. The IT industry is indeed replete with cases of failed innovations, ranging from the network computer to the open systems interconnection (OSI) model to artificial intelligence, that were nevertheless launched with such fanfare in their time that the general user could be forgiven for believing that they would indeed take over the world. The cumulative evidence of much-hyped yet ultimately failing IT innovations does provide a case for the phenomenon of IT adoption to be examined through the theoretical lens of management fads and fashions (Abrahamson, 1991, 1996). The practitioner community in fact already knows this very well. The notion that hype and management fashion play a big role in IT investment decisions is enshrined in the Gartner Hype Cycle posited by leading IT consulting firm Gartner (Gartner, 2007), and widely accepted by the practitioner community.
In this research, we argue that the hype accompanying the launch of hot new IT products could potentially inflate from the user's standpoint the value of new IT, thereby causing excess levels of investment in them. We assert that this inflation in the value of new IT is based on the complexity and uncertainty in the information on which the manager has to make a decision on investing in the new IT. At this stage of the research, we have completed building the theoretical model of information-driven value distortion and the survey instrument for testing the model. We did a small pilot to assess the content validity of the instrument where a preliminary version of the instrument was sent to a number of firms in the states of South Dakota and Minnesota. A total of 17 firms participated in this pilot. Based on the returned surveys and the comments, we refined the instrument by modifying or dropping certain items in the instrument. The final instrument is given in the Appendix. The next stage in the research will be to test our theoretical model of value distortion using the instrument we have developed.

LITERATURE REVIEW

The Gartner Hype Cycle (Gartner, 2007) is shown in Figure 1. It asserts that IT innovations go through the so-called Hype Cycle where users develop an inflated expectation of value of the technology. User expectations climb to the “peak of inflated expectations” before falling to the “trough of disillusionment” and then finally stabilizing at the “plateau of productivity”. This Hype Cycle model, while plausible and interesting, has never really been crafted into a theoretical model and then empirically tested. We develop a theoretical model that attempts to explain the drivers of the “peak of inflated expectations” from an information-theoretic perspective. If this phenomenon of users having very highly inflated expectations of IT innovations in their early stages does occur, then our model also studies the consequences of such value inflation from the standpoint of neoclassical economic rationalism.

Figure 1: Gartner Hype Cycle

Theories of bounded rationality and information complexity are not new but their application to investment decisions in IT innovations has not been done before. Classical rational choice theory, which is the dominant paradigm in microeconomics (Becker, 1978; Arrow, 1987; Sen, 1987; Tyzska, 1989), assumes that individuals have a stable set of preferences and constraints.
facing them and they act to maximize their preferences. In the phenomenon being examined here, the individuals are decision-makers in the firm who are contemplating investing in an IT innovation. Bounded rationality models, of which there are several variants, relax some of the standard assumptions of the neoclassical microeconomic model by recognizing that, when the information upon which a given decision is made is too complex or imperfect and there are cognitive capacity constraints on the decision-maker or organization making the decision, the “optimal” decision predicted by the neoclassical model may not be achieved (Binmore, 1987; Hogarth & Reder, 1987; Lipman, 1995; Rubinstein, 1997). Essentially, in our case, the IT decision maker may make a poor choice such as investing a significant amount in a much-hyped technology that ultimately does not bring much return to the firm.

Different approaches have been suggested to address this issue of the role of information complexity and limited cognitive capacity in decision making. One approach is to augment the neoclassical model with various types of costs for gathering and processing information. The satisficing genre of models belongs to this strain since the search for the best alternative cannot continue indefinitely in the face of the mounting costs to process more alternatives (Gigerenzer & Goldstein, 1996; Bordley & LiCalzi, 2000; Byron, 2004). Gigerenzer and Goldstein (1996) explain that the term satisficing is a blend of the two terms satisfying and sufficing. The organization thus appears to reach for a certain target or adequate level of value rather than for some theoretically optimal level. Some such as Gigerenzer and Selten (2002) have argued that many bounded rationality models are still elaborate utility maximization models where the apparently “suboptimal” decision is optimal when the many information-related and cognitive capacity constraints are layered into the model. In other words, these models actually preserve as sacrosanct the principles of expected value maximization.

