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# An Examination of Non-Adoption and Decision Inertia – A Web-Based Perspective

By

Rhoda C. Joseph

A dissertation submitted to the Graduate Faculty in Business in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York

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By

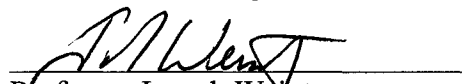
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This manuscript has been read and accepted for the Graduate Faculty in Business in satisfaction of the dissertation requirements for the degree of Doctor of Philosophy.

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THE CITY UNIVERSITY OF NEW YORK

# **An Examination of Non-Adoption and Decision Inertia – A Web-Based Perspective**

**By**

**Rhoda C. Joseph**

**Adviser: Professor Barry Dumas**

*The only menace is inertia.*  
St. John Perse

*The reason men oppose progress is not that they hate progress, but that they love inertia.*  
Elbert Hubbard

The innovation diffusion theory states that an individual will go through a set of stages to ultimately arrive at the decision to adopt or reject an innovation. This research presents a theoretical concept called decision inertia. Decision inertia is described as an intermediate state in the diffusion process. This state occurs when an individual develops a neutral attitude about the innovation and / or decides to neither explicitly adopt nor explicitly reject the innovation. Further, the type of innovation, the type of information and individual motivation are the main factors determining decision inertia. The three main objectives of this research are to: develop a theoretical framework for decision inertia; explore the attributes of this intermediate state; demonstrate its impact on the ultimate adoption decision. The theoretical construct of decision inertia can be very critical to how an innovation ultimately diffuses or does not diffuse through a target population. This research is motivated by the need to better understand non-adopters and the factors affecting their behavior- ultimately presenting and examining an explanation to resistance of technological innovations.

# **Dedicated**

To My Mother

Ruth Joseph

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## **Chapter 1: Introduction**

This study examines diffusion of web-based innovations, taking both an exploratory and explanatory approach. The exploratory component looks at identification of the intermediate state in the diffusion/adoption process we call decision inertia. The explanatory component builds on the identification of decision inertia and its ultimate impact on the diffusion of an innovation.

This chapter begins with a discussion of the motivation for this research. Following the motivation, the research questions are outlined and defined. The third section of the introduction describes the main areas of this study. The justification of the research and a list of the main hypothesis examined follows.

## ***1.1 Motivation for Study***

As an innovation diffuses through a target population, at any specific instance in time there will be members of the target population who 1. have adopted and continued to use the innovation, 2. have never adopted the innovation, and 3. adopted but have since discontinued its use.

This research, which focuses on web-based innovations, is motivated by a need to better understand members of the second group, those who have not adopted the innovation. We will call them non-adopters, individuals who at no point in the past, and as of the present date have not adopted the innovation.

Non-adopters can be further classified as rejectors(Ram 1987) or postponers (Gatignon and Robertson 1989; George 1995). This research is concerned with understanding the state that characterizes such individuals. Rejectors have explicitly decided that they will not use the innovation. Postponers are individuals who at some later date ultimately adopt the innovation. However, the prior research has not addressed the members of the population that are undecided. These individuals have not decided if they will ultimately adopt or reject the innovation. The examination of this class of individuals provides the foundation for the development of the decision inertia construct that is proposed in this study. This study proposes that there is a third group of non-adopters referred to as individuals in the state of Decision inertia.

Innovation diffusion theory states that individuals in the target population range from innovators to laggards (Rogers 1995). Innovators adopt innovations very early, while laggards adopt innovations at a much later point in time. The implicit assumption made is that all members of the target population will eventually adopt the innovation. Due to a pro-innovation focus in the research, much more attention has been paid to innovation adoption than innovation resistance (Brancheau and Wetherbe 1990; Parthasarathy and Bhattacharjee 1998; Ram 1987; Venkatesh and Brown 2001).

Our research posits that decision inertia is an intermediate state before explicit adoption or explicit rejection of an innovation that will ultimately affect the rate of innovation diffusion. Further, this intermediate state also affects the extent to which use of the innovation has penetrated through the target population. Hence it is important to identify the factors that can induce individuals to move out of the state of inertia and make an adoption/rejection decision.

## **1.2 The Research Questions**

The innovation diffusion theory states that an individual will go through a set of stages to ultimately arrive at the adoption or the rejection of an innovation. The five stages identified in the innovation-diffusion process are 1. knowledge 2. persuasion 3. decision 4. implementation and 5. confirmation (Rogers 1995). This research places decision inertia between the persuasion stage and the decision stage. Further this state can linger into the decision stage and affect the outcomes of the innovation-decision process.

The explicitly stated research questions are:

- Under what conditions does decision inertia occur?
- What are the characteristics of individuals in the state of decision inertia?
- What are the main variables affecting decision inertia?
- What is the impact of decision inertia?

### **1.3 Outline of the Study**

Section I gives an overview of the motivation, justification and research questions that define this study. Section II, provides a review of the relevant literature to support the decision inertia construct. This section contains four main chapters – chapters two through five. Chapter two provides a description of what defines an innovation and the different types of innovations. It also identifies one of the most important information technology innovations – the personal computer, and refines the discussion to the specific case of web-based innovations.

Chapter three discusses adopters and non-adopters. This chapter also addresses both the individual psychological factors, and the external innovation factors that affect the diffusion of an innovation. Innovation diffusion literature continues into chapter four, where the main characteristics of innovations are discussed. Chapter five addresses the issues of information valence and its impact on decision making. This section demonstrates that information valence is a critical component in decision making about an innovation.

Section three describes the research framework, based on the literature reviewed in Section II. Here the decision inertia construct is defined. Section IV discusses the methodology that will be used to examine decision inertia. This includes the mode of analysis followed by the experimental procedure involved.

Section V of this paper focuses on the major findings of this study. The results chapter is followed by a discussion of the results. The discussion focuses on an explanation of the hypotheses that were not supported. In this chapter there is also an explanation of the limitations of the study.

This paper concludes with an analysis of the direct implications of this study as it relates to practitioners and researchers. A general conclusion follows.

## ***1.4 Justification of the Study***

The focus of this research is on identification of the state where users are aware of and knowledgeable about an innovation but have not made an explicit decision to adopt or reject the innovation. This research positions an explanation for the delay or non-adoption of an innovation. The theory presented in this paper expands the knowledge in the field by elucidating another category in the diffusion process, developing explanations for the actions of its members and uncovering its impact. This study introduces an explanation for a special class of non-adopters defined as experiencing decision inertia.

This study argues that a state of decision inertia – a specific state of non-adoption –exists. In this state one of three events can follow: adoption, rejection or continued decision inertia. This research examines how to define this state, how to determine when it exists and under what conditions. Identifying and understanding the nature of this state provides a platform to better understand resistance to innovations, particularly in dynamic environments such as the World Wide Web.

## 1.5 Summary of Hypotheses

The main hypotheses that were tested in this study are formulated around the decision inertia construct. A statement of each hypothesis is listed below.

**Table 1: Summary of Hypotheses**

Hypothesis
1. Decision inertia is greater for negative information than for positive information.
2. Decision inertia is greater for discontinuous than continuous innovations.
3. Decision inertia is greater for consequential than functional characteristics of an innovation.
4a. Innovativeness moderates the relationship between information valence and decision inertia.
4b. Innovativeness moderates the relationship between innovation type and decision inertia.
4c. Innovativeness moderates the relationship between innovation characteristics and decision inertia.
5. Decision inertia is greater for individuals with low product involvement.
6. Decision inertia is greater for individuals with low awareness.
7. Decision inertia is greater for individuals with low perceived trust.
8. Decision inertia is greater for individuals with low perceived information relevance.
9. Decision inertia is greater for individuals with low perceived information completeness.
10. Decision Inertia is greater for individuals with low task satisfaction.

## **SECTION II. THE LITERATURE REVIEW**

This literature review primarily references studies in IT Diffusion, Consumer Behavior and Behavioral Psychology. Across these disciplines minimum attention has been paid to non-adoption of innovations. Identification of this gap in the literature caused a natural progression to the development of the proposed construct of decision inertia.

The literature review consists of four sections. The logic behind these four sections is that they examine the existing literature on innovations, the diffusion process, the type of information that is available on innovations, and of course the individual who eventually adopts or does not adopt the innovation. The inclusion of these sections provides a holistic view of the problem by identifying the major relevant components.

## Chapter 2: Defining Innovations

### 2.1 Types of Innovations

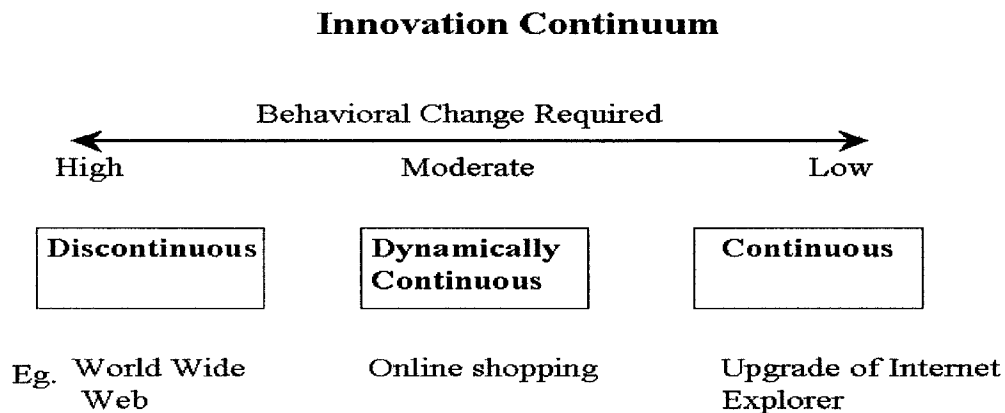
Innovations are classified into three main groups: continuous, dynamically continuous and discontinuous (Molesworth and Suortti 2001; Robertson 1967). The innovations classified have an impact on the established behavior patterns of users. The behavior patterns associated with each of the three groups is listed below (Robertson 1967):

- Continuous Innovation: *Has the least disruptive influence on established patterns. Alteration of an existing product is involved, rather than the establishment of a new product.*
- Dynamically Continuous Innovation: *Has more disruptive effects than a continuous innovation, although it still does not generally alter established patterns. It may involve the creation of a new product or the alteration of an existing product.*
- Discontinuous Innovation: *Involves the establishment of a new product and the establishment of new behavior patterns.*

A continuous innovation is one that deviates only marginally from the precursor that it replaced. A discontinuous innovation is one that is a radically new idea from anything that existed before. A dynamically continuous innovation describes an innovation that is

not completely revolutionary but has strong distinguishable characteristics from its predecessor.

**Figure 1:**



Source: Molesworth and Suortti 2001

Many different types of innovations, ranging from the discovery of electricity to wireless communication, have been advanced by various types of technology. Additionally, some innovations have become such a ubiquitous part of life that they no longer appear to be innovations.

There is no distinct point to determine when an innovation ceases to be perceived as an innovation. However, it can be a function associated with time, development of new

products and the audience. Some innovations, because of the drastic changes that they bring to life, continue to amaze and excite users as they diffuse globally.

Some innovations occur in groups and are described by Rogers (1995) as “technology clusters.” These technology clusters represent groups of products that are inter-related and their diffusion also becomes inter-related. One example is found in agriculture with the use of both fertilizers and pesticides to increase crop yield.

In the field of information systems such clusters can be seen with the bundling of operating systems and other auxiliary programs that need the specified operating system to function. This practice benefits the manufacturer, and eventually a critical mass of users may adopt the technology even if a competitor’s better product exists on the market. This occurrence is largely due to the compatibility of the varied elements that make-up the technology cluster.

Discontinuous innovations have a disruptive technology focus, while continuous innovations have an evolutionary or sustaining technology focus (Walsh, Kirchhoff et al. 2002). The disruptive nature of discontinuous innovations indicates that they occur less frequently than continuous ones. However, their impact can cause much more significant behavioral changes among developers and users.

### **2.1.1 Continuous Innovations**

Continuous innovations typically represent a replacement, substitute or an improvement of an existing technology (Walsh, Kirchoff et al. 2002). Continuous innovations are thus mainly evolutionary. Evolutionary products are a main staple in the field of Information Technology. Companies produce upgrades and newer versions of their products at a fairly rapid rate.

Continuous innovations usually provide a core competence for the firms that develop them. We argue that users of the product are not as resistant to such innovations because it is a version of a technology that they might have used in the past. Over time, an initially discontinuous innovation, can lead to successive generations of continuous ones. The cell phone in the U.S. market was a discontinuous telecommunications innovation (Rothaermel 2000) that is now experiencing the development of continuous versioning.

Continuous innovations in many instances function as a stable product for companies that produce them. The stability of continuous innovations is largely due to low technical and market uncertainties (Rice, Leifer et al. 2002). However, the reliability and stability of the continuous innovation can retard the development of more revolutionary innovations. It is argued that the focus and reliance on continuous innovations can actually retard a firm's potential to truly innovate with other products (Rice, Leifer et al. 2002). Despite this view, the continuous innovation represents a reliable revenue producer in many industries.

## 2.1.2 Discontinuous Innovations

A discontinuous innovation causes a significant change in the behavior of the individual. The incompatibility of the innovation, with the individual's previous behavior necessitates change in the behavior of the adopter (Agarwal and Prasad 1998a).

Discontinuous innovations are associated with high-assumed risk by both the developer who brings the product to the market, and by the consumer who eventually uses the product (Walsh, Kirchhoff et al. 2002; Walsh and Linton 2000). The risks associated with such products, also translates into higher levels of resistance to its use. The risk and resistance combination of discontinuous innovations can potential retard their diffusion.

The discontinuous innovation has been examined from the manufacturers perspective by looking at the characteristics of firms that develop such innovations (DeTienne and Koberg 2002; Walsh, Kirchhoff et al. 2002; Walsh and Linton 2000). The impact of the discontinuous innovation can cause transformations, emergence and even the disappearance of entire industries and markets (DeTienne and Koberg 2002). In a web-enabled environment these impacts can be highly visible because of the highly flexible and dynamic nature of the environment.

High levels of technical and market uncertainty are characteristic of discontinuous innovations (Rice, Leifer et al. 2002). Technical uncertainty encompasses issues such as

completeness, correctness, reliability and maintainability of the innovation. Market uncertainty addresses two main issues – clearly articulated customer needs and the existence of distribution channels. In the web-based environment the distribution channel is less important, because it is mainly a telecommunications problem. However, not meeting customer needs can make an innovation less appealing.

Discontinuous innovations are characterized as the children of disruptive technologies that add greater capabilities to mature technologies; provide dramatic increases in customer utility and cause major change in the technological base of an industry (Foster 1986; Lambe and Spekman 1997; Myers and Tucker 1989). Discontinuous innovations provide the foundation for developments in new and dynamic fields such as information systems.

### **2.1.3 Dynamically Continuous Innovations**

The dynamically continuous innovation lies between the continuous innovation and the discontinuous innovation. Its fuzzy definition (Robertson 1967) states that it is more disruptive than a continuous innovation but does not cause as many alterations in behavior patterns as a disruptive one.

For the web-based environment, on-line shopping is characterized as a dynamically continuous innovation (Molesworth and Suortti 2001). The logic behind this

characterization is that shopping itself is not new, but the on-line domain highlights a different set of environmental features, characteristics, constraints and concerns.

## ***2.2 Information Technology (IT) Innovations***

An IT innovation is described as one that relies extensively on technological advances such as computer hardware, computer software and telecommunications (Dekimpe, Parker et al. 2000). The adoption and diffusion of Information Technology (IT) innovations is of interest to both researches and practitioners in the IS community. The uniqueness of information technology necessitates the development of a distinct IT diffusion theory (Prescott and Conger 1995).

IT innovations can occur in a networked or non-networked environment. The networked environment is positively affected by the existence of network externalities. Network externalities occur where the technology is perceived as more useful and beneficial to the user as more individual adopt the technology. For example, when examining the adoption and diffusion of Electronic Data Interchange (EDI) - a networked technology, four sets of factors are considered: IT context, operational concerns, network externalities and exogenous factors (Bendoly and Kaefere 2003). With EDI technology value to the individual user is increased as other users adopt the technology. For non-networked technologies such as personal computers, network externalities will not be as significant a factor.

Irrespective of whether an IT innovation occurs in a networked or non-networked environment it presents a unique classification for innovations. IT innovations represent a dynamic and evolving class of innovations. One of the main drivers for the rapid diffusion of IT technology is the exponential growth of computing power. In fact, it has been found that computer power doubles approximately every 18 months (Laudon and Laudon 2004).

### **2.2.1 The Personal Computer (PC) – An IT Innovation**

The personal computer is a unique information technology innovation since it can exist in both networked and non-networked environments. The personal computer has had a significant impact on human behavior and is described as one of the clearest examples of a discontinuous innovation (Robertson 1967). The personal computer is used as an illustration to support two important assertions made in this research –1. all users in a target population do not adopt an innovation and 2. decision inertia exists.

The personal computer (PC) in homes sets the stage for the adoption of the World Wide Web and the plethora of ideas and products that followed. The 1980s saw the beginning of PCs in homes across America. In 1993 approximately one third of American homes had PCs (Anderson 1995), however by 1999 the number of homes with PCs was still approximately one third of American homes (Venkatesh and Brown 2001).

This statistic is very interesting for two main reasons. The first is that computer companies such as Dell Microsoft, IBM and Apple were showing record sales during that period, yet the number of households with PCs remained relatively fixed. Since IBM introduced its first PC in 1981, a plethora of innovations have followed to support the computer industry (Prescott and Conger 1995).

The second reason why this statistic is interesting is that more than 66% of American households have not purchased a PC in spite of all the benefits and advantages that can be derived from the use of this innovation. A recent study indicated that age, income and technological complexity were significant barriers to PC adoption (Wei 2001).

The non-movement of the number of adopters of PCs in the home suggests some level of stagnation (Venkatesh and Brown 2001). However, they do not elaborate on the cause or implications of stagnation. One plausible cause is decision inertia. A logical deduction regarding PCs in 1999, would be that the majority of American households would have heard about them. However, with only one third penetration in households, inertia can be one plausible explanation.

Explicit data supports the case that there is a correlation between household income and PC adoption. In 1989, 40 percent of homes with annual income over \$50,000 owned PCs, while only 5 percent of homes with income below \$15,000 owned PCs (Higgins and Shanklin 1992). The PC provides the window to access to the World Wide Web. Public institutions such as schools and libraries provide alternate access opportunities.

However, the examination of innovations spawned from the World Wide Web, excludes a large portion of the population who do not possess basic PC skills.

The promise of the World Wide Web itself a discontinuous innovation (Molesworth and Suortti 2001), has given birth to many other new innovations. These innovations range from financial examples such as on-line banking, on-line trading and purchases to downloading music and videos on-line.

The target of many of these innovations is the base of individual users. However, a lot still needs to be learnt about the adoption patterns of these innovations that are embedded into the larger innovation of the World Wide Web. This research attempts to broaden theory and understanding in this area.

### ***2.3 IT Innovations and Adoption***

The adoption of several different IT innovations has been examined in the literature – including smart cards (Plouffe, Hulland et al. 2001), Electronic Data Interchange (EDI) (Bendoly and Kaefere 2003). This research focuses on IT innovations that exist because of the Internet and web-based technologies.

The Technology Acceptance Model (TAM) (Davis 1989; Venkatesh and Davis 2000) and Perceived Characteristics of an Innovation (PCI) (Moore and Benbasat 1991) have

both been used to better understand the antecedents of technology adoption. Both models are highly intuitive, reliable and have high predictive power – allowing either to be used across settings (Plouffe, Hulland et al. 2001). The parsimony of the TAM model has facilitated its popularity, however PCI significantly outperformed TAM when predicting merchants' adoption intentions of a new smart card system (Plouffe, Hulland et al. 2001).

The IT adoption literature has used “intention to adopt” as a reasonable proxy for actual adoption behavior and continued use of a technology (Plouffe, Hulland et al. 2001). This is a very useful practice, since in many studies actual behavior is the variable of interest, but is difficult to actually measure.

IT innovations present a different contextual setting for the study of diffusion. IT innovations are complex and content-sensitive and thus no single theory has been found to completely explain the IT innovation phenomenon (Carter Jr., Jambulingam et al. 2001). The approach that has been used to study IT innovations, looks at each innovation or a related set of innovations separately.

One area where IT innovations differ from innovations in other fields is during the innovation development process. There is support for the case that the time to market of IT innovations is shorter than that of other innovations. This can be attributed to shorter product cycles and/or shorter product life span. This fundamental difference adds further support for looking at IT innovations separately.

### **2.3.1 TAM – Technology Acceptance Model**

The technology acceptance model (Davis 1989) examined the relationship of user perceived ease of use and user perceived usefulness as determinants for the probability of system use. TAM consistently explains about 40% of the variance associated with usage intentions and behavior (Venkatesh and Davis 2000). Further, the original TAM model was later revised to include subjective norms and tested longitudinally and defined as TAM2 (Venkatesh and Davis 2000).

TAM has been tested with other constructs to further explain users intentions and behaviors: TAM with trust and risk for e-commerce acceptance (Pavlou 2003); TAM with flow theory to explain consumer behavior on the web (Koufaris 2002); TAM with motivation and emotion (Venkatesh 2000). Extensive empirical support for the TAM constructs has been found (Adams and Nelson 1992; Chin and Todd 1995; Davis, Bagozzi et al. 1989; Gefen and Straub 1997; Klaus, Gyires et al. 2003; Taylor and Todd 1995; Venkatesh and Morris 2000).

One underlying theme of TAM is that it captures user perceptions. When perceptions are excluded, ease of use and usefulness are informational constructs. Information on these constructs can be derived from different sources including manufacturers, independent reviews, consumer groups and peers.

## ***2.4 Web-based Innovations***

One of the main distinguishing features of web-based IT innovations, as opposed to innovations in other fields is the precursor that exists. The World Wide Web is itself an innovation that has revolutionized economic, social and political domains. The use of the World Wide Web has grown exponentially (Rai, Ravichandran et al. 1998) and it has given birth to a plethora of other innovations. The examination of innovations, within an innovation itself presents a unique case for the examination of diffusion theory.

One of the unique characteristics of web-based innovations that distinguish them from any other is the range of diverse products that are available. Innovations that are web-based can be categorized as continuous, discontinuous or dynamically continuous innovations. The popularity of the web, low investment costs and purported benefits makes the web particularly attractive for most businesses and organizations to disseminate their products and/or innovations (Nambisan and Wang 1999). The variety and accessibility that the web provides makes it appealing at both the producer and consumer levels.