There is another school of thought that proposes to jettison altogether the rigid procedure of utility maximization as the central mechanism in rational decision-making and instead replace it with various types of heuristics for arriving at decisions (Gigerenzer & Selten, 2002). Gigerenzer’s (2007) recent book tries to make a case for the triumph of intuition over reason in good decision-making. While clearly intuition bred from experience does matter in IT decision-making, we do not in this research take so radical an approach as Gigerenzer (2007) in abandoning reasoning-based models in IT investment decisions. Neoclassical principles of economic rationalism, or expected value maximization, pervades much of the research on IT innovation (Swanson, 1994; Presscott & Conger, 1995; Fichman, 2000; Gallivan, 2001). Consequently, we remain within the framework of rational value maximization. While treating the IT investment decision-maker as an economically rational person, our model posits that the decision-maker’s perception of the value of an IT innovation can be inflated above its actual value because of the quality of information available at the time of the launch of an IT innovation. In the early stages of the introduction of an IT innovation, the volume of hype is at its maximum and there is much uncertainty about whether the new IT will actually deliver on its promise. For example, an IT manager making a decision on whether to invest in migrating to a service-oriented architecture (SOA) (Krafzig, Banke, & Slama, 2005; Erl, 2006) faces a set of technologies that is complex and whose benefits have not been conclusively proven since some say “SOA is dead” (Krill, 2009; Neubarth, 2010). Furthermore, vendors of SOA-related products are not helping the situation by hyiping SOA to the skies! Information-based value distortion is a consequence in such a scenario, which in turn could result in poor investment decisions.

Management fads and fashions (Abrahamson, 1991; Abrahamson, 1996) could be used as a theoretical basis to explain investment in over-hyped IT innovations. However, the notion of management fads and fashions is more a statement of a phenomenon rather than a fully-developed theory with its nomological network of constructs which explains the phenomenon.
We develop a testable theory that links the information-related constructs such as complexity and uncertainty to value inflation, which in turn results in poor IT investment decisions. For value inflation to occur, there must also be sustained hype by vendors of their offerings, which the vendors have been successful in getting the users to believe in. Furthermore, the users’ bounded rationality constraints make it difficult for them to see through this vendor hype.

**THEORETICAL DEVELOPMENT/MODEL**

Our theoretical model is shown in Figure 2. Investing in IT innovations represents a decision context that is fraught with information complexity and uncertainty. Information complexity imposes a high cognitive burden on the human processor (Malhotra, 1982; Miller, 1994; Lee & Lee, 2004). However, given limited time, budget, and expertise, the IT manager may not be able to accurately gauge the value of an IT innovation. This is the classic bounded rationality scenario, where suboptimal decisions are the consequence in a decision context where the information is complex and uncertain and cognitive capacity constraints exist on the decision-maker (Binmore, 1987; Hogarth & Reder, 1987; Lipman, 1995; Rubinstein, 1997). Information complexity and uncertainty about the technology, standards, costs, benefits, and the market landscape together with the limited time and resources the IT manager has to make a decision may make it very difficult for the manager to correctly assess the value of a new IT. It is plausible therefore that under the influence of hype, the IT manager may overvalue the supposedly hot new IT and invest too much in it, or make an investment where indeed none should have been made.

![Figure 2: Model of Information-Driven Value Distortion](image)

**Information Complexity**

Complexity associated with IT innovations can arise from:

- Complexity of the technology
We illustrate the issue of information complexity by focusing on an example of an IT investment decision.

We consider the case of enterprise integration (EI). EI technologies are used to integrate the systems, applications, databases, and business processes within the enterprise and also the extended enterprise comprising the firm’s business partners and customers. The technologies underlying EI that the IT manager or decision-maker must grasp in order to make an informed and judicious decision about which products and technologies to invest in include:

- **Message brokering**: Message brokers perform the function of reliably storing and forwarding messages, which could be documents or remote procedure calls or invocations of Web Services. Message brokers reliably move such messages between the end points of the applications environment.
- **Data transformation**: Messages moving between the end points of the applications environment of the extended enterprise may need to be transformed from one format to another before delivery such as a transformation between EDI and XML formats or some proprietary legacy format to XML.
- **Data verification and validation**: Databases can also be endpoints in the applications environment of the extended enterprise. Before inserting data into a database, the data must be verified and validated in order to not corrupt the database.
- **Business process management**: A business process, such as customer order entry or handling the return of a product, may involve invoking several applications; it may require approvals from a manager; and it would also involve inserting and extracting data from databases. The business process manager (BPM) handles the sequence of interactions across these endpoints of the applications environment, and maintains the overall state of the business process.
- **Transaction management**: A business process may be viewed as comprising a set of transactions. Some of these transactions that require involvement of humans, such as an approval from a manager, may be long-running transactions. In order to ensure the consistency of the state of the applications and the databases in the overall environment, each transaction must be handled as a discrete or atomic unit of work. If transactions fail in the middle, the state of the applications environment must be rolled back to the state that existed at the time of the start of the transaction. This is the job of transaction managers that are part of the BPM engine.
- **Portal**: It is not just applications and databases that participate in the business processes of the enterprise, but humans need to be involved such as an approval may be needed from a manager. Humans participate in the overall applications environment of the enterprise via portals.
- **Business event management**: Business events correspond to the salient milestones reached as a consequence of the various business processes that are running within the enterprise. Business event management correlates various types of events to ensure the overall integrity and health of business processes. For example, the event of order entry must be followed by other events such as order fulfillment either through inventory or through the initiation of the manufacturing process to fill that order. Business event management would detect and flag any anomalies in the expected sequence of events.
• Application adaptation: In the applications environment of the enterprise, many applications are expected to participate including both applications with newer Web Services interfaces as well as legacy applications with older interfaces. For the legacy applications that do not talk the language of XML and Web Services, an adaptation layer is necessary to convert legacy proprietary formats to the contemporary formats of XML and Web Services.

• Metadata management: The applications environment of the enterprise must have a unified logical view of all data. Data inconsistencies must be resolved. This would facilitate moving data between the end points of the applications environment. Metadata management is required to reconcile the specific ways in which applications view data so that ultimately, from the standpoint of the enterprise, there is indeed a single global view of all data.

These technologies are packaged in different ways by vendors who play in various segments of the EI market. The user must therefore understand not only the technologies but also the complicated and ever-changing landscape of the EI market. This market includes the following types of players:

• EAI Suites – Players in this market segment offer a complete range of enterprise application integration (EAI) functionality including message brokering, data transformation, and process management. Tibco offers its ActiveMatrix BusinessWorks product in this space (Tibco, 2015).

• Enterprise Service Bus (ESB): An ESB is essentially a stripped-down version of an EAI suite in that it provides reliable data transport based on message brokering, which is the lowermost layer of an EAI suite. However, ESB vendors typically also offer value-added services that can be layered on top of the ESB bus. Progress Software offers the Aurea Sonic ESB in this space (Progress Software, 2015).

• Application server: The main application server vendors such as IBM with its WebSphere and BEA with its WebLogic product also compete in the integration market as they provide enterprise integration functionality in their application server product portfolio (IBM, 2015).

• Extract, Transform, and Load (ETL): ETL vendors who had historically focused on the data warehousing market entered the enterprise integration space by supporting real-time movement of data between databases. Informatica offers its ETL product in this space (Informatica, 2015).

• Enterprise Information Integration (EII): The EII market segment is claimed by both real-time ETL vendors as well as vendors of federated database products that are used for logically integrating data sources into a single enterprise-wide view of all data. Red Hat’s Data Virtualization product is based on EII technology that it received from the acquisition of MetaMatrix which had a flagship EII product (Red Hat, 2015).

• Business Process Management (BPM): BPM players offer a process management engine for automating transactions across applications, systems, and humans that support business processes such as the order entry process. Pegasystems is seen as a leader in the BPM space by Gartner (Pegasystems, 2015).