## **Chapter 3: Adopters and Non-Adopters**

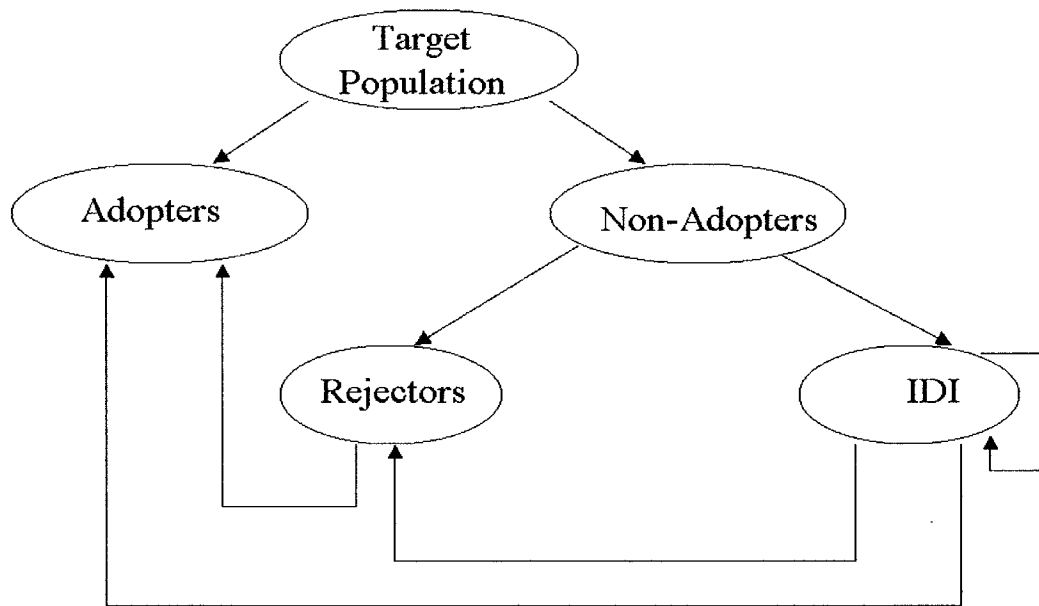
### ***3.1 User Categories***

This research adopts the nomenclature of adopters and non-adopter to describe the pool of individuals in the target population of the innovation. The different adopter categorizes are: innovators, early adopters, early majority, late majority and laggards (Rogers 1995). Innovators are the first to adopt and the laggards do so at a later point in time. The inherent assumption in this categorization is that at some point in time, all the members of the social system being examined will become adopters. There is some question as to the generality and accuracy of this assumption (Robertson 1967). The non-adopter is ignored in this model.

An innovation is generally directed to a target population of users. At any instance in time after the introduction of the innovation, there will be individuals of the target population that have adopted the innovation (adopters) or that have not adopted the innovation (non-adopters). The literature has identified two categories of non-adopters: explicit rejectors and postponers (Gatignon and Robertson 1989; Szmigin and Foxall 1998). Explicit rejection is an active process, where the individual has decided against the innovation. Postponement is also an active process where user has delayed the adoption process. We contend that a third more passive state exists where the user is seemingly indifferent to information about the innovation. This conceptualization is key to the

decision inertia construct. The figure below illustrates the adopter and non-adopter categories.

**Figure 2: Categorizing Adopters and Non-Adopters**



III – Individuals experiencing Decision Inertia

The three categories of non-adopters illustrated are rejectors, postponers and individuals experiencing decision inertia. The last group can move to explicit rejection, explicit adoption or remain in that state.

### **3.2 Innovation Resistance**

Change is inevitable but it is a phenomenon that can be severely resisted. In fact individuals seem to have a natural disposition to resist change and maintain the current status quo (Ram 1987). In some work and social settings individuals can be under significant pressure to resist change and conform to the group norms.

An innovation can face a high degree of resistance if it causes significant disruptions in the normal behavior patterns of users (Ram 1987). When an innovation is resisted, it is viewed as a shortcoming of the potential adopter who is further labeled a “laggard” (Rogers 1995). The laggard is a synonym for postponer that has been mentioned above. These terms do not carry positive connotations and seem to ascribe blame to the potential adopter rather than on attributes of the innovation. It is important to move beyond the negative projections of such individuals and examine more critically the larger class of non-adopters that include not only explicit rejectors and postponers but those that are truly undecided.

Many perceived barriers exist that retard the individual from the adoption of an innovation. Two main sources of resistance to innovations exist: functional barriers and psychological barriers (Ram and Sheth 1989). Functional barriers (Ram and Sheth 1989) refer to perceived changes that will result from the use of the innovation and include: usage barriers – the innovation is not compatible with the user’s existing habits; value

barriers – the cost of adopting the innovation exceeds the expected benefits; risk barriers – the user needs to be able to mitigate the physical, economic, functional (performance), social risks that are associated with the use of the innovation.

The second source of resistance – psychological barriers (Ram and Sheth 1989) refer to the perceived conflicts with the user's prior beliefs that will result from the use of the innovation and include: tradition barriers – the use of the innovation will cause the user to regress from established social, religious, institutionalized traditions; image barriers – the origins and identity of the innovation is viewed negatively by the user, and its use will be resisted.

These barriers provide a compelling basis to better understand why users resist innovations even though (Ram and Sheth 1989) did not explicitly test these constructs. Gradual integration, government mandates and education (Ram and Sheth 1989) are all proposed strategies to help reduce innovation resistance. Empirical tests about sources of resistance can provide further support for some of the assertions made by Ram et al (1989).

Ram et al. (1989) argue that innovation resistance is not the inverse of innovation adoption but instead is the antecedent to adoption. The reasoning to support the argument is that an individual must first overcome resistance before adoption to occur. Theoretically, there will be varying degrees of innovation resistance. If the degree of innovation resistance lies on a continuum from zero to one, then resistance of zero will

coincide with adoption and resistance of one will coincide with explicit rejection. An intermediate undecided state will lie between zero and one.

In addition to examining the antecedents to innovation resistance, other researchers have studied different types of innovation resistance (Gatignon and Robertson 1989; Szmigin and Foxall 1998). Three types of innovation resistance are identified in the literature: rejection, postponement and opposition (Gatignon and Robertson 1989; Szmigin and Foxall 1998). The boundaries across these three categories are somewhat blurred. The examination of innovation resistance is as significant as the examination of innovation adoption because they represent the poles bounding the results of the diffusion of an innovation.

Rejection occurs when an individual has processed the available information and decided that they will not use the innovation (Szmigin and Foxall 1998). The individual is thus an *active rejecter* of the innovation.

The second type of resistance: postponement, occurs when the individual has decided to delay the adoption of the innovation (Gatignon and Robertson 1989). A postponer is a type of non-adopter. The postponer is in an active state, waiting for his/her perceived best time to adopt the innovation.

The third type of innovation resistance categorized in the literature is innovation opposition. This occurs when the potential adopter actually tests the innovation but ultimately rejects it (Szmigin and Foxall 1998). This can be further characterized as discontinuance of the innovation (Parthasarathy and Bhattacharjee 1998). Discontinuance is outside the scope of this study.

Szmigin et al (1998) examined the use of innovative payment methods, such as credit card, debit card, store card in a purchase transaction and concluded that innovation resistance is based on both situational and psychological factors. Situational and psychological factors represent very broad categories but provide directions as to what to examine when trying to find root causes for innovation resistance. It also provides a basis for the further examination of the characteristics, attitudes and behaviors of non-adopters.

One of the challenges with clearly identifying innovation resistance is that it is not always observable (Midgley and Dowling 1978). Clearly distinguishing the different types of innovation resistance can provide an opportunity for better understanding, since resistance is a multi-faceted resister phenomenon.

### **3.2.1 Innovation Resistance in Organizations**

It has been argued that the innovation resistance includes situational components (Szmigin and Foxall 1998) that must also be examined. The issue of voluntariness is a situational component that varies in work and non-work environments (Venkatesh, Morris et al. 2003). Technology adoption at work is usually implemented across the organization or unit, and not at the individual user level. Consequently its use may be necessary to accomplish work related tasks and thus mandatory for the employee to use.

Innovation diffusion in an organizational context has been examined in a variety of ways such as, pre and post adoption beliefs (Au and Enderwick 1998; Karahanna, Straub et al. 1999); adoption opportunity and knowledge barriers (Nambisan and Wang 2000); information costs and adoption policies (Jensen 1988); adoption intention and strategic decision making (Tabak and Barr 1998); technological opportunism and technology adoption (Srinivasan, Lilien et al. 2002). At many of the above levels, concerns have been expressed regarding the non-adoption of the technology in question.

Potential adopters base their decision to adopt solely on normative pressures, while user intention is based solely on attitude (Karahanna, Straub et al. 1999). The normative pressures are perceptions about the innovation's ease-of-use, usefulness, demonstrability, visibility and triability (Karahanna, Straub et al. 1999). When a potential adopter is

hesitant about their perception of the innovation a delay in their final decision will be an inevitable consequence.

In an organizational setting the innovation adoption process is largely stimulated by the economic profit that will be derived from the use of the innovation. When there is uncertainty with regards to the profitability of an innovation, management decision-making involves several points at which a “wait” policy is adopted (Jensen 1988). Management may be waiting for more environmental stability before proceeding.

The idea of a wait policy is largely driven by the amount of uncertainty associated with the implementation and adoption of the innovation. The uncertainty is driven by individual, hierarchical, structural and cultural differences within the organization (Wettemann 2003). Without clear directives on the profitability of the innovation indecision can persist before a final adopt or reject decision is made.

### ***3.3 Factors Affecting IT Diffusion***

The diffusion of information technology happens in both work and non-work environments. Diffusion is affected by psychological factors of the user and characteristics and attributes of the products. This sections looks at the contrast between work and non-work environments and the main factors that directly and indirectly affect diffusion.

The home environment typically differs from a work environment when the technology adoption process is considered. One main difference is that the home may be void of some of the subjective norms and pressures that can typify the work environment. These norms include factors such as satisfying the requests of a manager or supervisor, conforming to pressure from colleagues and peers, employee advancement and compensation (Olson 1982). Pressures and concerns do exist in the home environment as well, however, the motivations and reward structure in these two environments are typically not the same.

The use of innovations in the workplace can potentially motivate the use of similar innovations at home. The awareness and familiarity of software and hardware products used at work can encourage use at home as well. Technology facilitates the capability to perform work related tasks at home (Olson 1982) . Hence, technology used in work settings, can support non-work functions in a home setting as well.

For many innovations, their successful diffusion through a social system have been thwarted by the persistence and non-mobilization of a large majority of indifferent members who are largely knowledgeable and familiar with the existence of the innovation but have not actively sought to use it. The personal computer, in spite of the proven value and benefits it provides has remained at one-third penetration of American homes for over a decade (Venkatesh and Brown 2001). The indifferent members contribute to the development of the decision inertia construct.

Continued adoption of an innovation is affected by a pre-adoption phase and a post-adoption phase. The adoption of an innovation and the continued use of the innovation are affected by different factors (Karahanna, Straub et al. 1999). The attitude of potential adopters is affected by trialability, perceived usefulness, result demonstrability, visibility, ease of use, perceived usefulness and image; while post adopters have a smaller subset of the above attributes in their reference set (Karahanna, Straub et al. 1999). The difference in the pre and post adoption reference set, supports the assertion that there is value in examining an undecided reference set as well.

Adopter traits, socio-economic status, communication channel and attributes of the innovation can all be barriers affecting the adoption of an innovation (Wei 2001). Broadly these factors are either external or internal to the potential adopter. It is necessary to clearly examine and differentiate between psychological / intrinsic factors and functional / extrinsic factors.

### **3.4 Psychological Factors**

The psychological factors are those that are personality and trait based characteristics of the potential adopter. These characteristics vary across individuals and cover a wide range of possibilities. Psychological factors affect the potential adopters attitude towards the innovation (Karahanna, Straub et al. 1999).

There is a void in the examination of intrinsic and psychological motivation in Information Systems research (Davis 1989). However many successive studies have examine such factors (Agarwal and Prasad 1998a; Koufaris 2002; Venkatesh 2000; Venkatesh and Davis 2000; Venkatesh, Morris et al. 2003) The individual's personal relevance to a technological innovation affects his/her adoption of the innovation (Malhotra 1999). Consequently, psychological and intrinsic factors are relevant when examining the diffusion of innovations.

Risk propensity, self-efficacy, cognitive complexity, education, age and experience explained only 7% of the variance of how individuals interpret organizational innovations (Tabak and Barr 1998). It is thus necessary to use other measures that are more holistic when capturing intrinsic information about innovativeness.

The discipline of psychology is the primary domain for studies related to human personality. Human personality is a major subgroup in Psychology (Gerow 1992; Lahey 2001). Our research is not aimed at covering the wide range of options associated with psychology and personality, but instead focuses on those that are relevant to innovation diffusion. The two major psychological characteristics related to this study are innovativeness and involvement.

### **3.4.1 Innovativeness**

One of the most frequently examined intrinsic factors in the innovation diffusion literature is innovativeness. The consumer behavior literature has done the most significant amount of research in this area.<sup>1</sup> In the field of information systems, innovativeness has been specifically measured in terms of information technology adoption and described as Personal Innovativeness in the Domain of Information Technology (PIIT) (Agarwal and Prasad 1998b). The PIIT scale is attached as Appendix B.

Innovativeness is a persistent personality trait that can be measured on a continuum ranging from high to low in value (Midgley and Dowling 1978). One definition of innovativeness states that it is the degree to which an individual is relatively earlier in adopting an innovation than other members of the system (Rogers and Shoemaker 1971). Another states that innovativeness is defined as the degree to which and individual makes

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<sup>1</sup> Midgley and Dowling (1978) and Im, Bayusm, Mason (2003) provide comprehensive literature reviews.

innovation decisions independently of the communication experience of others (Midgley 1977). Collectively, both definitions encompass issues of time and communication.

The communication experience that is referred to in the second definition of innovativeness has two main dimensions. The first dimension examines information communicated by the mass media. This involves different channels such as radio, television, telemarketing, faxes, e-mail and other forms that are possible through improved communication technologies. The second component addresses interpersonal communication with peers, friends, family and other change agents that the individual interacts with. The more “innovative” individual typically makes a decision prior to consultation with any of the above-mentioned groups or individuals.

The highly innovative individual seems to have strong intrinsic motivation. Intrinsic motivation is broadly defined as “the perception that users will want to perform an activity for no apparent reinforcement other than the process of performing the activity per se” (Venkatesh, Morris et al. 2003). Consequently, highly innovative individual may pay less attention to external information about an innovation.

The innovativeness literature has had mixed results in three main areas: how it can be measured; what are its antecedents and what it determines (Midgley and Dowling 1978). The apparent discrepancies that exist in the literature are largely explained by situational variables. The section below highlights the current state of the literature as it pertains to the innovativeness construct.

### *Measuring Innovativeness*

Two standard methods have been employed in the diffusion literature to measure innovativeness (Joseph and Vyas 1984) – the first method states that the most innovative individuals will have the smallest relative adoption time; the second measure states the most innovative individuals will be owners of the latest innovations. From these two measures it shows that innovativeness is a multidimensional construct – defined in at least two different ways: time to own and current ownership. One limitation of these measures is that they show the effects of innovativeness but do not necessarily present absolute measures of its existence. These are secondary measures and seem imprecise. A more meaningful measure might be based on a percentage value of the likelihood of the individual to adopt the specific innovation.

One way of addressing the issue of measurement is to first differentiate between the two different types of innovativeness. Two different types are 1. innate innovativeness – a high level of abstraction related to openness to trying new experiences and 2. actualized innovativeness - which is the observed measurable component related to a specific product (Midgley and Dowling 1978).

These two types of innovativeness have also been more widely classified as “open-processing” innovativeness and “domain-specific” innovativeness (Citrin, Sprott et al. 2000). Separate scales have been tested and validated for both open-processing innovativeness (Joseph and Vyas 1984) and domain specific innovativeness (Agarwal and Prasad 1998b; Goldsmith, d'Hauteville et al. 1998; Goldsmith and Hofacker 1991).

In the Information Systems literature a special case of the “domain-specific” innovativeness has been examined. This special case looked at innovative with respect to the World Wide Web and is referred to as PIIT. PIIT is defined as “the willingness of an individual to try out any new IT”(Agarwal and Prasad 1998b). The PIIT scale moderates the relationship between innovation characteristics and adoption intentions (Agarwal and Prasad 1998b). PIIT is a moderator for intention but more research has to be done examining PIIT under different IT innovations and different environmental settings.

Irrespective of the terminology used, the relationship that exists between these two types of innovativeness is a complex one that warrants further investigation. One interesting finding is that domain specific innovativeness has been more useful than open processing innovativeness in predicting the adoption of innovations (Citrin, Sprott et al. 2000; Joseph and Vyas 1984). This further illustrates the situational component that is associated with measuring innovativeness.

Another problem with measuring the innovativeness construct is time. There is a temporal component associated with the innovativeness trait. In one definition of

innovativeness, there is a characterization of “earlier in adopting.” Exactly how early is early, and a what point does it become late? On a review of 23 different studies, 48 percent used relative adoption time in calculating innovativeness (Midgley and Dowling 1978).

Measuring time in the diffusion process is contingent on several factors. These factors include the type of innovation, the target population of the innovation, and the norms of the particular environment. The difference of environmental norms can be seen if an innovation on the World Wide Web is compared to an innovation in medicine. A different set of variables is involved in the diffusion of a new drug than say, a new information presentation format on the web.

The major tradition employed when gathering information on diffusion time has been post hoc. The researchers typically asked the adopter when did they first use the product. In one particular study, the subjects were simply asked if they were a current owner of a particular product and when did they acquire the product (Baumgarten 1975). To truly account for time in the innovativeness measure, the research must capture external information about the innovation, and the environment it is in to accurately determine when early, is no longer so.

#### *Antecedents of Innovativeness*

Past research has linked innovativeness to other personality characteristics of individuals. Innovators have been characterized as younger, cosmopolitan, more gregarious and

socially peer integrated (Baumgarten 1975). However, the links between innovativeness and demographics has been much more challenging to establish.

The following demographic attributes had no significant relationship to innovativeness: religion, family income, size of hometown, location of hometown (Baumgarten 1975).

The choice to examine these factors may have been influenced by the assertion that innovators are usually urban dwellers and of higher economic standing.

As research has developed in this field it has become increasingly more difficult to make general statements relating demographics to innovativeness. However, age and income were identified as strong predictors to ownership of consumer electronics (Im, Bayus et al. 2003). Gender and age were also found to be moderators of the relationship between direct determinants and the intention to use a technology (Venkatesh, Morris et al. 2003).

The personal characteristic of dogmatism was negatively correlated with innovativeness and the adoption of new ideas (Altemeyer 2002; Jacoby 1971). However, given a different situation (the dogmatic individual was gift buying) dogmatism and innovativeness were positively correlated (Coney and Harmon 1979). A more recent study found that there was no relationship between dogmatism and innovativeness (Reisenwitz and Cutler 1998). Due to apparent inconsistencies associated with some individual characteristics and innovativeness, a situational perspective must be applied to better understand and evaluate the relationship.

*What Innovativeness relates to*

In the most general term, innovativeness affects the individual rate of adoption of an innovation. More specifically, domain specific innovativeness has provided most of the support for this assertion (Goldsmith, d'Hauteville et al. 1998). Domain specific innovativeness typically functions as a moderating variable.

One example of domain specific innovativeness is in web-use. High web-use innovativeness means that an individual is highly involved and interested in web-use. A specific case indicated that users with high web-use innovativeness have a much higher adoption rate for internet shopping (Citrin, Sprott et al. 2000). High innovativeness for general web-use will positively affect adoption rates for other web-related products.

An individual with high domain innovativeness, is usually more venturesome, in that particular domain (Agarwal and Prasad 1998b; Donnelly Jr. and Ivancevich 1974). Consequently, such individuals will be less restricted by situation factors when making adoption decisions.

### 3.4.2 Involvement

Prior to 1989 research in the field of Information Systems defined user involvement as “participation in the systems development process” (Barki and Hartwick 1989).

However, other disciplines such as Psychology, Marketing and Organizational Behavior regarded user involvement as a subjective psychological state. As a result of an apparent discrepancy with experimental results relating involvement to participation the second definition of user involvement, stating it was a psychological state, was also adopted in the field of Information Systems.

User involvement was thus defined as a concept distinct from user participation and explicitly described as a “subjective psychological state reflecting the importance and personal relevance of a system to the user” (Barki and Hartwick 1989). To further differentiate user involvement from the early assumption that it was a synonym for user participation at least four different types of user participation are identified (Barki and Hartwick 1994):

- Direct participation – This refers to personal individual action.
- Indirect participation – This refers to action via representation through a third party.
- Formal participation – This refers to action through channels such as meetings, groups.

- Informal – This refers to action through informal relationships, discussions.

In addition to being involved with a system, a user can be involved with advertisements, products or purchase decisions (Zaichkowsky 1985). In fact the foundation work on measuring the involvement construct was done by Zaichkowsky (1985). She concluded that individuals with high user involvement have personal relevance to the object that the involvement relates to. The PII, Personal Involvement Inventory is a bipolar adjective scale used to measure involvement, PII is sensitive to changes in a situation as the person and product remain constant (Zaichkowsky 1985). The PII is the most referenced scale that has been used to measure involvement.

However, one of the main criticisms of the initial PII (Zaichkowsky 1985), has been that it not only measures involvement but that there are also evaluation components included in the scale (Barki and Hartwick 1994; McQuarrie and Munson 1992). A revised scale was proposed to address some of the limitations identified by the initial PII. Enduring involvement refers to a more fixed state of involvement, situational involvement refers to a more dynamic state that is influenced by particular conditions, while felt involvements serves to capture the net involvement of both enduring and situational (McQuarrie and Munson 1992). The revised PII (McQuarrie and Munson 1992) includes less items than the original PII, has more simple language and addressed some of the original limitations listed above by capturing both enduring and situational involvement.

Involvement can also be described as perceived personal relevance (Petty, Unnava et al. 1991), which affects how a person processes a message. Involvement is a psychological state of the individual. An individual with high involvement to a product / process will be much more attentive when information about that item is presented.

One of the main implications of user involvement is that users with high involvement would hold very strong beliefs about a product (Zaichkowsky 1985). Given the strong beliefs of users they may be more biased to accept an innovation that they are highly involved with, even if negative information about the innovation is available.

### ***3.5 User Perceptions***

User perceptions are of interest in the area of Information Systems. Some of the more recent studies involving information systems and user perceptions examine perceptions about: website reputations (Toms and Taves 2004); online services (Cai and Jun 2003); e-mail (Dawley and Anthony 2003; Jessmer and Anderson 2001); system performance (Jiang, Klein et al. 2001); system design methodology (Purvis and Sambamurthy 1997).

This study examines the user's ability to decide on the adoption or rejection of an innovation, based on information presented.

Four main perceptions are examined in this study: information completeness, relevance, awareness, trust. The main reason for the interest in user perceptions is that favorable perceptions about a technology or system positively affect its adoption (Agarwal and

Prasad 1998a; Venkatesh 1999). These four attributes are examined, primarily because they have been shown to affect the decision making ability of subjects. This study is positioned in the domain of decision making, because it focuses on subjects who remain undecided about the adoption of an innovation. The sections below address the literature that supports the inclusion of these four attributes as critical when examining whether an individual explicitly adopts an innovation.

### **3.5.1 Information Completeness**

To make any decision, a certain amount of information about the subject must be furnished to the user. To adopt or reject an innovation also requires access to various amounts and types of information about the innovation. The perception of the degree of completeness of information presented affects the eventual decision outcome (Ahituv, Igbaria et al. 1998; Dennis and Carte 1998; Kivetz and Simonson 2000; Sridhar and Balachandran 1997a). If the user perception about the level of completeness affects the decision outcome, we further expect that perceptions about information completeness would also affect indecision.