• Business Activity Monitoring (BAM): BAM is a new and emerging market in the overall enterprise integration space. BAM products present the real-time state of the business on an “executive dashboard” which could show, for example, daily sales orders by geography, current inventory levels, lead times, and product return rates. BAM is tightly linked to the organization’s EAI infrastructure since much of the real-time information on the state of the business comes from monitoring the integration infrastructure by
intercepting XML messages flowing on an ESB. Oracle offers a BAM product (Oracle, 2015).

It is quite clear from reviewing this bewildering list of products and underlying technologies in the EI space that there is a tremendous amount of complexity in this space which the IT manager has to sort through before they can make a judicious choice of which products and technologies to deploy. Given that this inherent market and technology complexity is inevitably accompanied by the powerful marketing that each vendor employs, the IT manager with limited time and resources to assess these products and technologies can be forgiven for developing an inflated value of the product offerings of the EI vendors.

**Information Uncertainty**

Information uncertainty refers to the lack of all available information (Kydd, 1989) and thus necessitates a search process to gather additional information. The search process may incur costs, impose additional delays, and may or may not resolve the uncertainty. Uncertainty may be associated with markets, such as which vendors and their associated products and technologies will actually survive and thrive.

There is also uncertainty about which technology standards will survive, and this can be quite hard to predict. Continuing with our example of the EI space, there is indeed much confusion about the plethora of standards that have emerged in this space. Key integration standards include Extensible Markup Language (XML), Web Services, Simple Object Access Protocol (SOAP), Universal Description, Discovery and Integration (UDDI), XML Stylesheet Language Transformation (XSLT), XQuery, Java Messaging Services (JMS), and Business Process Execution Language for Web Services (BPEL4WS) (Krafzig et al., 2005; Erl, 2006; Marks & Bell, 2006). At the business process management layer, at one point there were a number of standards staking a claim to this layer such as Business Process Management Language (BPML), XLANG, Web Services Flow Language (WSFL), Web Service Choreography Interface (WSCI), and BPEL4WS (Jablonski et al., 2010). XLANG was driven by Microsoft whereas IBM threw its weight behind WSFL. BPML in turn was championed by an industry consortium called the Business Process Management Initiative (BPMI). Currently, the industry appears to be settling on BPEL4WS which is sort of a compromise standard that all the stakeholders can live with. Guessing the direction of standards and which vendor or consortium of vendors will win is just so much crystal ball gazing and is a particularly thankless task.

Uncertainty in the mind of the user can also result from conflicting views presented by competing vendors in a certain technology space. Different vendors in a particular space may have different architectures for their products which they hype to the hilt. In our example of the EI space, different vendors of the Enterprise Services Bus (ESB) product offer different architectures for their products (Progress Software, 2015; Tibco 2015). Some vendors have a more centralized architecture whereas others have a more distributed architecture. As these vendors bring in their respective technology gurus in the sales pitch they make, customers not well-versed in the intricacies of these architectures may well find themselves conflicted about whom to believe. Allied with architecture, performance is an area where there is also a good deal of uncertainty. More may be claimed about the performance of a product, where the vendor may have tested the product in a contrived situation to make it look the best, than what may be achieved in the customer’s environment.

In fact, it is the uncertainty about the value of IT that has resulted in the rise of real options as a new methodology for valuing IT investments under uncertainty. Erdogmus (2000) applies RO to
software development projects such as bringing older software products in compliance with emerging XML standards where management can take corrective action if the standards do not succeed. Bardhan et al. (2004) and Benaroch et al. (2006, 2007) apply RO to valuing multistage IT investment programs, though employing different methodologies. Bardhan et al. (2004) use the “added-value logic” where the option value of a downstream project adds to the benefits of the adjacent upstream project that enabled the downstream project. Benaroch et al. (2006, 2007) use the “subsidy-to-exercise price logic” where the option value of the downstream project provides a subsidy that reduces the acquisition cost, or exercise price, of the enabling upstream project. Ghosh and Li (2013) synthesize the options pricing models of Bardhan et al. (2004) and Benaroch et al. (2006, 2007) by using Benaroch et al.’s (2006, 2007) subsidy-to-exercise logic in aggregating the value of downstream projects with that of upstream projects, but at the same time they use Bardhan et al.’s (2004) approach for inter-stage learning.

Value Inflation as the Dependent Variable

The literature on decision-making under bounded rationality has been well-developed over many decades (Malhotra, 1982; Binmore, 1987; Hogarth & Reder, 1987; Miller, 1994; Lipman, 1995; Rubinstein, 1997; Lee & Lee, 2004). The gist of this research is that when the decision-maker is faced with an excess of complex and uncertain information, but at the same time has limited time, expertise, and resources to make the decision, a poor or sub-optimal decision is the result. Applying this to the context of making decisions to invest in complex IT accompanied by much uncertainty about benefits, costs, technology standards, and the market landscape, the decision-maker could indeed make a sub-optimal decision. The sub-optimality could be that the decision-maker makes too little of an investment, including not investing at all, when they should have actually made a larger investment. An alternative sub-optimality could be that the decision-maker in a flush of enthusiasm about the technology makes too much of an investment when they should have invested considerably less or perhaps none at all. We argue that, in face of the Gartner Hype Cycle where new technologies introduced with much fanfare climb to the peak of inflated expectations, the sub-optimal decision with regard to hot new IT is more likely to be an excess of investment rather than an underinvestment because of inflated perceptions of value. Hence, our first two hypotheses are:

**Hypothesis 1:** There is an interactive effect between information complexity and hype which results in an inflated perception of the value of the new IT.

**Hypothesis 2:** There is an interactive effect between information uncertainty and hype which results in an inflated perception of the value of the new IT.

Bounded Rationality as Moderator

Bounded rationality arises from the limitations of time, budget, and expertise available to make the decision. If the decision-makers had more expertise, more time, and a greater budget to evaluate the technology, then presumably they would not climb to Gartner’s “peak of inflated expectations” or the inflation in value perception could be minimized. The bounded rationality variables of time, budget, and expertise thus enter the model as a set of variables that moderate the relationship between the information-related antecedents and the dependent variable of value inflation.

Expertise Moderator
The hypotheses related to the expertise available to make the decision are:

**Hypothesis 3a:** The relationship between information complexity and inflated value perception in the presence of hype is moderated by the expertise available to make the decision to invest in the innovation. There would be less value inflation for the same level of information complexity and hype if the decision-maker, or organization, had more expertise available to make the decision.

**Hypothesis 3b:** The relationship between information uncertainty and inflated value perception in the presence of hype is moderated by the expertise available to make the decision to invest in the innovation. There would be less value inflation for the same level of information uncertainty and hype if the decision-maker, or organization, had more expertise available to make the decision.

**Time Moderator**

The hypotheses related to the amount of time available to make the decision are:

**Hypothesis 4a:** The relationship between information complexity and inflated value perception in the presence of hype is moderated by the amount of time available to make the decision to invest in the innovation. There would be less value inflation for the same level of information complexity and hype if the decision-maker, or organization, had more time available to make the decision.

**Hypothesis 4b:** The relationship between information uncertainty and inflated value perception in the presence of hype is moderated by the amount of time available to make the decision to invest in the innovation. There would be less value inflation for the same level of information uncertainty and hype if the decision-maker, or organization, had more time available to make the decision.

**Budget Moderator**

The hypotheses related to the amount of budget available to make the decision are:

**Hypothesis 5a:** The relationship between information complexity and inflated value perception in the presence of hype is moderated by the amount of budget available to make the decision to invest in the innovation. There would be less value inflation for the same level of information complexity and hype if the decision-maker, or organization, had more budget available to make the decision.

**Hypothesis 5b:** The relationship between information uncertainty and inflated value perception in the presence of hype is moderated by the amount of budget available to make the decision to invest in the innovation. There would be less value inflation for the same level of information uncertainty and hype if the decision-maker, or organization, had more budget available to make the decision.