On area that has received attention on the examination of perceived completeness of information is in the presentation of corporate information in a web domain. Missing information affects the user's ability to make selections and comparisons when decisions need to be made. On corporate web-sites the five most frequent attributes or cues in relevance order are: 1) price or value 2) performance 3) quality 4) safety and 5) taste

(O'Keefe and McEachern 1998). When one or more of these common attributes are missing it affects the individual's ability to make choices about the company, particularly when these attributes are present on other sites.

The rational decision making process assumes that the decision-maker wants to derive the optimal result or the optimal set of solutions. With the perception of incomplete information that task can be a challenge. However, retail shoppers are a group of users that have not always conformed to this rational model of decision-making. The shopper can deviate from utility-maximizing behaviors by influence of other conditions such as the store's physical environment, the location of products and components associated with the shopping experience (Chau, Au et al. 2000). In such instances the other factors can compensate for information that another user might deem necessary. From an innovation adoption perspective, it is important to examine the link between perceptions about the completeness of the information, and the individual's ability to explicitly adopt or reject the innovation.

In an ideal world complete and relevant information would exist on all things. However, there are boundaries within which complete information is defined. The completeness of information becomes much more visible when comparisons are to be made. Given the price of product A, there is only incomplete information when the price and taste of product B is given and when a comparison is done to highlight these differences. Therefore in both actual and experimental settings complete information can be represented by the presence of a few attributes, and incomplete information will be the

absence of one or more of those attributes. Experimental studies explicitly manipulating the level of information completeness have used on average 2-4 attributes to represent complete information (Ahituv, Igarria et al. 1998; Kivetz and Simonson 2000; Sridhar and Balachandran 1997a) . In some instances the subjects did not discern that they were presented with incomplete information, and they proceeded with the decision task. As individuals try to make adoption decisions about a technology, perceiving that the information is incomplete can have a ultimate impact on their decision making ability.

Incomplete information is one type of situation under the umbrella of uncertainty in decision-making. Users cope with this type of uncertainty in three main ways: suppressing it, denying it or using assumption-based reasoning (Van Birgelen, De Ruyter et al. 2000). With assumption based reasoning the individual fills in the gap of missing information by extrapolating on the information that they have already been presented with. As individuals are presented with information on various innovations, they can perceive that information is missing, but ignore the omission. If there is a perception that the information is incomplete and the user does not ignore that perception, we argue that it can indeed affect the user's ability to adopt the innovation.

### **3.5.2 Information Relevance**

Information will only be useful to decision making when it is perceived as relevant to the decision-maker. If information is perceived as irrelevant, it can potential retard or impede the decision making process. Identification of relevant documents is a necessary component in information retrieval and decision-making (Huang and Wang 2004; Vakkari and Sormunen 2004). Information retrieval is usually a key pre-cursor of decision-making.

Relevance in the existing Information Systems literature has been largely focused on reducing the gap that exists between research and practice (Benbasat and Zmud 1999; Robey and Markus 1998). The focus here is at the level of determining relevance of information presented to the decision maker.

### **3.5.3 Awareness**

Innovation awareness is defined as having a favorable attitude towards an innovation (Agarwal and Prasad 1998a). The awareness construct requires some interaction with the innovation directly or indirectly to develop a favorable attitude about it. Awareness may arise as a result of different pre-conditions, but the end is what is of importance. A

favorable attitude towards an innovation can further have an impact on associated behaviors. This is a direct link from the theory of planned behavior which states that attitudes affect intentions, which ultimately influence behaviors (Ajzen 1991). In this research we further examine innovation awareness to see its impact on the individual adoption behavior.

### **3.5.4 Trust**

An examination of the decision-making literature finds that trust is an important recurring theme (Driscoll 1978; Korsgaard, Schweiger et al. 1995; Spreitzer and Mishra 1999; Wang). Trust is a critical component when examining decision making in the domain of e-commerce (Jarvenpaa, Tractinsky et al. 2000; Koufaris and Hampton-Sosa 2004). Trust has received increased attention in the information age, particularly motivated by the onset of electronic commerce and the introduction of various innovations spawned by the internet and the World Wide Web. The process of decision making deals largely with the presentation of facts processed towards an ultimate goal. Trust is a less concrete concept, which also plays a critical role when decisions need to be made.

Trust can be defined along two dimensions: first as an assessment of a current situation and secondly as an innate personality trait or predisposition (Driscoll 1978). When trust is examined as an innate personality variable, individuals with low trust were generally more risk averse with decision making than individuals with high trust (Bonoma and

Johnston 1979). Our study does not identify adoption of an innovation in terms of the level of risk, however, with low trust of the source of information, we argue that individuals will have greater uncertainty and indecision regarding the innovation.

Since trust has been identified in the literature, as a critical component to decision-making, what is its significance when there is indecision? Some have even argued that indecision can be worse than making the wrong decision (Webber 1987). From an innovation diffusion perspective, indecision means that the innovation has not been adopted, which is one of the primary goals of introduction of the innovation. Since the literature shows that trust affects decision-making, the impact when an explicit decision is not made would provide an extension to the current literature.

### ***3.6 External Factors***

External factors are not based on innate characteristics of the individual. Instead they are derived from external stimulation, and influence the formation of user perceptions about the innovation.

The extrinsic factors capture information from the influence of peers, colleagues, classmates, friends, community leaders, mass media and others that can ultimately

influence attitude and behavior of the potential adopter. These extrinsic motivating factors are acting on the subjective norms of the potential adopter.

In a work setting, top management had the most significant impact of the subjective norms of the end-user (Karahanna, Straub et al. 1999). These results do not seem surprising, but in fact empirically validate an expected outcome for a less than voluntary innovation adoption environment. This is largely due to the nature of the work environment where the decision to implement an innovation is top-down and lower level employees have little or no involvement in the decision making process.

The two most significant determinants found to affect the potential adopter's attitude were perceived usefulness and triability (Karahanna, Straub et al. 1999). The significance of perceived usefulness might be related to the fact that it has been so widely examined. The triability character seems logical, since an individual will be able to gain further information and understanding about the innovation by trying it.

The class of external factors can be summarized by an examination of common features across the factors. This study presents a bi-level classification for these factors. The first category refers to the functionality and the inherent attributes of the innovation. The second category looks at the consequences of the use and possession of the innovation. Both groups will be expanded in section 4.2.

## **Chapter 4: Innovation Diffusion**

This chapter develops under three main areas. The first area examines what is innovation diffusion theory. The second section focuses on the characteristics of an innovation. The third and final section focuses on the innovation diffusion process.

### ***4.1 What is Innovation Diffusion***

The study of the diffusion of innovations has been of interest in many fields such as sociology (Ryan and Gross 1943; Van den Bulte and Lilien 2001); consumer behavior (Bagozzi and Lee 1999; Molesworth and Suortti 2001) and information systems (Agarwal and Prasad 1998b; Brancheau and Wetherbe 1990; Newell, Swan et al. 2000).

The studies in the various fields have been influenced to varying degrees by the foundation work done by Rogers (1995). In the field of information systems there has been interest in the factors that affect the adoption of innovations (Karahanna, Straub et al. 1999; Moore and Benbasat 1991; Venkatesh and Brown 2001) and what characterizes innovators (Citrin, Sprott et al. 2000; Joseph and Vyas 1984; Midgley and Dowling 1978).

The diffusion of innovation theory (Rogers 1995) explains how an idea, practice or object is communicated through a population. Diffusion is further described as “the process by which an innovation is communicated through certain channels over time among the members of a social system”.

(Rogers 1995) looked at thousands of innovation studies and characterized the main components in the diffusion model as:

1. Innovation – The idea, practice, object that is perceived as new.

*“An innovation is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. It matters little, so far as human behavior is concerned, whether or not an idea is objectively new as measured by the lapse of time since its first use or discovery. The perceived newness of the idea for the individual determines his/her reaction to it. If the idea seems new to the individual, it is an innovation.”* (Rogers 1995).

2. Communication Channel – The medium that supports communication from one person to another.
3. Time – The innovation development process and the rate of adoption.
4. Social System – The set of components that support the adoption.

Research studies on innovation diffusion originated in the discipline of rural sociology<sup>2</sup>.

One of the seminal studies on innovation diffusion, conducted at Iowa State University, examined hybrid corn adoption across farmers (Ryan and Gross 1943). Diffusion

research has gained a strong theoretical and methodological footing over the decades.

This rich research tradition continues to provide a framework for studies in diverse fields.

Economic modeling has been extensively used to examine theoretical concepts affecting

innovation diffusion (Baptista 1999; Bass 1969; Bass 1980; Dewan, Jing et al. 2000;

Lissoni 2000; Mahajan and Peterson 1978; Norton and Bass 1987). The economic models

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<sup>2</sup> The study of issues related to rural people, places, institutions and organizations.

examine issues such as: demand and growth forecasting, rate of diffusion, the diffusion curve, firm strategic decision making, supply side demands. This study does not take an economic approach but instead employs a behavioral approach for studying innovation diffusion.

The study and examination of innovation diffusion particularly technological innovations is of research interest to the field of Information Systems. Many of these innovation diffusion research studies in Information Systems have focused on organizational contexts with very little attention placed on the home and other non-work environments (Venkatesh and Brown 2001). The individual non-work setting defines personal voluntary usage of technology, which is generally less constrained than work settings that conform to specific norms, cultures and structure.

## ***4.2 Characteristics of an Innovation***

For any innovation there are several characteristics that affect its adoption (Moore and Benbasat 1991; Rogers 1995). The five main attributes of an innovation that will affect its adoption are (Rogers 1995) relative advantage, compatibility, complexity, observability and triability. The characteristics introduced by Rogers (1995) were later expanded (Moore and Benbasat 1991) with the division of observability into image and results demonstrability, and the inclusion of voluntariness. These characteristics have had varying degrees of influence in the adoption process (Gefen and Straub 1997; Karahanna, Straub et al. 1999; Moore and Benbasat 1991; Taylor and Todd 1995;

Tornatzky and Klein 1982; Venkatesh and Davis 2000; Venkatesh and Morris 2000; Venkatesh, Morris et al. 2003). The main characteristics of innovations are described below.

**Table 2: Characteristics of an Innovation**

(Adopted from Rogers 1995; Moore and Benbasat 1999; Venkatesh et al. 2003)

<b>Characteristic</b>	<b>Definition</b>
1. Relative Advantage	The degree to which an innovation is perceived as being better than the idea or method that was its precursor.
2. Compatibility	The degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters.
3. Complexity	The degree to which an innovation is perceived as difficult to understand and use.
4. Observability	The degree to which the results of an innovation are visible to others.
5. Result Demonstrability* (Dimension of Observability)	The degree to which the results of the use of an innovation are tangible.
6. Visibility* (Dimension of Observability)	The degree to which one can see others using an innovation.
7. Triability	The degree to which an innovation may be experimented with before adoption.
8. Image	The degree to which an innovation is perceived to enhance one's image or status in one's social system.
9. Voluntariness	The degree to which the use of an innovation is perceived as being voluntary or of free will.

\* Components of Observability.

The following sections review six of the main characteristics of an innovation. Examples from the existing literature examine how each characteristic affects the innovation diffusion process. The six characteristics examined are relative advantage, compatibility, complexity, observability, triability and voluntariness.

#### **4.2.1 Relative Advantage**

The relative advantage of an innovation is the degree to which an innovation is perceived as being better than the object, idea or method that it superceded or which preceded it. Relative advantage is typically expressed in terms of economic profit, social prestige, physical improvements, improved task efficiency or process execution (Rogers 1995).

It has been illustrated that there is a relationship between relative advantage and the rate at which an innovation diffuses through a population. Relative advantage consistently relates to innovation adoption (Agarwal and Prasad 1998a). A perceived relative advantage positively affects adoption. Of interest to this research is the degree to which information on relative advantages and disadvantages of an innovation affect adoption.

In order to perceive a relative advantage the individual should appreciate the usefulness of the innovation. Perceived Usefulness is defined as “the degree to which an individual believes that a particular system would enhance his or her job performance” (Davis

1989). This measure allows a user to indicate their perception about a particular product, tool or method and indicate how its use would be beneficial to him/her. Empirical testing of perceived usefulness and relative advantage found that in fact they were measuring the same construct (Riemenschneider, Hardgrave et al. 2002).

The relevance and significance of perceived usefulness and its impact on adoption has been widely reported in the Information Systems literature (Adams and Nelson 1992; Davis 1989; Davis, Bagozzi et al. 1989; Keil, Beranek et al. 1995; Venkatesh and Davis 2000). Perceived usefulness is a strong predictor of individual intentions related to technology use. From a behavioral perspective this is very critical information since intention is strongly correlated to eventual behavior (Bandura 1986).

Relative advantage also has a strong social component. The social approval that is associated with the adoption of an innovation is referred to as image (Moore and Benbasat 1991; Rogers 1995). Individuals can consciously and sub-consciously seek approval from their peers and others in their social sphere. In some instances the relative advantage derived from image, might be more discernable and desirable than that derived from economic gains. Holistically, relative advantage encompasses economic, social and psychological components.

### **4.2.2 Compatibility**

Compatibility is the degree to which an innovation is perceived as being consistent with the existing values, needs, and past experiences of potential adopters (Rogers 1995).

There is a relationship between compatibility and the rate of innovation diffusion. An innovation that is compatible with existing norms and beliefs of individuals in a target population will diffuse at a faster rate than one that is incompatible. Compatibility directly influences usage intentions (Hardgrave, Davis et al. 2003). Further, it is plausible that the existence of compatibility will be positively correlated with relative advantage.

Compatibility is significantly correlated to the use of different design methodologies by software developers (Riemenschneider, Hardgrave et al. 2002). Compatibility in the work environment is related to the way the individual performs their tasks. In non-work settings compatibility is associated with the individual's subjective norms and expectations.

An existing technology that is high in compatibility can potentially retard the adoption of a newer innovation, resulting in a large installed base of users with excess inertia (Farrell and Saloner 1986). The existence of inertia associated with the incompatibility of an innovation is very relevant to this research. It can be argued that with a highly incompatible innovation, the rate of innovation diffusion can be retarded, due to inertia.

Compatibility is relevant to innovation diffusion irrespective of the domain of the innovation. From a cultural perspective innovations that are incompatible with existing standards and norms take a longer time to diffuse through the targeted population. From a production and management perspective compatibility can increase network externalities<sup>3</sup> and the distribution of a product. When a critical mass of users develops through network externalities it drives innovation diffusion (Hovav, Ravi et al. 2001; Rai, Ravichandran et al. 1998). When a critical mass of persons experiencing inertia exists, the opposite is expected.

### **4.2.3 Complexity**

Complexity is the degree to which an innovation is perceived as difficult to understand and use. Rogers (1995) asserts that the target population, more readily adopts innovations that are easier to understand and use.

Perceived ease of use, described as “the degree to which an individual believes that using a particular system would be free of physical and mental effort” (Davis 1989), is closely related to the complexity characteristic. Perceived usefulness and perceived ease of use were the two constructs developed in the widely used technology acceptance model (Davis 1989). Like perceived usefulness, ease of use has also received attention in the information systems literature (Adams and Nelson 1992; Davis 1989; Davis, Bagozzi et al. 1989; Keil, Beranek et al. 1995; Venkatesh and Davis 2000; Venkatesh, Morris et al. 2003).

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<sup>3</sup> Network externalities refer to tangible and intangible benefits derived from increased number of users in a common environment.

Not surprisingly, a recent study indicated that complexity and ease of use are dimensions of a single usability construct (Riemenschneider, Hardgrave et al. 2002). Low complexity or high ease of use will have greater correlation with positive adoption intention than high complexity innovations. Highly complex innovations may prove to have low relative advantage to the user. Many of the characteristics of innovations are directly or indirectly related to each other. This suggests that many of these characteristics can be potentially grouped together. Section 6.3.2 develops these composite groups.

#### **4.2.4 Observability**

Observability is the degree to which the results of an innovation are visible to others (Rogers 1995). Others broadly describe individuals in the target population who may or may not have already adopted the innovation. Observation forms a critical component in the communication of information about an innovation. If the results of an innovation can be clearly demonstrated and visible to others in the target population, there is a greater rate of diffusion of the idea. Observability is one measure of “success” of an innovation (Dinnie, McKee et al. 1999). If others can be visibly stimulated by the results of an innovation, they are more likely to adopt the innovation.

Attempts to develop a single scale for observability were ambiguous, and it ultimately emerged that there were two different entities combined to form this construct : visibility (others can see use of product) and result demonstrability (tangible results of the use of

the product exists) (Moore and Benbasat 1991). These two measurable components also seem to be positively correlated to the rate of innovation adoption.

Intuitively, observability seems like a close kin of relative advantage. If the adopter can show his/her peers the new innovation that he/she is now using, it can positively impact the way that others perceive him/her. In fact, an individual's desire to gain social status is one of the major reasons why individuals choose to adopt an innovation (Moore and Benbasat 1991). The advantage is not derived from mere possession of the innovation, but from the actual displayed use of it. This further supports the idea that there are factors inherent to the product and some that are social implications related to the use of the product that affect the product's adoption and diffusion.

As more individuals adopt an innovation, there is usually greater visibility. A duality exists since an innovation will diffuse faster if it is more visible, and high visibility affects the rate of diffusion. One innovation that epitomizes the visibility diffusion dichotomy is the cellular phone. The user of a cellular phone is visible to others. In the year 2001, the penetration rate of cell phones had exceeded 150% (individuals with multiple cell phones) in some Western European countries and was close to an estimated 70% penetration in the United States (Mooney 2002). Lack of observability can potentially be related to more inertia in a population.

#### 4.2.5 Triability

Triability is the degree to which an innovation may be experimented with on a limited basis (Rogers 1995). Trying an innovation before adoption can reduce risk and uncertainty associated with the new product. Rogers (1995) observed from his extensive research that if a potential adopter is first able to try the product, he/she would have less reservations about using the product. Of course, this is contingent upon the trial meeting or exceeding the expectations of the user.

This construct has been extensively used in marketing to promote new products. American Online was able to gain a high volume of early adopters by distributing free samples of their software. This technique has also been used in a variety of different industries to promote products. Some examples of where free samples are used range from cosmetics (Miller 2003) to drinking water (Elliot 1996).

However, triability is one of the least significant characteristics, when empirically examining perceptions for adopting an information technology innovation (Moore and Benbasat 1991). As a result of its reduced significance, other recent information studies have ignored this characteristic (Agarwal and Prasad 1998a; Agarwal and Prasad 1998b; Plouffe, Hulland et al. 2001; Riemenschneider, Hardgrave et al. 2002).

The domain of Information Technology seems less likely to consider triability as a significant factor affecting adoption intention and by extension decision inertia. This can

be due to the focus of the preceding studies in work settings where a product is implemented by a managerial decision and not necessarily based on the demands of the intended users. In more voluntary settings triability is likely to be more significant.

#### **4.2.6 Voluntariness**

Voluntariness is the degree to which the use of an innovation is perceived as being voluntary or of free will (Rogers 1995). This construct was examined in the Perceived Characteristics of Innovation (PCI) scale (Moore and Benbasat 1991) primarily because there was an observed difference between mandatory and voluntary adoption on an innovation. Based on whether a situation was voluntary or mandatory, there are variations in the impact of subjective norms and beliefs on the individual (Hartwick and Barki 1994).

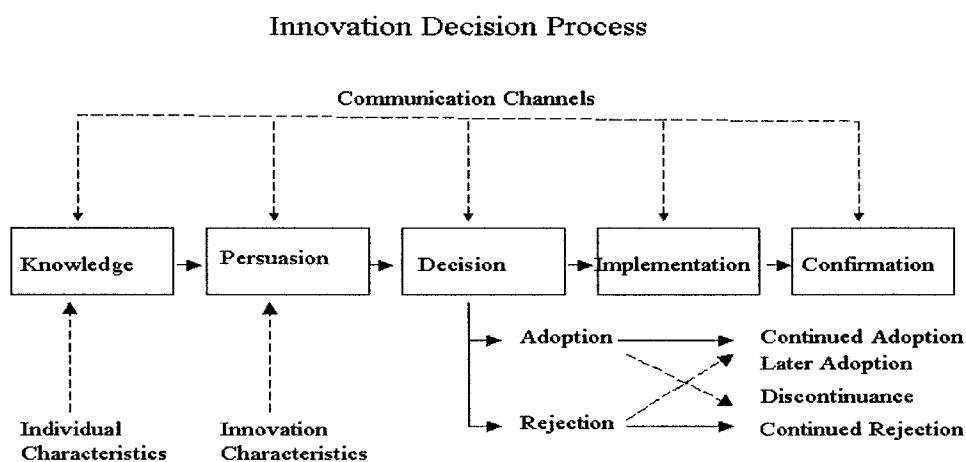
From a practical perspective, the mandatory – voluntary dichotomy can be transposed to a work – non-work (eg. home, leisure) environment. A potential adopter's behavior can be modified if the adoption occurs in a work environment where there are financial and status incentives associated with the use of the new technology. In many instances such as with the Windows operating system in a work environment the adoption and use of the innovation is not entirely a voluntary process (Karahanna, Straub et al. 1999). In a less structured non-work environment where the adoption is primarily initiated by the individual and not the organization different factors may be more relevant.

The current literature has not attempted to clearly differentiate between the two environments and examine whether the same assumptions are true both in a mandatory and a voluntary setting. Moore and Benbasat (1991) state that there are “degrees of voluntariness” exhibited by individuals in the target work population. It seems reasonable to suggest that some environments, such as personal web use will support a higher “degree of voluntariness” for adopters.

### 4.3 Innovation Decision Process

There are five main phases involved in the innovation-decision process. The five stages identified in the innovation-diffusion process are 1. knowledge 2. persuasion 3. decision 4. implementation and 5. confirmation (Rogers 1995). The passage through the innovation-decision process results in the adoption or rejection of the innovation.

**Figure 3:**



(Adapted from Rogers 1995)

The knowledge stage occurs when the individual first becomes exposed to information about the innovation. An individual can actively seek information about an innovation or they may become aware of it through mass media or informal networks such as peers and colleagues. An information technology innovation usually has software components and hardware requirements, and knowledge about one or both of these components are gathered in the knowledge stage.

One main idea at the knowledge stage is that an individual's awareness of an innovation is not a determinant of if or how the individual will use the innovation. Following awareness, the individual will evaluate the innovation and develop an attitude about the innovation. The next stage is persuasion.

Persuasion is the stage at which the individual evaluates the innovation and develops a positive or negative attitude towards the innovation. This research argues instead of developing a positive or negative attitude, an individual can also develop a neutral attitude towards the innovation. This state of neutrality or indifference, described as decision inertia, is what is of paramount concern in this research.

The innovation-decision process model states that after persuasion, the decision phase follows. The decision stage results in one of two options: adoption or rejection of the innovation. If the individual has not been persuaded positively or negatively in the persuasion stage, the result at the decision stage can be non-adoption. Non-adoption has

been described as a type of passive rejection, but admittedly, this option has not received any scientific attention in the literature (Rogers 1995). Passive rejection can exist if the individual is undecided about the innovation.