**Value Inflation and Excess Investment**

Value inflation is of course not an actual decision to invest. Hence, value inflation can be viewed as an intermediate dependent variable, with the final dependent variable being the excess investment made in the IT as a consequence of value inflation. The reason why excess
investment would occur as a consequence of value inflation follows in a straightforward fashion from neoclassical economic rationalism. Simply for the purposes of illustrating the linkage between value inflation and excess investment, we assume a Cobb-Douglas utility or value function \( V(x, y) \) as follows (Felipe & Adams, 2005):

\[
V(x, y) = Ax^\alpha y^\beta
\]  

where

\( x \) is number of units purchased of the IT innovation  
\( y \) is the number of units purchased of a basket of other IT goods and services  
\( \alpha \) is a parameter that signifies the contribution to overall value of the IT innovation with \( \alpha + \beta = 1 \)

For a Cobb-Douglas type of utility or value function, it can be easily proven that the dollar amount of investment in the innovation \( I_x \) is given by

\[
I_x = \alpha I
\]  

where \( I \) is the total budget available to the IT organization. The inflated perception of value caused by the fanfare, hype, and confusion essentially raises \( \alpha \) from its intrinsic value to an inflated value thus causing an excess investment in the IT innovation, \( \Delta I_x \), which is given by:

\[
\Delta I_x = (\alpha_{\text{inflated}} - \alpha_{\text{intrinsic}}) I
\]

This results in our final hypothesis:

**Hypothesis 6:** Inflated value perception is positively related to excess investment in the innovation.

**METHODS**

The instrument we developed for this study is shown in the Appendix. Each item in the instrument is measured on a 5-point Likert scale.

**Instrument Development Pilot**

A pilot study was done to assess the content validity of the survey instrument for this study. The research team sent out a preliminary survey instrument to about three hundred firms in South Dakota and Minnesota. A total of 17 firms responded to the survey. From the surveys returned along with the comments, we made certain key changes to the wording of the items in order to enhance the clarity of the instrument.

**Longitudinal and Retrospective Nature of Instrument**

Based on the surveys returned, it was clear that the wording of the questions needed to be tightened to reflect the longitudinal and retrospective nature of this instrument. The typical instrument that is often used in technology adoption studies, such as those used in the
Technology Acceptance Model (TAM) (Davis, 1989; Venkatesh et al., 2003), ask the respondents to think about the values of the model constructs at a given point in time. From a time dimension perspective, our instrument differs from the usual TAM instrument in that our instrument encompasses two time instants: 1) the time in the past when the investment was made in the new IT, and 2) the present time, as shown in Figure 3.

**Figure 3: Longitudinal and Retrospective Nature of Instrument**

For the constructs of information complexity and uncertainty, the respondent is being asked to think back to the time the investment was made and answer the questions pertaining to information complexity and uncertainty based on the mindset of the decision-maker at the time of making the investment. The respondents were asked to fill in the survey with respect to an innovative IT project that had been implemented at least one year ago. The bounded rationality questions pertaining to the limitations of expertise, time, and budget were also with regard to the time in the past when the investment was made.

The questions on value inflation asked the respondent to think about the two time instants of today and when the investment was made in the past. $Value_{past}$ refers to the value they had assigned to this project when they had started it in the past. $Value_{today}$ refers to the value they would place on this IT innovation if they started today given what we know today. Value inflation is the difference between these two quantities. In a similar vein, $Investment_{past}$ refers to the actual amount of investment they made in this project when they started it in the past. $Investment_{today}$ refers to the amount of the investment they would make in this IT innovation if they were to implement this project today given everything they now know about this IT innovation. The excess investment is the difference between these two quantities. The value inflation and excess investment variables are not quantified in dollar terms. They are being measured as magnitudes on a Likert scale.
Controlling Common Methods Variance

Particular care was taken to control common method variance (CMV) issues in the instrument which have plagued technology adoption model (TAM) studies in the past (Straub & Burton-Jones, 2007; Sharma, Yetton, & Crawford 2009). In particular, the order of presenting the independent variables (IV) and dependent variables (DV) in our instrument was changed, with half the respondents receiving an IV/DV order of the questions where the questions on the independent variables preceded those on the dependent variables, while the other half received a DV/IV order of the questions.