There is an inherent amount of uncertainty as to whether the end result of this process will be to adopt or reject the innovation. This uncertainty has been mitigated in some instances by allowing the adopter to test a sample the product. Free testing and sampling of a product is geared at positively influencing the individual to adopt (Elliot 1996; Miller 2003). The inclusion of samples usually occurs at the decision stage because it can influence the individual's decision to adopt or reject the innovation.

Following the decision stage is the implementation stage. Implementation occurs only if the individual has decided to adopt the innovation. Implementation occurs when the individual modifies his/her previous behavior and actively engages in the use of the innovation. This phase represents the first tangible evidence that the user has actually implemented the use of the innovation. The prior stages were heavily biased towards mental activity and the formulation of attitudes about the innovation.

The implementation phase is characterized by a phenomenon know as re-invention (Rogers 1995). Re-invention occurs when the individual modifies the innovation and uses it for other purposes than for which it was initially intended. All re-inventors are implementers but not all implementers re-invent. Re-invention, through initially viewed negatively by researchers (Brancheau and Wetherbe 1990), is now embraced as part of

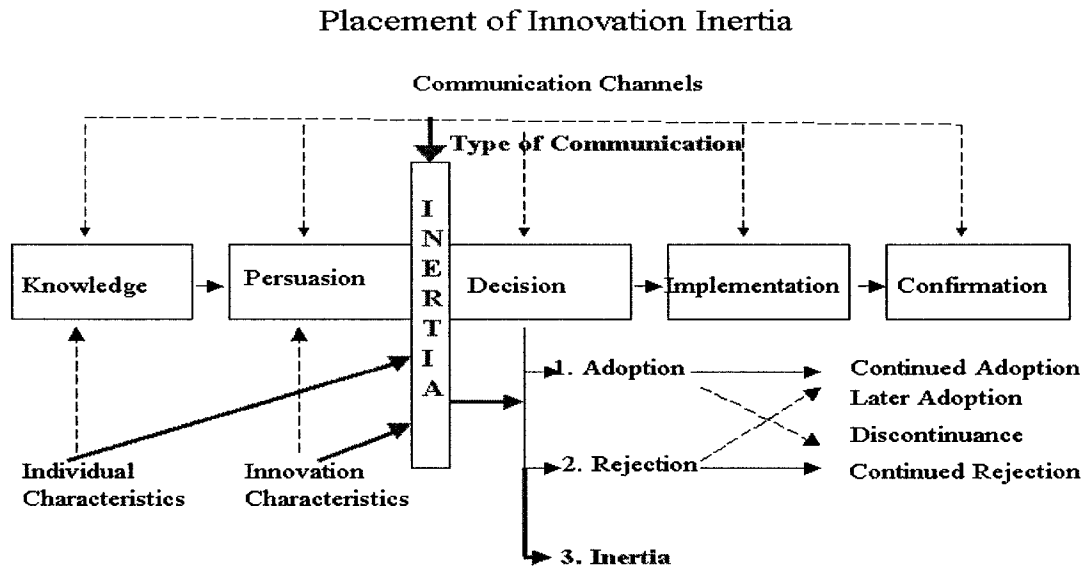
the flexibility and adaptability of an innovation. Once implementation has occurred the individual then confirms the validity of the choice has been made.

Confirmation occurs when the individual re-evaluates their prior decision and examines whether or not their behavior will continue in the same manner or be modified. At the confirmation stage the individual can decide to continue or discontinue use of the innovation. At the confirmation stage, if the individual did not implement the innovation, he/she can continue with the rejection or become a late adopter. Since an individual may never experience the implementation stage, confirmation can occur simultaneously with the decision stage. Confirmation reinforces the decision the user has made.

These five phases are described as individual stages each with their own unique set of characteristics. These five phases have been accepted as part of the tradition of innovation diffusion research.

This research, presents the case that there is an intermediate and overlapping phase between persuasion and decision phases. The discussion of this intermediate, inertia stage is largely motivated by the need to better understand what happens when the individual neither exhibits a strong positive nor negative attitude towards the innovation. This indifference can affect the diffusion process by retarding the diffusion of an innovation. There can also be reactions at the product design and implementation levels where redesign and re-evaluation of the product may be necessary.

**Figure 4:**



For IT innovations the five-phase diffusion process model can be reduced to three stages – initiation, adoption and implementation (Carter Jr., Jambulingam et al. 2001). The three stages proceed as follows (Carter Jr., Jambulingam et al. 2001):

1. *Initiation: the stage during which the adopting unit acquires information about the innovation and goes through an approval process for using the innovation.*
2. *Adoption: Developing capabilities for using the innovation, such as training and/or hiring personnel, or physically acquiring the innovation.*
3. *Implementation: Using the innovation in production for any complete software development project.*

The above stages are particularly relevant to software adoption in an organizational setting. This reduced diffusion process model focuses specifically on IT innovations.

Overall, the model captures the main elements. However, from an individual perspective, a more general model seems more applicable. Hence, the focus on the model presented by Rogers (1995).

## Chapter 5: Information Valence and Persuasiveness

Information persuasiveness examines the extent of the influence of a particular piece of information on the decision-making process. This section examines the persuasiveness construct in terms of user decision-making. The primary task in this research focuses on the individual's attitude towards innovations. Information valence refers to the direction (positive or negative) of the information presented.

### 5.1 Defining Persuasiveness

The meaning of persuade is “to induce to undertake a course of action or embrace a point of view by means of argument, reasoning, or entreaty.”<sup>4</sup> Decisions are made on a daily basis in a variety of settings based on the persuasiveness of the information presented. This research argues that for a user to adopt an innovation he/she must be sufficiently persuaded by the available information. The source and channel of information can also impact the level of perceived persuasiveness.

The persuasiveness of a piece of information is strongly influenced by the quality of the argument. Argument quality can be defined along two dimensions: strength – the subjective probability that the subject associates between the object and the consequence,

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<sup>4</sup> American Heritage Dictionary – from the Latin *persuādere*, meaning to urge.

and valence – the impact of the consequence (Xia and Lee 2000). This means that an argument about a particular subject presents either positive or negative (valence) information and the argument presented must be plausible (strength).

## ***5.2 Valence and Decision-Making***

A user's perceptions and initial attitudes towards IT adoption are significantly affected by persuasion (Xia and Lee 2000). The user's perceptions and beliefs can change over time and be affected by different situations and different pieces of information. High quality arguments usually cause outcomes in favor of the case presented while low quality arguments usually result in unfavorable responses (Xia and Lee 2000).

### III. RESEARCH FRAMEWORK

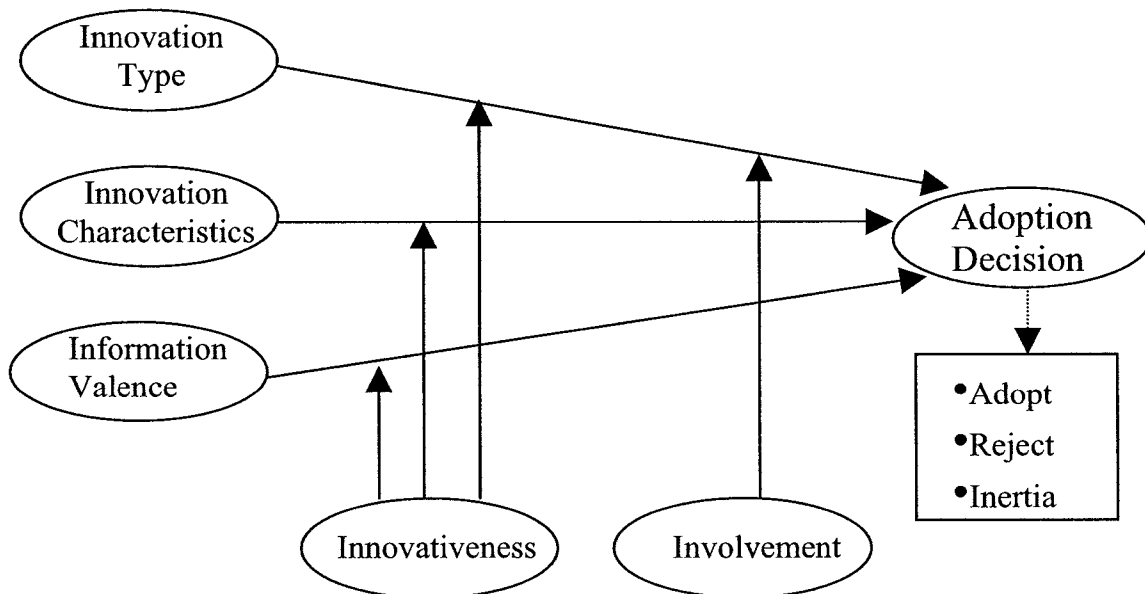
The research framework presents the context for the construct – decision inertia. The main factors influencing inertia, and those correlated to inertia are presented. The framework also presents a set of testable hypotheses to explain the decision inertia phenomenon.

## Chapter 6: Diffusion Inertia

### 6.1 Research Model

The theoretical framework for this thesis is built on an understanding of the innovation diffusion process model.

**Figure 5: Research Model**



This research proposes, defines and examines a theoretical construct called “decision inertia.” Decision inertia is defined *as the state in which the potential adopter is aware of and somewhat knowledgeable about the innovation but refrains from making a final adoption decision about the innovation.* This construct is characterized along two dimensions: individual state and collective effect. The first dimension is the individual state of inertia regarding a specific innovation or a cluster of innovations. The second dimension, the collective effect examines the impact of the combined effect of individuals experiencing decision inertia.

The research model provides a holistic model for the examination of an individual’s adoption intention. This model is based on the stages identified in the innovation diffusion process. This model includes the state of inertia, described as a third option in the decision process: adopt, reject, inertia. One underlying assumption is that decision-making in the innovation adoption process is somewhat of an iterative process (Xia and Lee 2000).

The second dimension is collective decision inertia – the state of inertia of the target population of the innovation. The theory will show that an individual may exhibit inertia towards an innovation, but the target population may have already collectively rejected or accepted the innovation. When there is a collective group of rejectors - individuals that prefer the older generation technology, they are sometimes referred to as the “installed base” (Dekimpe, Parker et al. 2000; Herbig and Kramer 1993).

The three main objectives of this research are to 1. develop a theoretical framework for decision inertia; 2. explore the attributes of this intermediate state; 3. demonstrate its impact on the ultimate diffusion decision. The theoretical framework of decision inertia is based on the literature on the innovation diffusion theory (Rogers 1995). The development of the attributes of this intermediate state is based on the understanding of innovation diffusion and of factors affecting changes in human behavior. Lastly, the impact of decision inertia is discussed based on whether the “wait” is as a result of an opportunistic or reactive stimulus.

## **6.2 Defining Inertia**

Cursory mention has been made of the term “inertia” (Farrell and Saloner 1986; Karahanna, Straub et al. 1999) in the context of innovation diffusion, but no attempt has been made on defining, characterizing or examining this construct. In an organizational setting social pressure, “may be an effective mechanism to overcome adopter initial inertia in adopting IT” (Karahanna, Straub et al. 1999). However, no prior of further discussion occurs to clarify exactly what defines “initial inertia”.

Most studies have looked at the characteristics of the adopter, and the different types of adopters ranging from early adopters to laggards. Due to the pro-innovation bias in research little or no attention has been paid to those that do not adopt the innovation.

Inertia occurs at a point when there is little or no movement in the explicit adoption or the explicit rejection of an innovation. Inertia represents an equilibrium period where change is difficult to effect (Lassila and Brancheau 1999). The number of current users remains relatively fixed.

Inertia involves a “wait and see” attitude (Dong and Saha 1998) that can indefinitely retard the adoption process. Consequently the adoption process is not merely a binary decision, but instead multi-modal in that it involves varying degrees of intensity of adoption of the innovation (Dong and Saha 1998).

From the individual perspective, decision inertia is not necessarily viewed negatively. In some instance there can be a compelling reasons to do nothing (Dong and Saha 1998). This research proposed the main factors acting on decision inertia involve the type of innovation and the quality of information about the innovation characteristics.

Decision inertia is a psychological state of the individual that can vary in intensity. The relative adoption rate can be a surrogate value for identifying the presence of inertia. If a very slow adoption rate exists for an innovation, this can be an indication that decision inertia is present. Most studies have used post hoc information for understanding diffusion (Baumgarten 1975; Venkatesh, Morris et al. 2003). This study will use pre adoption data to capture the affective factors and consequential impact of decision inertia.

## **6.3 Factors Affecting Decision Inertia**

The ultimate goal of this research is to fully comprehend the inertia phenomenon and prescribe ways to reduce it. One technique to reduce inertia is information dissemination (Dong and Saha 1998). However, the type of information disseminated can have either a positive, negative or neutral impact on the rate of diffusion. Consequently information dissemination is necessary but not sufficient to positively impact the rate of innovation diffusion. By extrapolation from the literature the main variables that are critical decision inertia are: innovation type; innovation characteristics and information valence.

### **6.3.1 Innovation Type**

In the field of information technology, new versions of software products are frequently released to users. New versions of software can be classified as a specific type of continuous innovation. In effect, incremental changes or modifications are made to the existing product to become a new version. The versioning of software is thus consistent with the broader definition of a continuous innovation (Rice, Leifer et al. 2002; Rothaermel 2000; Walsh, Kirchhoff et al. 2002).

Discontinuous innovations in the domain of information technology will refer to those innovations in first time release. Depending on the type of product first-time release innovations may be less common. A first-time release product can subsequently spawn many different versions by the initial vendors or subsequent companies. Consider the

case of the first time release of an innovation for “instant messaging” in a real-time environment. Several different vendors later reproduced this first-time release product – software for instant messaging.

### **6.3.2 Innovation Characteristics**

User perceptions are formulated in accordance with the characteristics of innovations discussed in section 4.2. In fact, these characteristics can be condensed into two main groups. Previous studies have examined different characteristics at an individual level. To date, only one study has attempted to categorize them (Venkatesh, Morris et al. 2003).

Our study identified that there are two main groups that emerge from the characteristics of innovations. The first group represents the functional characteristics of the innovation. This group “describes the inherent properties of the innovation including: relative advantage, compatibility, complexity and triability.

The second group moves beyond the core features and characteristics of the innovation and examines a more social aspect. Called consequential characteristics, it “describes the consequences associated with the use and or possession of the innovation” such as image, results demonstrability, visibility and social norms.

**Table 3: Functional and Consequential Characteristics of Innovations**

<b>Functional Characteristics</b>	<b>Consequential Characteristics</b>
Relative Advantage	Observability
Compatibility	Results Demonstrability
Complexity	Visibility
Triability	Voluntariness
Ease of Use	Connectability (Need for network)
Usefulness	

### **6.3.3 Information Valence**

One assumption in diffusion research is that potential adopters are initially exposed to full or complete information about the innovation (Dimara and Skuras 2003). However, potential adopters are usually exposed to information about an innovation incrementally and their overall perception about the innovation is subject to change. As part of this research design, subjects will be incrementally exposed to information about an innovation.

Valence and strength were identified as two critical components of persuasive information (Xia and Lee 2000). The valence of the information presented to the potential adopters will influence their attitudes towards the innovation.

## **6.4 Hypothesis Formulation**

This section builds hypotheses based on the discussions provided in the literature review and the research framework. The hypotheses are formulated around three main concepts: information valence, innovation type and innovation characteristics.

Information valence has both direction and strength. In this study we focus only on the directional component of valence. As it relates to information on an innovation, valence has two modes – positive or negative. Decision makers typically have a bias towards seeking negative information as opposed to positive information to arrive at a decision (Gatignon and Robertson 1989). However, initial acquisition of only negative information suppresses adoption (Sapp and Korsching 2004). We therefore expect that if individuals are presented with only negative information, they are more likely to be undecided than if they were only presented with positive information about an innovation. This leads to the formulation of hypothesis 1.

*H1: Decision inertia is greater for negative information than for positive information.*

Innovations can be classified as continuous, discontinuous or dynamically continuous (Citrin, Sprott et al. 2000; Robertson 1967). On this continuum of innovations the two end-points are of interest in this research. The middle category – dynamically continuous innovations, were excluded because they are much more difficult to categorize and identify. Since different behavior patterns are associated with the continuous and discontinuous innovations (Robertson 1967; Walsh, Kirchhoff et al. 2002), we expect that they will also have different effects when examining decision inertia.

Discontinuous innovations require more behavioral modifications from users than do continuous innovations (Molesworth and Suortti 2001; Rice, Leifer et al. 2002; Walsh, Kirchhoff et al. 2002). The need for different behavioral changes can inhibit the users from adopting the innovation. We therefore expect that an individual will experience less decision inertia when presented with information about a continuous innovation as compared to information about a discontinuous one. This leads to the development of the second hypothesis about decision inertia. This leads to the formulation of hypothesis 2.

*2. Decision inertia is greater for discontinuous than continuous innovations.*

The primary dependent variable of interest in this research is decision inertia. The user of a potential innovation receives information about the innovation from various sources. The user perceptions of the innovation will ultimately affect their attitudes and behavior (Ajzen 1991). When users are presented with information about an innovation, it will affect their attitudes about the specific innovation.

This study synthesized innovation characteristics into two main groups: functional and consequential. The set of functional constructs have received more empirical support than consequential factors for affecting adoption intentions (Davis 1989; Davis, Bagozzi et al. 1989; Moore and Benbasat 1991). Based on these findings we expect that the presence of information on functional characteristics of an innovation will reduce decision inertia, as compared to information on consequential characteristics. This leads to the formulation of hypothesis 3.

*H3. Decision inertia is greater for consequential than functional characteristics of an innovation.*

Innovativeness and involvement are two user characteristics that have a moderating effect on users adoption intentions (Agarwal and Prasad 1998b; Zaichkowsky 1985). As a result of their previous relevance we also expect these two variables to be significant when examining the decision inertia construct. Highly innovative individuals are usually the first group of users to adopt an innovation (Rogers 1995). This early adoption indicates that they rely strongly on intrinsic motivation, and discounts external factors. We thus expect that highly innovative individuals will be less influenced by the information presented to them and exhibit lower levels of decision inertia. This understanding leads to the formulation of hypotheses 4a, 4b and 4c.

*H4a. Innovativeness moderates the relationship between information valence and decision inertia.*

*H4b. Innovativeness moderates the relationship between innovation type and decision inertia.*

*H4c. Innovativeness moderates the relationship between innovation characteristics and decision inertia.*

High involvement individuals are usually well informed and very familiar with the product or innovation. Highly involved individuals are thus more likely to rely on information, outside of what they are provided with to make decisions. We therefore expect that high involvement would moderate the impact of different pieces of presented information. This leads to the formulation of hypothesis 5.

*H5. Decision inertia is greater for individuals with low product involvement.*

Innovation awareness is defined as having a favorable attitude towards an innovation (Agarwal and Prasad 1998a). The definition of awareness was a natural inclusion to the decision inertia construct because it provided information on how the user perceives the actual innovation. This perception, we argue, leads ultimately to an active or passive decision-making process on the part of the individual. This leads to the formulation of hypothesis 6.

*H6. Decision inertia is greater for individuals with low awareness.*

A critical component used to evaluate the quality of information is an examination of the source of the information. The quality of the information thus relates directly to trusting the source(s) of the information. The issue of trust has been shown to affect the quality

of the decision-making (Jarvenpaa, Tractinsky et al. 2000; Koufaris and Hampton-Sosa 2004). Trust has also been identified as an important variable affecting attitudes and behavior (Razzaque and Tan Gay Boon 2003).

One issue of concern when presented with information for decision-making is the source of the information. The credibility of the source has a direct impact on whether the user is persuaded to believe the information that is presented (Jain and Posavac 2001). The issue of source credibility is relevant to the innovation adoption process particularly where the user is still learning about the product. We expect that if an individual trusts the source of the information that they receive, he/she will experience less inertia in the decision making process. This leads to the formulation of hypothesis 7.

*7. Decision inertia is greater for individuals with low perceived trust.*

Relevance examines whether or not the information that is presented is pertinent to the decision making task. As such, if an individual is presented with information that they perceive to be irrelevant, there can be an ultimate impact in the decision-making process. We expect that with increased relevance less inertia will occur. This leads to the formulation of hypothesis 8.

*8. Decision inertia is greater for individuals with low perceived information relevance.*

Individuals are more likely to be hesitant about making a decision when they feel that they have incomplete information. We argue, that based on the literature, decision inertia

would be more likely to occur when the individual detects that there is missing information. Consequently, we expect that the perception of incomplete information would likely increase the occurrence of decision inertia, leading to hypothesis 9.

*9. Decision inertia is greater for individuals with low perceived information completeness.*

Finally as an individual travels through the decision making process, there will be some associated satisfaction with the task that they have completed. We examination satisfaction, mainly to suggest indecision is not usually the more satisfying outcome. We finally test an exit relationship and hypothesis that decision inertia will be greater with lower levels of task satisfaction.

*10. Decision Inertia is greater for individuals with low task satisfaction.*

## **IV. METHODOLOGY**

### **Chapter 7. Methodology**

This chapter describes the research methodology designed to support an examination of the decision inertia construct. The procedures that were used to test the stated hypotheses are presented. The independent variables, dependent variables, moderating variables, subjects and task are all presented in this section.

To test the hypotheses a controlled laboratory experiment was used. The experiment is the core of this research since it allows testing of the theorized constructs that support decision inertia. The laboratory experiment addresses the issue of internal validity of the research (Sekaran 2000).

An experiment was used to examine the antecedents to decision inertia. The theoretical construct – decision inertia is positioned as dependent on the innovation type, information characteristics and information valence. Most research in innovation diffusion used the post implementation methodology for data capture (Venkatesh, Morris et al. 2003). This research looks at innovations that currently exist in the information technology domain and the decision inertia construct.

## **7.1 Mode of Analysis**

This study involved the use of a single experimental design for analysis. The hypotheses tested are based on theoretical construct of decision inertia. The table below lists the hypotheses that were tested using the experiment. All one-way, two-way and three way interactions were measured.

The one-way measures involved the independent variables of innovation type, innovation characteristics and information valence. The two-way interactions examined the innovation type and innovation characteristics; innovation type and information valence; and innovation characteristics and information valence. The single three-way interaction involved all three independent variables.

## **7.2 Experimental Design**

A laboratory experiment was used to test the presented hypotheses. The field of information systems has extensively used laboratory experiments (Compeau and Higgins 1995; Davis and Consenza 1993; Davis 1989; Sharda, Barr et al. 1988; Vessey 1994) to test theoretical constructs. The two main reference disciplines – marketing (Donnelly Jr. and Ivancevich 1974; Goldsmith and Hofacker 1991; Im, Bayus et al. 2003; Kivetz and Simonson 2000) and psychology (Csikszentmihalyi 1990; Gerow 1992; Lahey 2001) also have a wide body of research that employs the experimental approach.

The experimental design is a 2x2x2 completely randomized factorial design with the three factors: innovation type, information characteristics and information valence. Innovation type has two levels: continuous innovation and discontinuous innovation; information characteristics has two types: functional and consequential; and information valence has two levels: positive and negative (Figure 6).

**Figure 6: Experimental Design**

		Information Characteristics			
		Functional		Consequential	
		Positive Information (1) 25	Negative Information (2) 23	Positive Information (3) 20	Negative Information (4) 32
Innovation Type	Discontinuous				
	Continuous	Positive Information (5) 20	Negative Information (6) 20	Positive Information (7) 25	Negative Information (8) 22

Each subject in the experiment was randomly assigned to one of the above cells. As a result each subjects was exposed to one level of each of the three treatments. This randomization was reduce subject biases in the experiment.

Subjects were randomly assigned to one of the eight experimental categories as described below:

- (1) Subjects were presented with positive functional information about a discontinuous innovation.
- (2) Subjects were presented with negative functional information about a discontinuous innovation.
- (3) Subjects were presented with positive consequential information about a discontinuous innovation.
- (4) Subjects were presented with negative consequential information about a discontinuous innovation.
- (5) Subjects were presented with positive functional information about a continuous innovation.
- (6) Subjects were presented with negative functional information about a continuous innovation.
- (7) Subjects were presented with positive consequential information about a continuous innovation.
- (8) Subjects were presented with negative consequential information about a continuous innovation.

A within-subject factorial design is used to increase the power of the test, whereby a subject is exposed to several variations of the treatment (Tan and Benbasat 1990).

However, there are three major disadvantages of within subject designs: practice effects, carry-over effects and restricted statistical justification (Keppel 1982). As a result of the above concerns, repeated measures were not used in this study.

### 7.2.1 Experimental Task

All participants in the experiment were presented with information about a particular innovation. Two fictitious innovations were used in the study: WebClass and NewBlackBoardXT. These innovations were created based on the description of continuous and discontinuous innovations.

The participants were presented with statements about the particular innovation in their treatment group. The information was presented in a sequential manner to the subjects. After each piece of information was presented the subject indicated his/her likelihood of adopting the innovation. This information was captured with the statement:

*Based only on the above information I plan to use  $X^5$  in the future.*

The above responses were captured on a seven point Likert scale ranging from strongly agree to strongly disagree. Participants were also informed that the information that they were presented with was captured from a variety of sources. These sources included other students, professors, designers and other users of the product. The inclusion of this statement was primarily to illustrate that different sources were used for information capture, and not cause a bias in any particular direction.

---

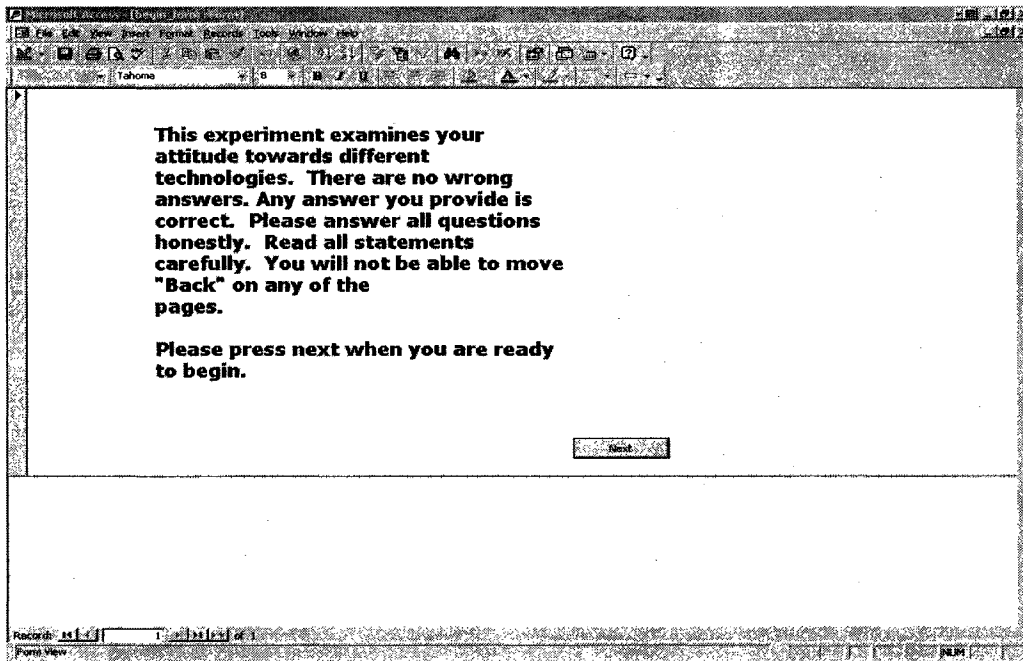
<sup>5</sup> X represents the innovation in the particular cell of the experiment – Either WebClass or NewBlackBoardXT.

## 7.2.2 Experimental Procedure

1. A manipulation check was first conducted to validate the statements that were used in the actual experiment. This procedure is further discussed in section 7.6 manipulation check.
2. All participants in the experiment were first presented with a small demonstration of how the experiment was to be conducted. Participants viewed an over-head projector showing some general sample statements and shown how to submit their opinion on each of the statements. This process lasted approximately ten minutes. Subjects were also instructed on how to use the mouse to navigate the screens. All participants were informed that there were no “correct” or “incorrect” answers. They were all encouraged to answer the questions as honestly as possible based on the information that they were presented with. Finally, subjects were informed that they would be no option to go back to the previous pages as they proceeded through the experiment. Participants were also instructed to press SAVE and then press NEXT to allow navigation through the experiment. The SAVE NEXT procedure was a built in safe guard to ensure that all data was being captured and stored in the underlying Microsoft Access database.
3. To begin the experiment all the participants were presented with the first screen listed below (Figure 7). A random number was assigned to each subject to track their

navigation across the different pages. As the participants navigated through the experiment, time was recorded unobtrusively from the computer's clock.

**Figure 7: Experimental Interface 1**



4. The next page (Figure 8) requested demographic information about the subjects. This form captured information such as age, gender, student status, work status and income. This form is illustrated below.

Figure 8: Experimental Interface 2

The screenshot shows a Microsoft Access form titled "Subject Test Form" with a menu bar (File, Edit, View, Insert, Format, Records, Tools, Window, Help) and a toolbar. The form content includes a header "Please Answer All Questions as Honestly as Possible:" and several sections of questions:

- Gender:** Radio buttons for Male and Female.
- Age (in years):** A dropdown menu with options: 18-20, 21-25, 26-30, 31-35, 36-40, 41-50, 51-64, and 65 and over.
- Student Status:** Radio buttons for Freshman, Sophomore, Junior, Senior, Grad Student, and Other.
- Current Employment Status:** Radio buttons for None, Part-Time, and Full-Time.
- Annual Income:** Radio buttons for income brackets: < \$20,000, \$20,000-\$30,000, \$30,001-\$50,000, \$50,001-\$75,000, \$75,001-\$100,000, and > \$100,000.

Buttons for "Save" and "Next" are located to the right of the Annual Income section. At the bottom, a status bar shows "Record: 1 of 1" and "Form View".

4. The next page (Figure 9) captured information on the technology background of the subject. This included information such as how long they have used the web, whether they have an existing web page and what are the primary reasons for using the web. This form is illustrated below.

Figure 9 : Experimental Interface 3

The screenshot shows a Microsoft Access window titled "Microsoft Access - Fresh\_Background : form". The window contains a form with the following content:

Please Answer All Questions as Honestly as Possible:

How long have you been using the Internet: Choose One

How often do you use the Internet: Choose One

Do you currently have a personal webpage on the Internet: No

What do you generally use the Internet for - Check all that apply:

<input type="checkbox"/> Banking	<input type="checkbox"/> Chat	<input type="checkbox"/> Music Downloads
<input type="checkbox"/> Browsing	<input type="checkbox"/> Dating	<input type="checkbox"/> Research
<input type="checkbox"/> Business	<input type="checkbox"/> E-mail	<input type="checkbox"/> Searching
<input type="checkbox"/> Shopping	<input type="checkbox"/> Other	

Please describe below what else you use the Internet for:

Save

Next

Records: 14 of 1

Form View

6. Participants then completed the innovativeness scale. The innovativeness measure is included as one of the moderating variables in this study.

7. At this stage the subjects were then randomly assigned to one of the eight experimental cells. Cells numbered 1-4 contained information on the discontinuous the discontinuous innovation **WebClass**. Cells numbered 5-8, contained information on the continuous innovation **NewBlackBoardXT**. Only participants that were randomly assigned to cells

5-8 were required to complete the involvement scale. This scale captured the individual's current attitude to the learning software BlackBoard<sup>6</sup>.

8. Group5 1-4 next received an overview of the **WebClass** product, while groups 5-8 receive an overview of the updated **NewBlackBoardXT** product.

9. Participants then are given additional information about the innovation based on the treatment group that they have been assigned to. After each piece of information is received, subjects indicate the adoption intention, reflected on a 7-point Likert scale.

10. Next, subjects receive the decision inertia scale, after they have received all the relevant information about the innovation.

11. Lastly, each subject was presented with three exit questions. The exit form is shown below (Figure 10).

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<sup>6</sup> BlackBoard is a proprietary software used to enhance classroom learning. Tools include a digital drop-box and posting features for class notes and online discussions. This product was selected because it is frequently used at the college, and at least most students if they have not actually used the product has heard about it.

**Figure 10: Experimental Interface 4**

The screenshot shows a Microsoft Access window titled "Form: Form1". The menu bar includes "File", "Edit", "View", "Insert", "Format", "Records", "Tools", "Window", and "Help". The toolbar contains various icons for navigation and editing. The main content area displays the following text and controls:

Please answer the following overall questions.

The instructions were clear and easy to follow.

Strongly Agree      Neutral      Strongly Disagree

I am satisfied with how I completed this exercise.

Strongly Agree      Neutral      Strongly Disagree

I was as honest as possible with my answers.

Strongly Agree      Neutral      Strongly Disagree

Save

Exit

Record: 1 of 1  
Form View

### **7.3 The Variables**

The independent variables are innovation type, innovation characteristics and information valence. The moderating variables are innovativeness and involvement. The main dependent variable examined is decision inertia.

## **7.4 Subjects**

All subjects were students of Baruch College, City University of New York. Student participation was completely voluntary. All participants were paid ten dollars (\$10) to participate in the experiment. Student participants had the option to discontinue participation in the experiment at any time. Once the student indicated that they had completed the task (in their opinion – not verified by the experimenter) they were paid for their time and participation in the experiment.

Three techniques were primarily used to attract students. The first involved distribution of recruitment fliers to faculty members. These faculty members then made announcements in their classes about the experiment. Students were not required to participate for any course, neither was any student given course credit for participation in the study. The second technique involved a student volunteer that actively recruited small groups of students during club hours at the college. The student recruiter informed potential subjects about the purpose and type of experiment that was being conducted. The third involved posting recruitment fliers around the campus to attract students (Appendix C).

Interested students were directed to contact the Principal Investigator to schedule a time for participation in the experiment. Once students kept their appointment and appeared at the lab to participate in the experiment, they were required to complete a consent form

(Appendix D). All students were encouraged to ask questions for any clarification about the experiment.

It was necessary to have randomization of participants at as many levels as possible to increase the generalizability (Peterson 2001) of the study. Even though it can be argued that with a purely student subject base there will be some limits as to generalizing the results beyond similar populations.

## **7.5 Validity**

### **7.5.1 Construct Validity**

Construct Validity refers to the extent to which a scale measures a theoretical variable of interest (Kappelman 1995). Construct validity is measured under eight different categories: content validity; internal consistency; convergent validity; temporal stability; discriminant validity; predictive validity; nomological validity; uni-dimensionality. Internal and external validity are critical to the research and are addressed below.

### **7.5.2 Internal Validity**

Internal validity refers to the attribution of the measures of the dependent variables directly to the manipulation of the independent variables (Gay and Diehl 1992). The main threats to internal validity are history; maturation; testing; instrumentation;

statistical regression; differential selection of subjects, mortality, and selection-maturation interaction (Campbell and Stanley 1963).

The first technique used in this study to increase internal validity is the use of random subjects, to only one cell treatment in the experiment. Only the principal investigator conducted the actual experiment. As a result of the above fact testing and instrumentation threats were significantly reduced. Further, since this is not a longitudinal study there are virtually no threats associated with maturity, history and mortality.

### **7.5.3 External Validity**

External validity refers to generalizability of the experimental results to settings outside of the laboratory environment (Gay and Diehl 1992). Six main threats to external validity exist: pretest-treatment interaction; multiple-treatment interference; selection-treatment interaction; experimenter effects; specificity of variables and reactive arrangements.

This study did not use a pretest for the subjects, so that threat is not an issue in this study. The multiple treatment threat is also eliminated in this study because each subject was exposed to only one cell in the experimental treatment.

Every attempt was made in this research to reduce the selection-treatment effect. The primary method was the complete randomization of subjects into the different treatment cells. Students that participated in the experiment were all volunteers. However, they

may be motivated by a variety of factors. In this respect the selection-treatment threat is also reduced because of the self-selective nature of the subjects.

## **7.6 Manipulation Check**

A manipulation check was done on a small group of pretest subjects. Manipulation checks have been used in experimental research to validate proposed constructs (Ziamou and Ratneshwar 2003). This manipulation examines the information valence independent variable. On a seven point Likert scale subjects indicate the extent to which they agree or disagree with the characterization of positive and negative statements about the innovations.

Each subject was presented with 54 statements (Appendix E) to assess whether they identified the statement as positive or negative. This list of statements was derived from the literature that examined perceived characteristics of an innovation. The statements covered all the characteristics from relative advantage to image.

The results of the manipulation check indicated that there was a very high level of agreement between the subjects and the experiments assessment of negative and positive statements. A few of the statements in the consequential group were revised after the manipulation check because of perceived ambiguity on the part of some participants.

## **7.7 Measurements**

The dependent variables measured in this study are all focused around the decision inertia construct. These variables provide the basis for understanding this theoretical construct, and the impact that it has on innovation diffusion.

### **7.7.1 Decision Inertia**

The decision inertia construct has not been measured in the existing literature. We used a single measure for decision inertia, and examine supporting surrogate variables that would provide more explanation for the decision inertia construct. Four surrogate constructs were examined to develop, test and explain decision inertia: The four constructs are 1. perceived information completeness; 2 . perceived information relevance; 3. awareness; 4. perceived information quality.

The sections below indicate how these constructs were measured.

#### *7.7.1.1 Perceived Information Completeness*

The first construct that was included was the completeness of the information presented.

The perceived completeness of the information affects the decision-making process of the

individual (Ahituv, Igbaria et al. 1998; Kivetz and Simonson 2000; Sridhar and Balachandran 1997b).

Based on the above information the items included in the decision inertia scale to test perceived information completeness are listed below.

- The information I received was complete.
- The information I received was incomplete.
- I needed more information to help me make a decision.
- The information I received was sufficient.

#### *7.7.1.2 Perceived Information Relevance*

The second construct that was used in the development of the decision inertia scale is the perceived relevance of the information. The following four statements were included as part of the decision inertia scale to capture information on perceived relevance.

- The information I received was useful.
- The information I received helped me to make a decision.
- The information I received was irrelevant.
- The information I received was relevant.

### *7.7.1.3 Awareness*

The third surrogate construct that is used in define decision inertia is awareness.

The following three statements were used to capture information on the perceived awareness of the innovation.

- I believe that X represents an important innovation.
- I believe that this technology is critical for the company to get a competitive advantage.
- I think it is appropriate for the company to adopt this technology.

### *7.7.1.4 Trust*

The fourth and final surrogate included to support decision inertia examines trusting the source of the information received.

The three measures below were used to address the issue of perceived trust of the source of the information.

- I trust the sources of this information.
- The sources of the information I received are trustworthy.
- I was satisfied with the accuracy of the statements.

## **7.8 Pilot Study**

A pilot study was done prior to the full implementation of the experiment. The pilot study was done after a review of the methodology proposed and the inclusion of comments and suggestions. The main reason for conducting the pilot study was to determine the procedure for the experiment. The data collected in the pilot study was not used as part of the later analysis for the full experiment. The main object was to clear the procedures for conducting the experiment.

A group of 18 students participated in the pilot study. These students were paid \$10 for their participation in the study. The participants were instructed to ask questions as they completed the tasks. The direct feedback that was provided was useful in refinement of the experimental procedure.

The objectives of the pilot study were to determine the following:

1. The length of time that would be required for participants to complete that task. It was determined that 30 minutes would be sufficient for completing the experimental task.
2. The level of difficulty in understanding the task. The students understood was stated and asked. The questions were not adjusted.

3. The format of presentation of the information. This was an issue of concern during the design of the experiment. Since subjects were being presented with text information there was a discussion as to whether the information should be all presented on a single page or across multiple pages. The pilot was conducted with the information presented across multiple pages. This format allowed each piece of information to be reviewed. Some of the feedback regarding the format included, that subjects wanted to go back to previous pages to change their input. The presentation of information across different pages was the format that was adopted for the experiment because it gave subjects the ability to access the information separately.

The main motivation behind preventing students from going back is that we wanted to examine the value of each piece of information that the subject received. If the subjects were allowed to move back and forth freely, the control environment would be compromised. It would be very difficult to determine at which point the subject decided to accept, reject the innovation, or more importantly if they were still undecided.

4. The functionality and usability of the interface. The user interface was created with Microsoft Access. The participant interacted with a series of forms during the execution of the task. The participants were instructed to click the “next” button on the form to navigate. However, there was a concern by some of the

subjects as to whether their entries were being saved or not. As a result of this concern a “save” as well as a “next” button was added to the form design. In fact, this was a redundant procedure, but it help to reassure the participants that their entries were saved. This was a simple but useful finding from the results of the pilot study.

5. The clarity of the instructions. This was final objective of the pilot. It was important to determine if the subjects clearly understood what they were expected to do.

## **V. RESULTS**

### **Chapter 8: Results**

This chapter presents the results of the research conducted. The detailed explanation of the results is presented under the discussion chapter. The first part of the chapter gives a detailed description of the data that was collected. The chapter proceeds with an analysis of each of the hypotheses.

#### ***8.1 Data Description***

One hundred and ninety six students participated in the experiment. Of the 196 participants 187 subjects completed the entire experiment. This represents a loss of less than five percent of the subjects in the experiment. The attrition of subjects in the experiment was due to non- completion of the tasks defined in the study. The number reveals a very high percentage of valid data points for this laboratory experiments.

All analysis in this study was conducted using the statistical software SAS 9.0.

Hypothesis testing using this software excludes missing values. Data analysis is not necessarily compromised with missing data points (Little and Rubin 1987). Identical numbers of subjects are not required or expected for successful analysis of the data.

Consequently no attempt was made to replace missing values or equate the number of subjects in each cell of the experiment.

Of the 187 valid subjects, there were 92 males and 95 females. The subjects also were categorized in the following student categories: freshmen =65; sophomores = 56; juniors = 38; seniors = 21; graduate students = 7. The table below summarizes the distribution of the subjects by their stated majors. The distribution of the student majors below closely reflects the actual student population at the institution (Table 4).

**Table 4: Participant Majors**

Major	Count	%
Accountancy	41	22
Actuarial Science	2	1
Business Communication	16	9
CIS	15	8
Economics	6	3
English	1	0.5
Finance	38	20
Management	12	6
Marketing	16	9
Mathematics	2	1
Music	2	1
NONE	27	14
Political Science	3	2
Psychology	3	2
Real Estate	2	1
Sociology	1	0.5
	187	100

The above distribution is a representative sample of the student population at Baruch College. Accounting represents the largest major in the school, and it also represented the largest group of students in the experiment.

Of the valid subjects 97 (52%) reported that they worked part-time, 24 (13%) worked fulltime and 66 (35%) were not employed. The table below (table 5) represents the income of the 121 (65%) employed students.

**Table 5: Participant Incomes**

Annual Income	Count	% of Employed
Less than \$20,000	103	85
\$20,001 - \$30,000	10	8
\$30,001 - \$50,000	3	3
\$50,001 - \$75,000	1	1
\$75,001 - \$100,000	3	3
Greater than \$100,00	0	0

The table below (table 6) represents the age group of the subjects in the experiment.

**Table 6: Participant Ages**

Age	Count	% of Subjects
18-20	130	70
21-25	50	25
26-30	4	2
31-35	2	1
36-40	1	1

## ***8.2 Decision Inertia***

The decision level is the variable that examines whether the participant has made a decision about the innovation or if they have not made an explicit decision. The decision level variable was captured with a single question asked multiple times. The groups presented with functional information (group1, group2, group5, group6) were asked the single question five times while the groups presented with consequential information (group3, group4, group7, group8) were asked the question four times. This difference was due to the fact that the functional groups had one additional characteristic in that category. The results across the both sets of groups were normalized to create a valid basis for comparison. The questions were asked after the presentation of sequential information about the innovations.

## ***8.3 ANOVA, Normality and Test Explanations***

The primary technique used for data analysis in this study in the analysis of variance (ANOVA). For ANOVA three main assumptions about the data exists: homogeneity of error variance; independence of error components and normally distributed population (Keppel 1982).

The test for homogeneity of error variance requires that the variances of the different treatment populations be equal. However, distortions among the variances do not seem to affect the F statistic. As a result, many researchers do not conduct test for homogeneity tests as a part of their research (Rogan, Keselman et al. 1979).

The independence of error components addresses the independent assignment of treatments to the various experimental groups. Critical both statistically and experimentally is the random assignment of subjects to each of the treatment groups (Keppel 1982). Consequently random assignment of subjects in this study was of utmost importance. The first randomization technique was the recruitment of subjects. No large groups or classes were used for participation in the experiment.

Students were recruited from class announcements and flyers posted around the school. Subjects self selected for participation from several different sources of announcements. During the actual participation in the experiment each subject was then randomly assigned to an experimental group using a Visual Basic random number generator function.

Even though normality of data is desired slight variations from normality do not constitute a serious problem for data analysis (Norton 1952). Several tests and techniques exist for verification of normality. The more frequently used techniques involve an examination of skewness, kurtosis and the Kolmogorov-Smirnov test (Hatcher and Stepanski 1994).

## **8.4 Scale Reliability**

At least six different scales were used in this experiment. The main scales used tested: 1 Innovativeness; 2: Product Involvement; 3: Perceived Information Completeness; 4: Perceived Information Relevance<sup>7</sup>; 5: Innovation Awareness and 6: Perceived Trust. Once scales are used it is imperative that the scale captures the uni-dimensional construct that it sets out to capture. The reliability of a scale refers to the consistency of the score and is typically measured along two dimensions: test-retest reliability and internal consistency reliability (Hatcher and Stepanski 1994).

Administering the test at two different periods of time and then comparing the results calculates test-retest reliability (Sekaran 2000). The retesting shows the stability of the measure. In this study, given its experimental nature, testing occurred at a single instance in time. The second measure of reliability, the internal consistency reliability, is examined in this study.

Cronbach's alpha is an internal consistency reliability measure that examines how closely the scale items are inter-correlated (Sekaran 2000). Generally the closer the Cronbach's alpha value is to 1, the greater the internal consistency reliability of the scale. A value of .70 is often recommended for field studies (Nunnally 1967). Recent studies in the field of information systems have also used a Cronbach's alpha of .70 as an acceptable reliability level (Agarwal and Prasad 1998a).