RESULTS

The result from this part of the study was the instrument that will be used in testing the theoretical model shown in Figure 2. The final instrument is given in the Appendix.

DISCUSSION AND CONCLUSIONS

This research targets the perennial question of why investments in IT often don’t return the level of benefits expected from them (Strassmann, 1985; Roach, 1987; Willcocks & Lester, 1993), or why managers so often invest in underperforming IT. We approach this question in a new way by drawing first upon the wisdom of practitioners. We turn to the Gartner Hype Cycle that avers that IT innovations are typically accompanied by much fanfare and this causes users to climb to the “peak of inflated expectations”. Our model focuses on both the causes and the consequences of customers having highly inflated expectations of new IT. We develop an information-theoretic model that relates inflated expectations to the information-related factors of information complexity and uncertainty. In the fanfare, hype, and confusion of launching new IT, customers who develop an inflated view of the value of an IT innovation may invest more in it than they should have. Perhaps the right decision would have been to not invest anything at all had they been given clear, non-conflicting, and understandable information instead of having to rely on information that is complex and uncertain while also having to make the decision within limited time and budgets. We have completed the instrument development for this research and affirmed its content validity through a small pilot where 17 firms participated in the pilot. The language of some of the items was changed as a result of this pilot.

The instrument development stage is now complete and the next stage of the research would be to do a full-scale mailing of the survey to collect the data and test the hypotheses in our theoretical model. As we are confident of the content validity of the instrument through our engagement with the 17 firms in the pilot, we do not plan on doing exploratory factor analysis. We expect to combine confirmatory factor analysis with the path model estimation in the next stage of this research.

APPENDIX

Survey Instrument

The items in the instrument for each of the constructs in the theoretical model are identified in this appendix.

Information Complexity (IC)

IC1: The technology was complex and difficult to grasp.
IC2: The technology had a complex architecture.
IC3: There were many vendors in this market with somewhat similar products.
IC4: It was difficult to understand the true differences between various products in this space.
IC5: It was difficult to ascertain which vendor has the best architecture for their product.
IC6: There were many confusing and overlapping standards in this space.

**Information Uncertainty (IU)**
IU1: It was not clear if this technology would fully meet our needs.
IU2: It was quite possible that our needs could change in unanticipated ways.
IU3: We were not sure if this technology would bring long-term benefits.
IU4: It was not clear what the total life-cycle costs of this technology would turn out to be.
IU5: It was possible that the costs of this technology could turn out to be lot more than planned.
IU6: It was not clear if the technology would perform as expected in our environment.
IU7: It was possible we may see a performance below what the vendors were claiming.
IU8: It was not clear which standards would ultimately win in this space.

**Expertise (E)**
E1: We had experts who could effectively evaluate this technology.**
E2: We did not have IT staff who had worked with similar types of technology.
E3: Our IT staff had not been trained in this type of technology and were not familiar with it.

**Time (T)**
T1: We had to quickly make a decision on whether to implement this technology
T2: We felt that our competition could get ahead if we did not quickly deploy this technology.
T3: There wasn’t enough time to do a full evaluation of this technology.

**Budget (B)**
B1: Sufficient budget was not allocated to do a full evaluation of this technology.
B2: We needed consultants to help with the evaluation but did not have the budget to hire them.
B3: Budget was not a problem with regard to thoroughly evaluating this technology.**

**Value Inflation (VI)**
VI1: We now believe we overestimated the value of the technology.
VI2: We now believe that the value of this technology is less than what we estimated at the time.
VI3: We now believe that the benefits will actually be more than what we had projected.**
VI4: We believe we may have underestimated the technology’s Return on Investment (ROI).

**Excess Investment (EI)**
EI1: We now believe we invested more in this technology than we should have.
EI2: We realize now that we should not have invested in this technology.
EI3: We did not invest enough and we need to increase our investment in this technology.**

**Note:** All ** items are reverse coded.

**REFERENCES**