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<sup>7</sup> This scale consisted of three items developed by the author to test this construct.

In this results chapter, the Cronbach's alpha measure is reported for all the scales used.

All of the scales (table 7) included had a Cronbach's alpha greater than .70.

**Table 7: Scale Reliability**

<b>Scale</b>	<b>Cronbach's Alpha (Standardized Variables)</b>
Innovativeness	.70
Product Involvement	.87
Perceived Information Completeness	.77
Perceived Information Relevance	.80
Innovation Awareness	.78
Perceived Trust	.89

The above table indicates that the scales used, reliably capture the constructs that they seek to measure. All of the values are at or above .70, and accepted level for information systems research.

### ***8.5 Analysis of Repeated-Measure Factor***

As mentioned earlier, the decision inertia construct was captured with the repeated application of a single measure. The main disadvantage associated with this within-subject treatment is the possibility of differential carry-over effects (Keppel 1982). A carry-over effect states the previous answers can bias the answers to treatments and questions that follow.

To determine if there was a carry-over effect with the repeated question, factorial ANOVA with repeated measure analysis was employed (Hatcher and Stepanski 1994). This technique examines whether the previous treatment significantly biases the following one.

To analyze the data, the consequential and functional innovation type groups were examined separated, because there were 4 and 5 respective applications of the questions. The summary of the results of this analysis is displayed in the table below (table 8).

**Table 8:**  
ANOVA Summary table investigation repeated-measure factor

Source	DF	SS	MS	F
<b>Consequential Groups</b>				
Between Subjects	97	726.1		
Group(A)	3	139.83	46.61	7.47*
Residual Between	94	586.27	6.23	
Within Subjects	294	795.18		
Time(B)	3	13.98	4.66	1.89!
AxB (Interaction)	9	85.89	9.54	3.87*
Residual within	282	695.31	2.47	
Total	391	1521.28		
<b>Functional Groups</b>				
Between Subjects	85	1364.02		
Group(A)	3	753.29	251.1	33.71*
Residual Between	82	610.73	7.45	
Within Subjects	344	653.65		
Time(B)	4	58.18	14.54	10.56*@
AxB (Interaction)	12	143.66	11.97	8.69*
Residual within	328	451.81	1.38	
Total	429	2017.67		

\*p<.001

!p>.13

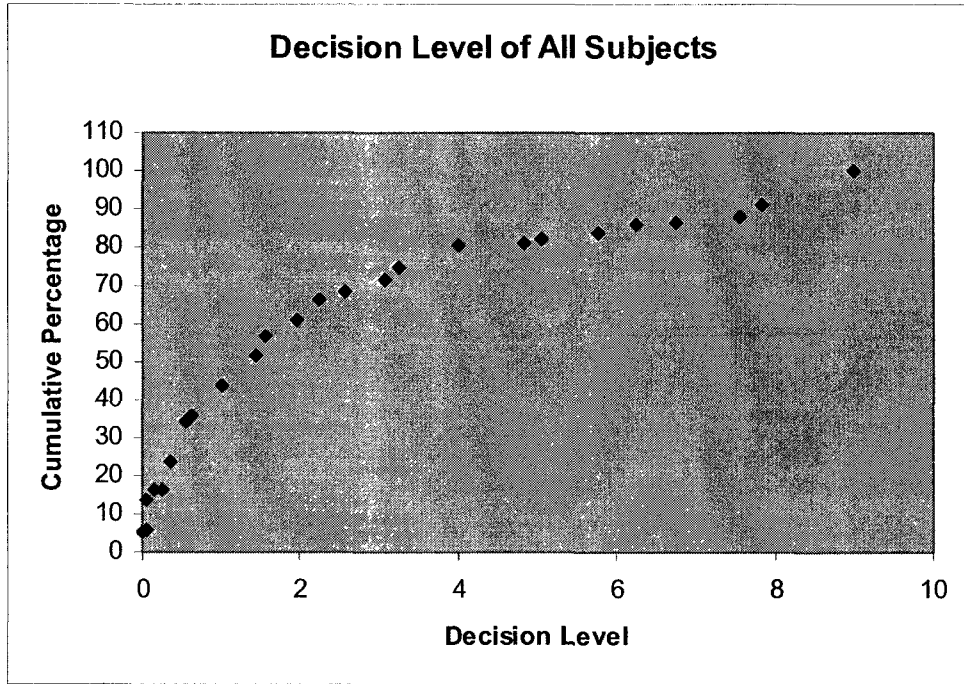
@ Significance only between the first and third responses.

For the consequential treatment groups the main effect of group was significant with  $F(3,94) = 7.47, p < .001$ . For the functional treatment groups the main effect of group was also significant with  $F(3,82) = 33.71, p < .001$ . The effect of time in the consequential treatment group was non-significant with  $F(3,282) = 1.89, p = .1315$ . However, the effect of time in the functional group was significant with  $F(4,328) = 10.56, p < .001$ . Post-hoc contrasts found that the third response was significantly higher than the first response. The time effect for the second, fourth and fifth responses were non-significant. Since only one response created the significance in the functional category, it was viewed as an anomaly that could be explained by the particular statements, and further analysis of the data was continued under the overall assumption that time did not have a significant effect on the results, and there was no significant carry-over effect with the responses.

The question measuring the decision level was measured on a seven point Likert scale. The seven points on the scale were rated from  $-3$  to  $+3$ . Each subject thus had an overall value that was scored in the  $-3$  to  $+3$  range. The extreme ends of the scale represented subjects that explicitly decided to adopt or reject the innovation. As a result of this phenomenon we used the square of the data for analysis. The square data thus ranged in value from 0 to 9.

For analysis, we selected 4 as the midpoint for decision level. Values above 4 were considered as decided. The decision would either be to explicitly adopt or reject the innovation. The values below 4 were regarded as undecided. The graph below shows the cumulative decision levels for the participants in the experiment. The data illustrates that 80% of the population lies at or below decision level 4 (Figure 11).

Figure 11:



## 8.6 Hypothesis

This section examines the results of the twelve hypotheses examined in this paper. Each hypothesis is presented separately with the supporting results.

### 8.6.1 Hypothesis 1

*Decision inertia is greater for negative information than for positive information.*

To test the first hypothesis ANOVA was used. The valence variable consists of analyzing the impact of positive and negative information on the decision process. The valence variable was statistically significant at  $F(1,183) = 22.69, p < .0001$ . To determine the direction of the significance the means of positive and negative information were examined. The mean for positive information was 3.53 and the mean for negative information was 1.65. Since decision inertia is measured as distance from zero, hypothesis 1 is supported (Table 9).

**Table 9: Results Hypothesis 1**

Dependent Variable: DI

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	164.20	164.20	22.69	0.0001
Error	183	1324.40	7.24		
Corrected Total	184	1488.61			

R-Square	C.V.	Root MSE	DI Mean
0.11	105.07	2.69	2.56

Source	DF	Type I SS	Mean Square	F Value	Pr > F
VAL	1	164.20	164.20	22.69	0.0001

Levels	Valence	N	Mean	Std Dev
	N	96	1.65	2.20
	P	89	3.53	3.13

## 8.6.2 Hypothesis 2

*Decision inertia is greater for discontinuous than continuous innovations.*

To test this hypothesis ANOVA was used. The innovation type variable consisted of two levels, discontinuous and continuous. The innovation type variable did not show any statistical significance with  $F(1,183) = 0.11$  and  $p = 0.75$ . Consequently there is no support for hypothesis 2 (Table 10).

**Table 10: Results Hypothesis 2**

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	0.86	0.86	0.11	0.75
Error	183	1487.75	8.13		
Corrected Total	184	1488.61			

R-Square	Coeff Var	Root MSE	result_DL Mean
0.0006	111.36	2.85	2.56

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TYPE	1	0.86	0.86	0.11	0.75
Levels	TYPE	N	Mean	Std Dev	
	C	87	2.63	3.10	
	D	98	2.50	2.61	

### 8.6.3 Hypothesis 3

*Decision inertia is greater for consequential than functional characteristics of an innovation.*

The information characteristic variable consists of two levels: consequential and functional. The innovation characteristic variable was statistically significant with  $F(1,183) = 14.97$  and  $p < .0002$ . To further examine the direction of hypothesis the means for both levels were examined. The mean for the functional characteristic was 3.4 and the mean for the consequential characteristic was 1.83. As a result of these values, there is statistical support for hypothesis 3 (Table 11).

**Table 11: Results Hypothesis 3**

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	112.56	112.56	14.97	0.0002
Error	183	1376.05	7.52		
Corrected Total	184	1488.61			

R-Square	Coeff Var	Root MSE	result_DL Mean
0.08	107.10	2.742152	2.56

Source	DF	Type I SS	Mean Square	F Value	Pr > F
CHAR	1	112.56	112.56	14.97	0.0002

Levels	CHAR	N	Mean	Std Dev
	C	99	1.83	2.41
	F	86	3.40	3.08

#### **8.6.4 Hypothesis 4**

Hypothesis 4 consists of three different parts. These three hypotheses examine the moderating effect of innovativeness on the decision inertia construct. Innovativeness is measured using the PIIT scale, and it provides further support for an analysis of innovative behaviors (Agarwal and Prasad 1998b).

The innovativeness measure was the average of four questions each rated from 1 to 7.

The data showed mean=3.58, standard deviation=1.25, median=4 and mode=4. The value 4 was selected as the cutoff point to differentiate between high and low innovativeness.

Four and below was defined as low innovativeness and above 4 was defined as high innovativeness. The application was necessary to examine the significance of the variable as a moderator.

A moderating variable has a contingent effect on the relationship between the dependent and the independent variable (Sekaran 2000). This variable alters the main effect of the independent variable.

4a. *Innovativeness moderates the relationship between information valence and decision inertia.*

The moderating effect of innovativeness between valence and decision inertia was significant at  $F(3,184) = 9.62, p < .01$  (Table 12). The mean decision inertia for subjects with high innovativeness was 2.88 while the mean decision inertia for subjects with low innovativeness was 2.10. The difference in the means was statistically significant.

**Table 12: Results Hypothesis 4a**

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	284.02	94.67	14.23	<.0001
Error	181	1204.59	6.66		
Corrected Total	184	1488.61			

R-Square	Coeff Var	Root MSE	result_DL Mean
0.19	100.76	2.58	2.56

Source	DF	Type I SS	Mean Square	F Value	Pr > F
valence	1	164.20	164.20	24.67	<.0001
innov	1	55.82	55.82	8.39	0.0042
valence*innov	1	63.99	63.99	9.62	0.0022

Level of valence	Level of innov	-----result_DL-----		
N	H	N	Mean	Std Dev
N	H	64	1.62	2.18
N	L	32	1.72	2.27
P	H	45	4.68	3.33
P	L	44	2.37	2.45

4b. *Innovativeness moderates the relationship between innovation type and decision inertia.*

Hypothesis 2 tested the significance of the innovation type on decision inertia. Since there was no significance statistically, the testing of a moderating variable at this point seemed less than appropriate. However, on testing, it was revealed that there was some statistical significance between the interaction of innovation type and innovativeness. The testing revealed  $F(3,183)=3.18, p<.1$  (table 13).

**Table 13: Results Hypothesis 4b**

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	53.77	17.92	2.26	0.08
Error	181	1434.84	7.93		
Corrected Total	184	1488.61			

R-Square    Coeff Var    Root MSE    result\_DL Mean  
 0.036120    109.97    2.82    2.56

Source	DF	Type I SS	Mean Square	F Value	Pr > F
type	1	0.86	0.87	0.11	0.74
innov	1	27.67	27.67	3.49	0.0633
type*innov	1	25.24	25.24	3.18	0.0760

Level of type	Level of innov	N	Mean	Std Dev
C	H	52	3.27	3.53
C	L	35	1.68	2.04
D	H	57	2.53	2.63
D	L	41	2.45	2.61

*4c. Innovativeness moderates the relationship between innovation characteristics and decision inertia.*

Hypothesis 3 found that innovation characteristic was a statistically significant when measuring decision inertia. When measuring the moderating variable innovative the results were as follows  $F(3,184) = 1.08$  with  $p=.30$  (Table 14). The result indicates that there is no statistical support for the proposed hypothesis.

**Table 14: Results Hypothesis 4c**

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	137.11	45.70	6.12	0.0005
Error	181	1351.50	7.47		
Corrected Total	184	1488.61			

R-Square	Coeff Var	Root MSE	result_DL Mean
0.092	106.73	2.73	2.56

Source	DF	Type I SS	Mean Square	F Value	Pr > F
char	1	112.56	112.56	15.07	0.0001
innov	1	16.46	16.46	2.20	0.14
char*innov	1	8.09	8.09	1.08	0.30

		-----result_DL-----		
char	innov	N	Mean	Std Dev
C	H	53	1.94	2.49
C	L	46	1.71	2.33
F	H	56	3.78	3.36
F	L	30	2.69	2.37

### *Interaction Effects*

The table below shows the three independent variables and their interaction results.

There were significant interactions between 1. innovation characteristic and innovation type; 2 innovation characteristic and information valence both at  $p < .05$ . There was no significant three way-interaction across the variables.

Source	DF	Type III SS	Mean Square	F Value	Pr > F
char	1	114.72	114.72	17.93	<.0001
type	1	1.73	1.73	0.27	0.6040
valence	1	170.13	170.13	26.59	<.0001
char*type	1	34.09	34.09	5.33	0.0222
char*valence	1	38.64	38.64	6.04	0.0150
type*valence	1	4.80	4.80	0.75	0.3876
char*type*valence	1	7.31	7.31	1.14	0.2868

### 8.6.5 Hypothesis 5

*Decision inertia is greater for individuals with low product involvement.*

Product involvement examines the relationship that the individual has with a particular product. Involvement refers to the individual's "perceived relevance of the object base on inherent needs, values and interests" (Zaichkowsky 1985). Since this refers to an existing established relationship it was only examined where subjects were presented with continuous innovation. The continuous innovation used in the study was BlackBoard. The underlying reason was that students even if they did not use it before would most likely have heard of the tool.

The involvement scale (McQuarrie and Munson 1992) used consisted of ten items each scaled from 1 to 7. The possible scores from this scale ranged from 10 to 70. The data had a mean=50.56, mode=53, median=52, minimum=22, maximum=70. The median of 52 was used as the cut-off point to differentiate between high and low inertia.<sup>8</sup>

Hypothesis 2 did not find any statistical significance between innovation type and decision inertia. However, the involvement construct is hypothesized to moderate this variable, and more specifically affect the continuous innovation. Analysis of the hypothesis reveal an  $F(1,85) = .47$  with  $p = .49$ . There was thus no support for hypothesis 5 (table 15).

---

<sup>8</sup>The 25<sup>th</sup> and 75<sup>th</sup> percentiles were used to determine high and low involvement (Zaichowsky 1985). This study considered the full range of values since only half of the subjects were exposed to the involvement treatment.

**Table 15: Results Hypothesis 5**

Dependent Variable: DI

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	4.58	4.58	0.47	0.49
Error	85	823.15	9.68		
Corrected Total	86	827.74			

R-Square	Coeff Var	Root MSE	DI Mean
0.006	118.21	3.11	2.63

Source	DF	Type I SS	Mean Square	F Value	Pr > F
invol	1	4.58	4.58	0.47	0.49

Level of -----DI-----

invol	N	Mean	Std Dev
H	42	2.39	2.81
L	45	2.85	3.37

### 8.6.6 Hypothesis 6

*Decision inertia is greater for individuals with low awareness.*

Innovation awareness is defined as a favorable attitude towards the innovation (Agarwal and Prasad 1998a). We present the case in this research that a favorable attitude towards an innovation would decrease the likelihood of decision inertia.

A Likert scale was used to measure awareness. There were three questions in the awareness scale that were rated from strongly agree to strongly disagree. The data description was as follows: mean = 3.04; median = 3; mode = 3. Two levels of awareness were used: high and low. All values less than or equal to the median of 3 represented high awareness. Recall, that the scale ranges from 1-7 with strongly agree corresponding to the 1 value. All values greater than 3 were interpreted as low awareness. No midrange values were considered, since they did not seem relevant to the ideas being tested.

With the defined limits for high and low awareness, an ANOVA was conducted. The was statistical significance at the  $p < .05$  level with  $F(1,183) = 5.16$ . The mean decision level for individuals with high awareness was 2.95 and the mean decision level for individuals with low awareness was 1.99. Clearly, high awareness is associated with less indecision, and thus supports hypothesis 6 (Table 16).

**Table 16: Results Hypothesis 6**

Dependent Variable: DI

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	40.80	40.80	5.16	0.02
Error	183	1447.81	7.91		
Corrected Total	184	1488.61			

R-Square	Coeff Var	Root MSE	DI Mean
0.03	109.86	2.8127	2.56

Source	DF	Type I SS	Mean Square	F Value	Pr > F
awareness	1	40.80	40.80	5.16	0.02

Level of awareness	N	Mean	Std Dev
H	109	2.95	3.08
L	76	1.99	2.37

### 8.6.7 Hypothesis 7

*Decision inertia is greater for individuals with low perceived trust.*

This hypothesis examined the impact of trusting the source of the information regarding making a decision about an innovation. Three questions were asked, and each response was captured on a seven point Likert scale. The average of the three questions was used to capture the subject's overall perception about trusting the source. From the data the mean was 3.99 with a mode and median of 4.

The range of responses was from strongly agree to strongly disagree (values from 1 through 7). The average responses were categorized as high and low trust. Scores less than or equal to 4 represented high trust while values above 4 represented low trust.

The result of hypothesis 7 revealed an  $F(1,183) = .31$  with  $p > .58$ . The low F statistic indicates that there was no significant difference between subjects that perceived high or low trust about the source of the information. The lack of significance indicates that no support was found for the tested hypothesis (Table 17).

**Table 17: Results Hypothesis 7**

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	2.53	2.53	0.31	0.58
Error	183	1486.08	8.12		
Corrected Total	184	1488.61			

R-Square	Coeff Var	Root MSE	result_DL Mean
0.002	111.30	2.85	2.56

Source	DF	Type I SS	Mean Square	F Value	Pr > F
trust	1	2.53	2.53	0.31	0.58

Level of	-----result_DL-----		
trust	N	Mean	Std Dev
H	107	2.66	2.79
L	78	2.42	2.93

### 8.6.8 Hypothesis 8

*Decision inertia is greater for individuals with low perceived information relevance.*

I assert in the theory presented in this research that relevant information is necessary for effective decision making. The argument presented is that if an individual does not perceive information to be relevant it would affect how successful he or she is about making a decision about an innovation. Further, if the information presented is perceived as irrelevant, the individual will have greater inertia than an individual that is presented with relevant information.

Three questions were used to capture information relevance. The three items were also measured on a seven point Likert scale. The responses ranged from strongly agree to strongly disagree. The mean of the data was 3.4 while 3.3 was the mode. The 3.4 value was used as the divider to separate high and low relevance. Values less than or equal to 3.4 represented high relevance while values greater than 3.4 represented low relevance.

The results of the ANOVA revealed  $F(1,183) = 4.25$  with  $p < .05$ . The mean decision inertia with low relevance was 2.11 while the mean decision inertia with high relevance was 2.96. Decision inertia was greater for individuals with less perceived relevance of the information presented. These results indicate support for hypothesis 8 (Table 18).

**Table 18: Results Hypothesis 8**

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	33.78	33.78	4.25	0.04
Error	183	1454.83	7.95		
Corrected Total	184	1488.61			

R-Square	Coeff Var	Root MSE	result_DL Mean
0.022689	110.12	2.82	2.56

Source	DF	Type I SS	Mean Square	F Value	Pr > F
relevance	1	33.77	33.77	4.25	0.04

Level of	-----result_DL-----		
relevance	N	Mean	Std Dev
H	98	2.96	3.005
L	87	2.11	2.59

### 8.6.9 Hypothesis 9

*Decision inertia is greater for individuals with low perceived information completeness.*

Information completeness was measured on a scale of three questions. The questions were reported via a Likert scale ranging from 1 to 7, where the poles represented strongly agree and strongly disagree. The mean of the data was 3.9 with a mode of 4.

For analysis of the data, two groups were created. One group represented low perceived information completeness and the second group represented high perceived information completeness. Values less than or equal to 4 represented high perceived information completeness and values above 4 represented low perceived information completeness.

The ANOVA revealed  $F(1,183)=.87, p>.35$ . No support was found for this hypothesis (Table 19).

**Table 19: Results Hypothesis 9**

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	7.08	7.08	0.87	0.35
Error	183	1481.52	8.10		
Corrected Total	184	1488.61			

R-Square	Coeff Var	Root MSE	result_DL Mean
0.005	111.13	2.85	2.56

Source	DF	Type I SS	Mean Square	F Value	Pr > F
complete	1	7.08	7.08	0.87	0.35

Level of	-----result_DL-----			
complete	N	Mean	Std Dev	
H	113	2.72	2.86	
L	72	2.32	2.82	

### 8.6.10 Hypothesis 10

*Decision Inertia is greater for individuals with low task satisfaction.*

This hypothesis was tested with a single question used to capture the task satisfaction construct. The single question was: “I am satisfied with how I completed this exercise”. Of the total number of subjects in the experiment, 175 of them completed this question. The lower response rate might be due to the fact that it was one of the very last questions of the task to complete.

The ANOVA produced a result of  $F(1,174) = 3.07$  and  $p = .08$ . This hypothesis is significant at the  $p < .1$  level. Consequently there is statistical significance for hypothesis 10 (Table 10).

**Table 20: Results Hypothesis 10**

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	22.55	22.55	3.07	0.08
Error	174	1277.64	7.34		
Corrected Total	175	1300.19			

R-Square	Coeff Var	Root MSE	result_DL Mean
0.017344	112.71	2.71	2.40

Source	DF	Type I SS	Mean Square	F Value	Pr > F
SATIS	1	22.55	22.55	3.07	0.08

Level of SATIS	N	Mean	Std Dev
H	88	2.76	2.94
L	88	2.05	2.46

## 8.7 Summary of Results

The table below (table 20) illustrates a summary of the hypothesis tested and the results that were found.

**Table 21: Summary of Results**

Hypothesis	Statistical Significance	P-value
1. Decision inertia is greater for negative information than for positive information.	Yes	p<.0001
2. Decision inertia is greater for discontinuous than continuous innovations.	No	
3. Decision inertia is greater for consequential than functional characteristics of an innovation.	Yes	p<.0002
4a. Innovativeness moderates the relationship between information valence and decision inertia.	Yes	p <.01
4b. Innovativeness moderates the relationship between innovation type and decision inertia.	Yes	p<.1
4c. Innovativeness moderates the relationship between innovation characteristics and decision inertia.	No	
5. Decision inertia is greater for individuals with low product involvement.	No	
6. Decision inertia is greater for individuals with low awareness.	Yes	p<.05
7. Decision inertia is greater for individuals with low perceived trust.	No	
8. Decision inertia is greater for individuals with low perceived information relevance.	Yes	p<.05
9. Decision inertia is greater for individuals with low perceived information completeness.	No	
10. Decision Inertia is greater for individuals with low task satisfaction.	Yes	p<.1

## ***8.8 Supplemental Analysis***

This supplemental analysis provides an introduction to some of the future analysis that will be done on the current data set. This analysis is beyond the twelve main hypotheses that were examined. The analysis seeks to provide the framework for the development of a comprehensive Decision Inertia scale.

The scale for perceived information quality was initially measured along the sixteen-point scale listed below. Each item below was measured on a seven point Likert scale from strongly agree to strongly disagree (Table 22). The order of the items was randomized when presented to the participants.

**Table 22: Supplemental Analysis: Perceived Information Quality**

<b>Dimension</b>	<b>Variable Name</b>
1.The information I received was complete.	Comp
2.The information I received was incomplete. *	Incom
3.I needed more information to help me make a decision.	More
4.The information I received was sufficient.	Suff
5.The information I received was useful.	Useful
6.The information I received helped me to make a decision.	Rele
7.The information I received was irrelevant.*	Irrel
8.The information I received was relevant.	Rel
9.I believe that _ represents an important innovation.	Impinn
10.I believe that this technology is critical to this school.	Criti
11.I think it is appropriate for the school to adopt this technology.	Sadopt
12.The information I received was of a high quality.	Hqua
13.The information I received could have been of a higher quality.*	Lqua
14.I trust the sources of this information.	Tsource
15.The sources of the information I received are trustworthy.	Trustw
16.I was satisfied with the accuracy of the statements.	Accu

\*Reverse scored, counterbalanced questions.

The table below (Table 23) shows the values of the different variables with their means and standard deviations.

**Table 23: Supplemental Analysis – Variable Means**

<b>Means and Standard Deviation</b>		
<b>Variable</b>	<b>Mean</b>	<b>Std Deviation</b>
comp	3.83	1.71
useful	3.325	1.57
impinn	2.97	1.53
hqua	3.79	1.68
incom	4.01	1.87
trustw	4.04	1.67
criti	3.22	1.83
lqua	3.37	1.71
more	3.19	1.87
irrel	4.58	1.58
suff	4.07	1.69
accu	3.97	1.69
rel	3.51	1.50
tsource	4.03	1.66
sadopt	3.00	1.59
rele	3.55	1.74

Principal component analysis was conducted as an initial screening process on the data collected for the perceived information quality scale. This analysis looked at 13 variables, because it excluded the counterbalanced variables. This procedure used a linear combination of the measurements to explain as much of the variability as possible. The total variance found was 36.4.

**Table 24: Supplemental Analysis – Covariance Matrix**

**Eigenvalues of the Covariance Matrix**

	<b>Eigenvalue</b>	<b>Difference</b>	<b>Proportion</b>	<b>Cumulative</b>
1	19.57	15.96	0.54	0.54
2	3.61	0.83	0.10	0.64
3	2.79	0.61	0.08	0.71
4	2.17	0.57	0.06	0.77
5	1.61	0.24	0.04	0.82
6	1.37	0.21	0.04	0.85
7	1.16	0.20	0.03	0.89
8	0.97	0.14	0.03	0.91
9	0.83	0.14	0.02	0.94
10	0.69	0.07	0.02	0.95
11	0.62	0.06	0.02	0.97
12	0.56	0.10	0.02	0.99
13	0.47		0.01	1.00

The eigenvalues above (Table 24) one indicates the number of factors that are retained.

From the above data, seven values are above one, explaining 88.65% of the variability of the results. However, it must also be noted that when only the first three factors are considered 71.3% of the variance is explained.

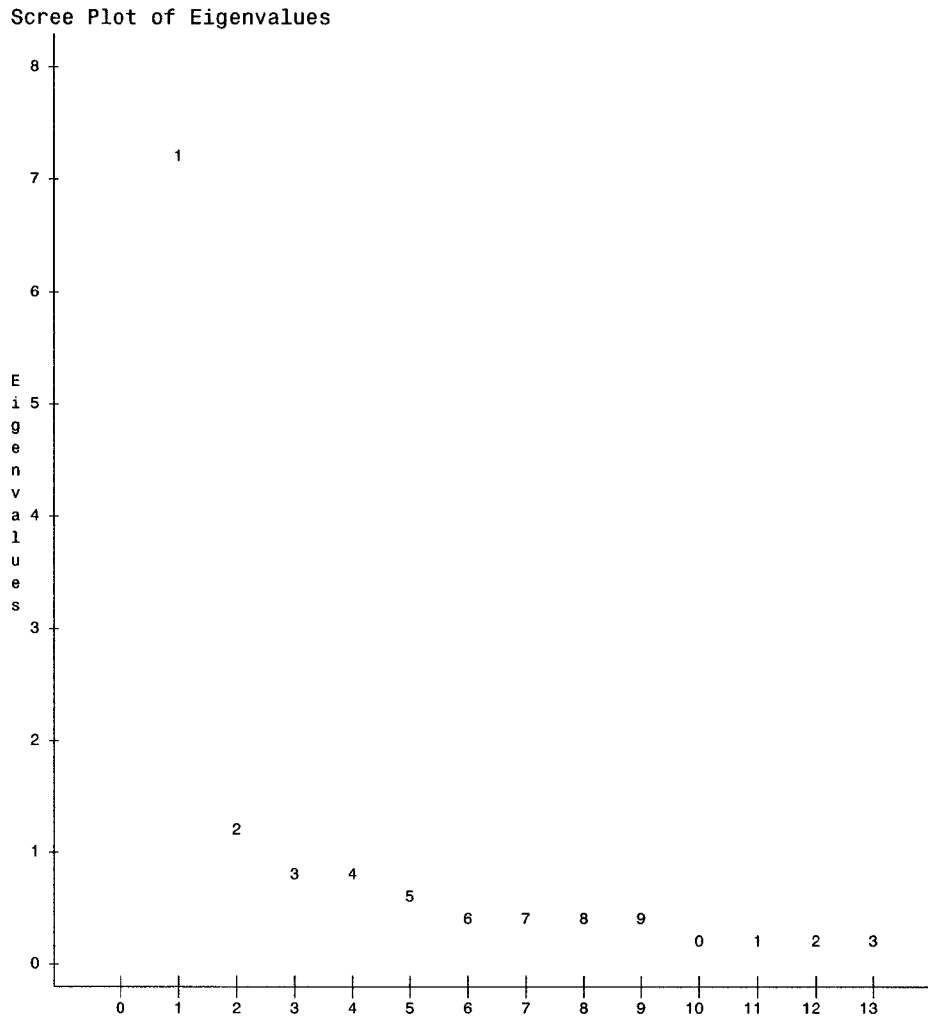
Factor analysis was a second technique used for the analysis of the data of the decision inertia construct. A subset of non-correlated variables was derived to explain the data.

The important findings refer to which variables load on which factors.

The results of the factor analysis indicated that two factors would be retained by the mineigen criterion. The eigenvalues of the two factors retained were 7.08 and 1.22 respectively.

**Figure 12: Supplemental Analysis – Scree Plot**

Scree Plot of Factors  
The FACTOR Procedure  
Initial Factor Method: Principal Components



The above graph represents the scree plot of the eigenvalues. From the above graph, three factors will be retained. The nfactor criterion retained 5 factors. There are advantages and disadvantages of each measure for the amount of factors that are retained.

The table below shows the result of the factor analysis.

**Table 25: Supplemental Analysis – 3 Factor Loadings for the 13 variables**

Variable	Factor1	Factor2	Factor3
1. Comp	X		
2. Useful	X		
3. Impinn		X	
4. Hqua	X		
5. Trustw	X		
6. Criti	X		
7. More			X
8. Suff	X		
9. Accu	X		
10. Rel	X		
11. Tsource	X		
12. Sadopt		X	
13. Rele	X		

Of the total 13 variables used to measure perceived information quality, 10 loaded onto a single factor. A single factor loading signifies a single underlying construct (Zaichkowsky 1985). Of the 13 variables, 77% (10) have loadings in excess of .55. A factor loading greater than .45 is fair, greater than .55 is good, greater than .63 is very good and greater than .71 is excellent (Comrey 1973).

To further analyze the above results, a factor analysis with only the variables that were loaded on the first was done. The results revealed only two factors with eigenvalue above one. The eigenvalue was 16.5 and 1.22 respectively. Further, the mineigen criterion also retained a single factor while the nfactor result also showed only two eigenvalues above one. Examination of the scree plot indicated that two factors were maintained.

The table below (Table 26) shows the factor loading for the 10 variables that initially loaded on factor 1.

**Table 26: Supplemental Analysis – 2 Factor Loadings for the 13 variables**

**Factor Loadings for the 13 variables**

<b>Variable</b>	<b>Factor1</b>	<b>Factor2</b>
1. Comp	X	
2. Useful	X	
4. Hqua	X	
5. Trustw		X
6. Criti	X	
8. Suff	X	
9. Accu		X
10. Rel		X
11. Tsource		X
13. Rele	X	

Two significant factors emerge from the factor analysis involving the 10 main variables.

## **VI. DISCUSSION AND LIMITATIONS**

### **Chapter 9 Discussion**

The discussion section provides explanations for the hypothesis that did not receive any support. The theory presented in the paper, expected to find support for all the hypotheses tested. The hypotheses that were supported do not need further discussion, since this is what we expected to find.

#### ***9.1 Decision Inertia and Innovation Type***

The first hypothesis that was not supported was:

*Hypothesis 2: Decision inertia is greater for discontinuous than continuous innovations.* Theoretically, there is support for the argument that different behaviors occur when individuals are presented with discontinuous versus continuous innovations (Molesworth and Suortti 2001; Robertson 1971).

However, two possible explanations exist for the lack of support for this hypothesis.

The first explanation is that the example used in the experiment for a discontinuous innovation may not have been the best example. We were satisfied with the selection of NewBlackBoardXT as a continuous innovation since 90% of the participants in this study indicated that they had used BlackBoard before. A critical definition of a continuous innovation is that it is a modification of an existing product (Walsh, Kirchhoff et al. 2002). The use of an existing product, modified by adding different features, was consistent with the description of a continuous innovation. However, the selection of WebClass as our discontinuous innovation was limited in that it may not have truly captured the essence of a discontinuous innovation.

The main logic behind the design of WebClass was that this new software introduced features to the participants that were not previously available to them before. Some of the new features included, remote access to real time classes, on-line class communication with other students and faculty, high speed immediate downloads and uploads. However, the problem with this innovation is that one or more of its attributes might not have been perceived as new and innovative. One of the features described in WebClass was the ability to participate remotely and in real-time in classes. This feature, on closer examination, is similar to features examined under group decision making, which has received extensive coverage in the literature (Fjermestad and Hiltz 1998/1999). So even though the technology was not currently in use at the college, it is not unlikely that students might have heard of similar tools used in business setting.

The second explanation is more user-focused. The participants that were exposed to WebClass (our example for a discontinuous innovation) did not perceive the innovation to be radically different from something they had heard about before. Even though the software WebClass was not in use at the Baruch College, students may have believed that it was available for use elsewhere, hence affecting the perception of a revolutionary new idea.

My conclusion is that distinction between the continuous innovation and the discontinuous innovation was not significant enough to produce varying results. The subjects in the both groups did not perceive a difference between the two. For further studies it would be useful to have a greater distinction between the two. This particular problem was also encountered in this study, because one goal was to keep the continuous and discontinuous innovation within the same domain.

## **9.2 Decision Inertia, Innovation Characteristics and Innovativeness**

The second hypothesis that was not supported was:

*Hypothesis 4c: Innovativeness moderates the relationship between innovation characteristics and decision inertia.*

This hypothesis was the third of three hypotheses that examined innovativeness as a moderating variable. There was support for innovativeness moderating the relationship between information valence and decision inertia; and innovation type decision inertia.

Lack of support for this hypothesis was a bit surprising and somewhat more difficult to explain. The initial argument presented the case that the more innovative participant would experience less inertia irrespective of the characteristics of the innovation. From the results, the differences in the mean of the two groups, was not statistically significant when innovativeness was examined.

The reason we are forwarding is that the two groups for information characteristics: functional and consequential were well-formulated and not affected by the level of innovativeness of the participants. Both types of information were very distinct from each other. Participants did not discount the information, because they were innovative. This finding indicates that innovation characteristics are critical components in affecting the decision inertia construct, and is not strongly affected by moderators, that have an impact on other variables.

### **9.3 Decision Inertia and Involvement**

The third hypothesis that was not supported was:

*Hypothesis 5: Decision inertia is greater for individuals with low product involvement.*

Involvement measures the perceived personal relevance of the product to the individual (Petty, Unnava et al. 1991; Zaichkowsky 1985). By definition, this implies that the individual has had some exposure to the product. In this study the two products used were NewBlackBoardXT and WebClass. However, since only NewBlackBoardXT was identified as a continuous innovation, only participants in the NewBlackBoardXT groups were exposed to the involvement treatment. Since we presented WebClass in the experiment as a discontinuous innovation, we assumed that participants were not previously familiar with it, and thus could not report on their current “involvement” with the tool.

Eighty-nine subjects were randomly assigned to the NewBlackBoardXT treatment. As a result, 89 participants were exposed to the involvement treatment. Of the 89 subjects, two levels were then identified: high and low involvement. From the data there were less than 45 participants in the high and low involvement groups. The lack of support is believed to be largely due to the small number of data points that were captured for this part of the experiment. One way to compensate for this problem would be to use simulation to increase the number of data points (Kleijnen and Van Beers 2004). A second, more immediate measure that would have compensated for this problem would

have been to ask all the participants - those presented with the continuous and the discontinuous innovation to complete the innovativeness treatment. This would have resulted in a larger sample size to sufficiently test the moderating impact of the involvement construct.

From the results it seems evident that students that participated in this survey did not have any strong feelings, positive or negative about BlackBoard. One potential explanation for this is that students may view BlackBoard as a tool that they have little control over. Either it is used in their class or not. Further, it is also possible that the students that participated in this experiment had similar experiences with BlackBoard. If some level of homogeneity existed with their previous level of experience with BlackBoard, it can affect the fact that all the measurements of involvement were clustered around the middle and not more distributed.

## **9.4 Decision Inertia and Perceived Trust**

The fourth hypothesis that was not supported was:

*Hypothesis 7: Decision inertia is greater for individuals with low perceived trust.*

Perceived trust in this study referred to trusting the source of the information.

Participants were informed that statements were collected about the software (NewBlackBoardXT or WebClass) from a variety of sources including other students, faculty and developers.

The lack of statistical significance is that there was no discernable difference on decision inertia between low and high perceived trust subjects. Given the setting, and the context of the material, subjects may not have had any reason to doubt the reliability of source of the information. A similar study examining source credibility and trust with a student populations, showed that trust was not significant in that experimental environment (Morris 1993). Therefore, low and high trust could not be discerned since all the results hovered very closely to each other. In fact, the mean decision inertia for high trust was 2.66 and the mean for low trust was 2.42, these values are indeed very close to each other.

This study focused on decision-making based on presentation of different pieces of information. There was no associated negative impact as a result of a particular decision or non-decision that the participant made. Without an explicit positive or negative impact the value of trust seems to have been diminished. In fact, a recent empirical study found

that where there were high levels of information exchange in an on-line environment, trust was not a significant issue (Deeter-Schmelz and Kennedy 2004).

Even though support was not found for the proposed hypothesis this finding is very interesting since it suggests that there are specific instances in the decision-making literature where trust is not a significant issue. This finding presents the case that when decision inertia occurs, it is not correlated with a lack of trust of the information source.

## **9.5 Decision Inertia and Perceived Information Completeness**

The fifth hypothesis that was not supported was:

*Hypothesis 9: Decision inertia is greater for individuals with low perceived information completeness.*

Approximately 60% of the participants reported that they perceived a high level of information completeness. This result can help to explain some of the lack of significance of this hypothesis. If participants generally perceived that the information presented was complete, there is no valid basis for the analysis of incomplete information.

A more effective method to attempt to capture the perception of completeness would have been to instruct the subjects that they received some percentage of the information available. If participants are told that they received incomplete information, they are more likely to take that into account when making decisions (Ahituv, Igbaria et al. 1998). However, we did not want to predispose the participants in any particular direction, by telling them a priori that the information was complete or incomplete.

The lack of support for this hypothesis seems linked to the lack of support for hypothesis 7, which dealt with trusting the source of the information. Since participants showed a consistent level of trust for the source of the information, it further seems unlikely that they would perceive that the trusted source presented them with incomplete information.

Presentation of complete information results in higher levels of trust on the part of the decision-maker (Birgelen, de Ruyter et al. 2000).

It also seems possible that the converse seems true as well, that when the source is trusted it is less likely that there will be a perception that the source will present incomplete information. If the participants showed a distrust of the information source, it is also more likely that they would also perceive that information was withheld from them. This however, would require further examination for definitive support. At this time, it is a proposition to explain the apparent lack of support for this hypothesis.

## **9.6 Limitations**

Several plausible explanations can be presented to explain the lack of differentiation between the continuous and the discontinuous innovation. One main issue and thus a limitation in this study is attributed to the selection of innovations. The two innovations used did not sufficiently differentiate between the continuous and the discontinuous innovation.

The main problem occurred with the selection of WebClass as a discontinuous innovation. Some of the information presented about Webclass may not have been perceived as radically different from innovations that participants were previously exposed. One characteristic of WebClass was the ability to have face-face real time classes remotely. This is one example characteristics that participants can interpret as something that exists elsewhere. By definition, a discontinuous innovation causes a change in the individual behavior (Robertson 1967). The participants in this study did not envision that the use of WebClass would require any significant change in their current behavior. As a result there was no statistically significant different between WebClass and its continuous counterpart BlackBoardXT.

After finding no statistical support for hypothesis 2, it was a bit surprising to then find support for hypothesis 4b. Hypothesis 4b examined the moderating effect of innovativeness on innovation type and decision inertia. The existence of the moderating effect suggests that with a stronger distinction between the continuous and the

discontinuous innovation, support for hypothesis 2, can arise. It is thus imperative that in future studies, an innovation that is truly “new” must be used for the illustration of a discontinuous innovation.

One of the main limitations of this study, as with most experimental research is the generalizeability of the findings. There are two areas where generalizations will be limited: first beyond a student population and secondly beyond a web-based domain. Even though several studies have used student populations for technology acceptance and adoption studies (Davis 1989; Gefen and Straub 2000; Moon and Kim 2001), and inherent weakness is that the student population is usually more technologically literate than the general population (Carter and Belanger 2004).

This study examined two modes for information valence – positive and negative. The underlying thesis in this research looks at the state of neutrality of the subject. However, neutral information was not presented. The main challenge associated with the presentation of neutral information is that there will inherently be some bias, or some perception of bias in the statements.

The third limitation in this study is the repeated single measure for decision inertia. Even though the construct was captured at several different times it can be argued that more than a single question should have been used to capture this construct. The examination of supporting attributes such as relevance, trust, information completeness and

awareness, help to alleviate some of the concerns associated with the decision inertia construct.

## **VII. RESEARCH IMPLICATIONS**

### **Chapter 10 : Research Implications**

The results of this research have implications for both practitioners and researchers. The practitioners refer particularly to software developers, website builders, technicians and analysts. These groups create, design and support implementation of new products on a daily basis. The findings of this study can assist them in dealing with the implementation, diffusion and support of new and existing technologies.

The research category considers other members of the academic community who develop and challenge theories for the advancement and development of the field.

## ***10.1 Implications for Practitioners***

There are also implications for practitioners in this study. A better understanding of resistance to innovation can improve development and design of products in this area.

The first issue is the recognition that all software, tools and products are not in the same category. The identification of continuous and discontinuous innovation in the field of information systems illustrates that versioning of software, and the introduction of an entirely new product will have an impact on how the product diffuses through a population.

An established product, which is undergoing successive versioning will be likely less resisted than a first release product.

## **10.2 Implications for Researchers**

From a research perspective, this study provides an alternative approach for the examination of innovation adoption. The re-classification of characteristics of innovations also provides a framework that can be the basis for further research work.

This study examined decision inertia at an individual level however it can ultimately have a collective effect. We suggest two dimensions for the collective effect. The first dimension is referred to as an opportunistic stimulus. This is where the potential adopter perceives that there are future gains that can be harnessed from the use of the innovation. However, there are concerns and reservations that can lead to the retreat from active information seeking and decision-making about an innovation.

The second dimension is referred to as a reactive stimulus, where the potential adopter, perceives that the associated costs of adopting the innovation will outweigh any future benefits, but the potential adopts wants more evidence to support this assertion.

High costs, dissatisfaction with service, lack of time to use the service and service replacement are the four main reasons for the discontinuance of web-based subscription services (Parthasarathy and Bhattacharjee 1998). These factors can also be relative disadvantages that can cause a state of the inertia, and can change as cost and time pressure decrease, and service quality increases. Perhaps ironically, satisfaction with the

current product can also lead to decision inertia, by preventing, or at least considerably delaying, the adoption of future upgrades or substitutes.

These are all propositions based on the existing study. The impact to researchers is that some or all of these concepts can be empirically tested to broaden the area of research around innovation adoption, innovation rejection and decision inertia.

## **VIII. CONCLUSION**

### **Chapter 11: Conclusions**

This study applies a theoretical construct called Decision Inertia. This construct provides a basis for further analysis and understanding of the non-adoption phenomenon. The area of non-adoption and technology rejection has received limited attention in the field of Information Systems. This research provides a critical point from which further studies can be conducted. The presented theory can be further applied in other web and business domains.

The web-based context provided a platform and unique environment for the empirical validation of the construct of Decision Inertia. The web domain also supports a host of e-commerce domains including e-banking and e-government. These are rich and developing areas that even though many users are aware of them, there has been limited adoption. Application of the Decision Inertia construct in these areas provides a basis for growth and development of this research stream.

Decision Inertia provided an alternative approach to the examination of factors affecting non-adoption. Further, it highlights the value of identifying individuals in such as state. The direction of movement from individuals in the undecided state can ultimately affect the diffusion of the innovation in question.

One of the main objectives of this research was to capture the characteristics of the undecided group. The significance of the undecided group has implications beyond the area of technology adoption. The undecided group can impact areas such as management, marketing and political science. One specific reference can be made of the importance that can be placed on an undecided group in a closely contested political race.

Important to this research is the identification of those individuals experiencing Decision Inertia. Moving individuals out of inertia is a key concern. Ultimately movement out of this stage can positively impact other areas of business including product development, production and the field of management as a whole.

# IX. APPENDICES

## Appendix A

### RPII - Revised Product Involvement Inventory

(Product Involvement Scale) E. F. McQuarrie and J. M. Munson 1992

Place an X to represent your feeling about the product (Example:Very Closely Related)

Important	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	unimportant
				<b>OR</b>				
Important	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	unimportant
Example: Closely Related								
Important	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	unimportant
				<b>OR</b>				
Important	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	unimportant
Example: Slightly Related								
neutral) you should place your check as follows:								
Important	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	unimportant
				<b>OR</b>				
Important	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	unimportant

Important:

Be sure that you check every scale for every (product): do not omit any.

Never put more than one check (x) mark on a single scale.

(Insert name of object to be judged)

Important	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	unimportant
No needed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	needed
Irrelevant	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	relevant
								means
Means a lot to me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	nothing to me
Unexciting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	exciting
Dull	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	neat
								doesn't
Matters to me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	matter
Boring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	interesting
Fun	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	not fun
								unappealing
Appealing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ng
								of concern
Of no concern	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	to me

## **Appendix B – Personal Innovativeness in the Domain of Information Technology**

(Agarwal and Prasad 1998)

All items are measured on a seven-point scale, with the end points being “Strongly Disagree” and “Strongly Agree”.

1. If I hear about a new information technology, I would look for ways to experiment with it.
2. Among my peers, I am usually the first to try out new information technologies.
3. In general, I am hesitant to try out new information technologies. \*
4. I like to experiment with new information technologies.

\* This is a reverse scaled item.

## **Appendix C: Recruitment Flier**

*Attention Baruch Students: Participants Needed!!!*

A research study is being conducted school by Rhoda Joseph, PhD candidate.

Volunteer about 45 minutes of your time to participate in this study. This study is part of research about attitudes and decision-making associated with web-based technologies.

There are no risks involved or any impact on your academic performance. Each participant will receive a \$10 gratuity and a chance of winning one of three \$100 prizes.

All information will be kept confidential and your name will never be associated with any publications that may arise as a result of this study.

If you wish to participate, please write your name, email address and telephone number(s) on the sign up sheet that is provided. I will contact you as to the scheduled time of the study. If you have any questions please contact me, Rhoda Joseph, Principal Investigator email: [Rhoda\\_Joseph@baruch.cuny.edu](mailto:Rhoda_Joseph@baruch.cuny.edu)

Thank you

## Appendix D: Consent Form

Principal Investigator: Rhoda Joseph, Doctoral Student, Graduate Center, CUNY  
Department of Statistics/CIS  
Zicklin School of Business 1 Bernard Baruch Way  
Box E-435 New York, NY 10010

My name is Rhoda Joseph and I am a doctoral student in Business – Information Systems Program at the Graduate Center of the City University of New York (CUNY), and Principal Investigator of this project, entitled Adoption Intention and Diffusion Inertia in Web-based Innovations. I am requesting your participation in a laboratory experiment.

The complete experiment is expected to last approximately 45 minutes. You will receive \$10 gratuity for participating in this experiment, and the possibility of winning one of three \$100 prizes from a random drawing.

All data collected will be kept confidential and reported only in aggregate form. Published results of this study will not contain any individual participant's information. There is no financial risk or impact on your academic record from participation in this experiment.

The data collected will be kept confidential and reported only in group form. I may publish results of the study, but names of people, or any identifying characteristics, will not be used in any publications. If desired you can see the data collected from only your participation, by providing me with your address and I will send you a copy in the future.

If you have any questions or concerns regarding this research, please feel free to contact me: Rhoda Joseph, principal investigator at Rhoda\_Joseph@baruch.cuny.edu, (646) 312-3393 or her advisor Professor Barry Dumas at Barry\_Dumas@baruch.cuny.edu, (646)-312-3360. If you have any questions about your rights as a participant in this study, you can contact Hilry Fisher, Sponsored Research, graduate school, City University of NY, (212) 817-7523, hfischer@gc.cuny.edu

Thank you for participation in this research. By signing below, you accept and understand the terms of this research study as stated above and that your participation is totally voluntary.

\_\_\_\_\_  
Full Name

Rhoda Joseph  
Full Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

\_\_\_\_/\_\_\_\_/03

\_\_\_\_/\_\_\_\_/03

## Appendix E: Valence Manipulation Check

### Instructions: Please read carefully

ProdX is a new software product that is available for use at school and at work. You have no information about what the product is or what it does. However, you have the following statements about the product. For each statement about the product you can interpret it in the range of *very positive* to *very negative*.

For each of the statements listed about ProdX check the box that best represents your opinion of that statement.

- 1 People in my organization who use ProdX have a high profile.
- 2 Using ProdX enhances my effectiveness on the job.
- 3 I would have difficulty explaining why using ProdX may be beneficial.
- 4 Using the system is worth the effort.
- 5 ProdX is very visible in my organization.
- 6 I would have difficulty telling others about the results of using ProdX.
- 7 Learning to operate ProdX is easy for me.
- 8 I would not have difficulty telling others about the results of using ProdX.
- 9 Although it might not be helpful, using ProdX is always mandatory in my job.
- 10 Using ProdX involves too much time doing mechanical operations (eg. Data input).
- 11 The results of using ProdX are not apparent to me.
- 12 Using ProdX takes little time from my normal duties.
- 13 Using ProdX does not enable me to accomplish tasks more quickly.
- 14 Using ProdX is compatible with all aspects of my work
- 15 Using ProdX gives me greater control over my work.
- 16 In my organization, one sees ProdX on very few desks.
- 17 Using ProdX takes too much time from my normal duties.
- 18 People in my organization who use ProdX have more prestige than those who do not.
- 19 Having ProdX is a status symbol in my organization.
- 20 I believe that it is easy to get ProdX to do what I want it to do.
- 21 My interaction with ProdX is difficult and confusing.
- 22 I would have difficulty explaining why using ProdX may not be beneficial.
- 23 My boss always requires me to use ProdX.

- 24 My interaction with ProdX is clear and understandable.
- 25 Using ProdX is incompatible with all aspects of my work
- 26 Overall, I believe that ProdX is difficult to use.
- 27 My boss does not require me to use ProdX.
- 28 I believe I could communicate to others the consequences of using ProdX.
- 29 Before deciding whether to use ProdX, I was able to properly try it out.
- 30 Using ProdX gives me less control over my work.
- 31 Using ProdX makes it more difficult to do my job.
- 32 Using ProdX makes it easier to do my job.
- 33 I believe I could not communicate to others the consequences of using ProdX.
- 34 ProdX is not visible in my organization.
- 35 It takes to long to use ProdX to make it worth the effort.
- 36 Using ProdX reduces the quality of work I do.
- 37 Working with the system is simple, it is easy to understand what is going on.
- 38 I believe that it is difficult to get ProdX to do what I want it to do.
- 39 In my organization, one sees ProdX on many desks.
- 40 Using ProdX improves the quality of work I do.
- 41 Using the system involves doing very few mechanical operations (eg. Data input).
- 42 Although it might be helpful, using ProdX is certainly not compulsory in my job.
- 43 Overall, I believe that ProdX is easy to use.
- 44 People in my organization who use ProdX have less prestige than those who do not.
- 45 The results of using ProdX are apparent to me.
- 46 Working with ProdX is so complicated, it is difficult to understand what is going on.
- 47 Using ProdX does not fit into my work style.
- 48 Using ProdX enables me to accomplish tasks more quickly.
- 49 People in my organization who use ProdX have a low profile.
- 50 Learning to operate ProdX is difficult for me.
- 51 I was permitted to use ProdX on a trial basis long enough to see what it could do.
- 52 Having ProdX is not a status symbol in my organization.
- 53 Using ProdX fits into my work style.
- 54 Using ProdX reduces my effectiveness on the job.

# Appendix E: SAS Output for Hypotheses 1-10

Hypothesis 1:

Class	Levels	Values
valence	2	N P
Number of Observations Read		185
Number of Observations Used		185

The GLM Procedure

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	164.203945	164.203945	22.69	<.0001
Error	183	1324.401435	7.237166		
Corrected Total	184	1488.605381			

R-Square	Coeff Var	Root MSE	result_DL Mean
0.110307	105.0726	2.690198	2.560324

Source	DF	Type I SS	Mean Square	F Value	Pr > F
valence	1	164.2039453	164.2039453	22.69	<.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
valence	1	164.2039453	164.2039453	22.69	<.0001

The GLM Procedure

Tukey's Studentized Range (HSD) Test for result\_DL

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type

II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	183
Error Mean Square	7.237166
Critical Value of Studentized Range	2.79026
Minimum Significant Difference	0.781
Harmonic Mean of Cell Sizes	92.36757

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	valence
A	3.5388	89	P
B	1.6532	96	N

The GLM Procedure

Level of valence	N	Mean	Std Dev
N	96	1.65320312	2.20027997
P	89	3.53879213	3.13427605

**Hypothesis 2:**

Class	Levels	Values
TYPE	2	C D
Number of Observations Read		185
Number of Observations Used		185

The GLM Procedure

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	0.856234	0.856234	0.11	0.7459
Error	183	1487.749147	8.129777		
Corrected Total	184	1488.605381			

R-Square	Coeff Var	Root MSE	result_DL Mean
0.000575	111.3639	2.851276	2.560324

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TYPE	1	0.85623380	0.85623380	0.11	0.7459
Source	DF	Type III SS	Mean Square	F Value	Pr > F
TYPE	1	0.85623380	0.85623380	0.11	0.7459

The GLM Procedure

Tukey's Studentized Range (HSD) Test for result\_DL

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type

II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	183
Error Mean Square	8.129777
Critical Value of Studentized Range	2.79026
Minimum Significant Difference	0.8287
Harmonic Mean of Cell Sizes	92.17297

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	TYPE
A	2.6325	87	C
A			
A	2.4962	98	D

The GLM Procedure

Level of TYPE	N	Mean	Std Dev
C	87	2.63252874	3.10239422
D	98	2.49622449	2.60849535

**Hypothesis 3:**

Class	Levels	Values
CHAR	2	C F
Number of Observations Read		185
Number of Observations Used		185

The GLM Procedure

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	112.555450	112.555450	14.97	0.0002
Error	183	1376.049930	7.519399		
Corrected Total	184	1488.605381			

R-Square	Coeff Var	Root MSE	result_DL Mean
0.075611	107.1018	2.742152	2.560324

Source	DF	Type I SS	Mean Square	F Value	Pr > F
CHAR	1	112.5554503	112.5554503	14.97	0.0002
Source	DF	Type III SS	Mean Square	F Value	Pr > F
CHAR	1	112.5554503	112.5554503	14.97	0.0002

The GLM Procedure

Tukey's Studentized Range (HSD) Test for result\_DL

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type

II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	183
Error Mean Square	7.519399
Critical Value of Studentized Range	2.79026
Minimum Significant Difference	0.7975
Harmonic Mean of Cell Sizes	92.04324

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	CHAR
A	3.3972	86	F
B	1.8333	99	C

The GLM Procedure

Level of CHAR	N	Mean	Std Dev
C	99	1.83333333	2.40667651
F	86	3.39720930	3.08397171

**Hypothesis 4a:**

The GLM Procedure  
Class Level Information

Class	Levels	Values
valence	2	N P
innov	2	H L

Number of Observations Read 185  
Number of Observations Used 185

The GLM Procedure

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	284.015688	94.671896	14.23	<.0001
Error	181	1204.589693	6.655192		
Corrected Total	184	1488.605381			

R-Square 0.190793      Coeff Var 100.7593      Root MSE 2.579766      result\_DL Mean 2.560324

Source	DF	Type I SS	Mean Square	F Value	Pr > F
valence	1	164.2039453	164.2039453	24.67	<.0001
innov	1	55.8195504	55.8195504	8.39	0.0042
valence*innov	1	63.9921918	63.9921918	9.62	0.0022

Source	DF	Type III SS	Mean Square	F Value	Pr > F
valence	1	149.8872268	149.8872268	22.52	<.0001
innov	1	53.3171660	53.3171660	8.01	0.0052
valence*innov	1	63.9921918	63.9921918	9.62	0.0022

The GLM Procedure

Tukey's Studentized Range (HSD) Test for result\_DL

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha 0.05  
Error Degrees of Freedom 181  
Error Mean Square 6.655192  
Critical Value of Studentized Range 2.79047  
Minimum Significant Difference 0.749  
Harmonic Mean of Cell Sizes 92.36757

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	valence
A	3.5388	89	P
B	1.6532	96	N

The GLM Procedure

Tukey's Studentized Range (HSD) Test for result\_DL

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	181
Error Mean Square	6.655192
Critical Value of Studentized Range	2.79047
Minimum Significant Difference	0.7607
Harmonic Mean of Cell Sizes	89.55676

NOTE: Cell sizes are not equal.  
Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	innov
A	2.8842	109	H
B	2.0959	76	L

The GLM Procedure

Level of valence		-----result_DL-----		
	N	Mean	Std Dev	
N	96	1.65320313	2.20027997	
P	89	3.53879213	3.13427605	

Level of innov		-----result_DL-----		
	N	Mean	Std Dev	
H	109	2.88415138	3.09767487	
L	76	2.09588816	2.37895848	

Level of valence	Level of innov		-----result_DL-----		
		N	Mean	Std Dev	
N	H	64	1.61796875	2.18367949	
N	L	32	1.72367188	2.26662985	
P	H	45	4.68494444	3.32817332	
P	L	44	2.36659091	2.44727928	

**Hypothesis 4b:**

The GLM Procedure  
Class Level Information

Class	Levels	Values
type	2	C D
innov	2	H L

Number of Observations Read 185  
Number of Observations Used 185

The GLM Procedure

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	53.768501	17.922834	2.26	0.0829
Error	181	1434.836880	7.927276		
Corrected Total	184	1488.605381			

Source	DF	Type I SS	Mean Square	F Value	Pr > F
type	1	0.85623380	0.85623380	0.11	0.7428
innov	1	27.67189231	27.67189231	3.49	0.0633
type*innov	1	25.24037445	25.24037445	3.18	0.0760

Source	DF	Type III SS	Mean Square	F Value	Pr > F
type	1	0.00649075	0.00649075	0.00	0.9772
innov	1	31.11051441	31.11051441	3.92	0.0491
type*innov	1	25.24037445	25.24037445	3.18	0.0760

The GLM Procedure

Tukey's Studentized Range (HSD) Test for result\_DL

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	181
Error Mean Square	7.927276
Critical Value of Studentized Range	2.79047
Minimum Significant Difference	0.8183
Harmonic Mean of Cell Sizes	92.17297

NOTE: Cell sizes are not equal.  
Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	type
A	2.6325	87	C
A	2.4962	98	D

The GLM Procedure

Tukey's Studentized Range (HSD) Test for result\_DL

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	181
Error Mean Square	7.927276
Critical Value of Studentized Range	2.79047
Minimum Significant Difference	0.8302
Harmonic Mean of Cell Sizes	89.55676

NOTE: Cell sizes are not equal.  
Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	innov
A	2.8842	109	H
A			
A	2.0959	76	L

The GLM Procedure

Level of type	N	Mean	Std Dev
C	87	2.63252874	3.10239422
D	98	2.49622449	2.60849535

Level of innov	N	Mean	Std Dev
H	109	2.88415138	3.09767487
L	76	2.09588816	2.37895848

Level of type	Level of innov	N	Mean	Std Dev
C	H	52	3.27134615	3.52572919
C	L	35	1.68342857	2.03657558
D	H	57	2.53092105	2.63034077
D	L	41	2.44798780	2.60960367

**Hypothesis 4c:**

The GLM Procedure  
Class Level Information

Class	Levels	Values
char	2	C F
innov	2	H L

Number of Observations Read 185  
Number of Observations Used 185

The GLM Procedure

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	137.109939	45.703313	6.12	0.0005
Error	181	1351.495442	7.466826		
Corrected Total	184	1488.605381			

R-Square 0.092106  
Coeff Var 106.7267  
Root MSE 2.732549  
result\_DL Mean 2.560324

Source	DF	Type I SS	Mean Square	F Value	Pr > F
char	1	112.5554503	112.5554503	15.07	0.0001
innov	1	16.4614274	16.4614274	2.20	0.1393
char*innov	1	8.0930608	8.0930608	1.08	0.2992
Source	DF	Type III SS	Mean Square	F Value	Pr > F
char	1	86.26567354	86.26567354	11.55	0.0008
innov	1	18.99387917	18.99387917	2.54	0.1125
char*innov	1	8.09306079	8.09306079	1.08	0.2992

The GLM Procedure

Tukey's Studentized Range (HSD) Test for result\_DL

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha 0.05  
Error Degrees of Freedom 181  
Error Mean Square 7.466826  
Critical Value of Studentized Range 2.79047  
Minimum Significant Difference 0.7948  
Harmonic Mean of Cell Sizes 92.04324

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	char
A	3.3972	86	F
B	1.8333	99	C

The GLM Procedure

Tukey's Studentized Range (HSD) Test for result\_DL

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	181
Error Mean Square	7.466826
Critical Value of Studentized Range	2.79047
Minimum Significant Difference	0.8057
Harmonic Mean of Cell Sizes	89.55676

NOTE: Cell sizes are not equal.  
Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	innov
A	2.8842	109	H
A			
A	2.0959	76	L

The GLM Procedure

Level of char	N	Mean	Std Dev
C	99	1.83333333	2.40667651
F	86	3.39720930	3.08397171

Level of innov	N	Mean	Std Dev
H	109	2.88415138	3.09767487
L	76	2.09588816	2.37895848

Level of char	Level of innov	N	Mean	Std Dev
C	H	53	1.93985849	2.48879588
C	L	46	1.71059783	2.32969801
F	H	56	3.77785714	3.36355586
F	L	30	2.68666667	2.37023109

**Hypothesis 5:**

The GLM Procedure  
Class Level Information

Class	Levels	Values
char	1	C
invol	2	H L

Number of Observations Read 87  
Number of Observations Used 87

The GLM Procedure

Dependent Variable: DI

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	4.5835923	4.5835923	0.47	0.4933
Error	85	823.1535014	9.6841588		
Corrected Total	86	827.7370937			

R-Square	Coeff Var	Root MSE	DI Mean
0.005537	118.2110	3.111938	2.632529

Source	DF	Type I SS	Mean Square	F Value	Pr > F
invol	1	4.58359230	4.58359230	0.47	0.4933

Source	DF	Type III SS	Mean Square	F Value	Pr > F
invol	1	4.58359230	4.58359230	0.47	0.4933

Tukey's Studentized Range (HSD) Test for DI

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	85
Error Mean Square	9.684159
Critical Value of Studentized Range	2.81184
Minimum Significant Difference	1.3275
Harmonic Mean of Cell Sizes	43.44828

NOTE: Cell sizes are not equal.  
Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	invol
A	2.8543	45	L
A	2.3949	42	H

The GLM Procedure

Level of invol	N	Mean	Std Dev
H	42	2.39494048	2.80680051
L	45	2.85427778	3.37150562

**Hypothesis 6:**

The GLM Procedure  
Class Level Information

Class	Levels	Values
awareness	2	H L

Number of Observations Read            185  
Number of Observations Used            185

The GLM Procedure

Dependent Variable: DI

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	40.798513	40.798513	5.16	0.0243
Error	183	1447.806867	7.911513		
Corrected Total	184	1488.605381			

R-Square	Coeff Var	Root MSE	DI Mean
0.027407	109.8588	2.812741	2.560324

Source	DF	Type I SS	Mean Square	F Value	Pr > F
awareness	1	40.79851342	40.79851342	5.16	0.0243
Source	DF	Type III SS	Mean Square	F Value	Pr > F
awareness	1	40.79851342	40.79851342	5.16	0.0243

The GLM Procedure  
Tukey's Studentized Range (HSD) Test for DI

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	183
Error Mean Square	7.911513
Critical Value of Studentized Range	2.79026
Minimum Significant Difference	0.8293
Harmonic Mean of Cell Sizes	89.55676

NOTE: Cell sizes are not equal.  
Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	awareness
A	2.9525	109	H
B	1.9979	76	L

The GLM Procedure

Level of awareness	N	Mean	Std Dev
H	109	2.95245413	3.08488304
L	76	1.99792763	2.36650095

Hypothesis 7:

The GLM Procedure  
Class Level Information

Class	Levels	Values
trust	2	H L
Number of Observations Read		185
Number of Observations Used		185

The GLM Procedure

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	2.527299	2.527299	0.31	0.5776
Error	183	1486.078081	8.120645		
Corrected Total	184	1488.605381			

R-Square	0.001698	Coeff Var	111.3013	Root MSE	2.849675	result_DL Mean	2.560324
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Source	DF	Type I SS	Mean Square	F Value	Pr > F
trust	1	2.52729939	2.52729939	0.31	0.5776
Source	DF	Type III SS	Mean Square	F Value	Pr > F
trust	1	2.52729939	2.52729939	0.31	0.5776

The GLM Procedure

Tukey's Studentized Range (HSD) Test for result\_DL

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	183
Error Mean Square	8.120645
Critical Value of Studentized Range	2.79026
Minimum Significant Difference	0.8371
Harmonic Mean of Cell Sizes	90.22703

NOTE: Cell sizes are not equal.  
Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	trust
A	2.6601	107	H
A	2.4234	78	L

The GLM Procedure

Level of trust	N	Mean	Std Dev
H	107	2.66011682	2.78650463
L	78	2.42342949	2.93441210

**Hypothesis 8:**

The GLM Procedure  
Class Level Information

Class	Levels	Values
relevance	2	H L
Number of Observations Read		185
Number of Observations Used		185

The GLM Procedure

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	33.774679	33.774679	4.25	0.0407
Error	183	1454.830702	7.949895		
Corrected Total	184	1488.605381			

R-Square	0.022689	Coeff Var	110.1249	Root MSE	2.819556	result_DL Mean	2.560324
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Source	DF	Type I SS	Mean Square	F Value	Pr > F
relevance	1	33.77467862	33.77467862	4.25	0.0407
Source	DF	Type III SS	Mean Square	F Value	Pr > F
relevance	1	33.77467862	33.77467862	4.25	0.0407

The GLM Procedure

Tukey's Studentized Range (HSD) Test for result\_DL

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	183
Error Mean Square	7.949895
Critical Value of Studentized Range	2.79026
Minimum Significant Difference	0.8195
Harmonic Mean of Cell Sizes	92.17297

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	relevance
A	2.9629	98	H
B	2.1068	87	L

The GLM Procedure

Level of relevance	N	Mean	Std Dev
H	98	2.96290816	3.00537574
L	87	2.10683908	2.59404331

**Hypothesis 9:**

The GLM Procedure  
Class Level Information

Class	Levels	Values
complete	2	H L
Number of Observations Read		185
Number of Observations Used		185

The GLM Procedure

Dependent Variable: result\_DL

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1	7.082214	7.082214	0.87	0.3509
Error	183	1481.523166	8.095755		
Corrected Total	184	1488.605381			

R-Square	Coeff Var	Root MSE	result_DL Mean
0.004758	111.1306	2.845304	2.560324

Source	DF	Type I SS	Mean Square	F Value	Pr > F
complete	1	7.08221442	7.08221442	0.87	0.3509
Source	DF	Type III SS	Mean Square	F Value	Pr > F
complete	1	7.08221442	7.08221442	0.87	0.3509

The GLM Procedure

Tukey's Studentized Range (HSD) Test for result\_DL

NOTE: This test controls the Type I experimentwise error rate, but it generally has a higher Type II error rate than REGWQ.

Alpha	0.05
Error Degrees of Freedom	183
Error Mean Square	8.095755
Critical Value of Studentized Range	2.79026
Minimum Significant Difference	0.8465
Harmonic Mean of Cell Sizes	87.95676

NOTE: Cell sizes are not equal.

Means with the same letter are not significantly different.

Tukey Grouping	Mean	N	complete
A	2.7165	113	H
A	2.3152	72	L

The GLM Procedure

Level of complete	N	Mean	Std Dev
H	113	2.71650442	2.86156860
L	72	2.31520833	2.81945651



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