

COGNITIVE INNOVATIVENESS AS A PREDICTOR OF STUDENT ATTITUDES AND INTENT: AN APPLICATION OF THE THEORY OF PLANNED BEHAVIOR TO TECHNOLOGY DELIVERED INSTRUCTION

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Abstract

This study, using the Theory of Planned Behavior as a framework, investigated the effect of internal and external cognitive innovativeness on attitudes, beliefs and behavioral intentions related to intent to experience an online technology delivered course. Results indicated that respondents who scored high in levels of cognitive innovativeness had more positive attitudes toward taking an online course than did those who scored low. Analysis suggested that attitude was most predictive of intentions for high internal cognitive innovators, while for high external cognitive innovators, attitude and norms were most predictive.

Introduction

Although it has been addressed conceptually, limited research has been done on the influence of innate personality traits on students' attitudes and beliefs with respect to technology delivered instruction. Technology delivered instruction, or TDI, encompasses the range of technology-based instructional tools and techniques commonly used in modern distance education and hyper-mediated instruction, including video, interactive television, Internet hypermedia (the World Wide Web, e-mail, discussion forums) and CD-ROM based multimedia. Many of these technologies were initially used to facilitate instruction for adult learners, but are now being targeted at traditional aged students (Universities Target Distance Ed, 1998).

Although technology delivered instruction is becoming more common in agriculture, primarily through implementation of distance education programs at the land grant institutions (Miller, 1999), little work has been done to explore how innate traits affect attitudes and intentions of students toward TDI courses. Most of the limited research which has been done in the area of attitudes and intentions has been conducted with adult learners, who do not necessarily share some of the prior experiences, motivations, and beliefs which are known to affect attitudes and intentions.

In the studies that have been conducted, findings suggest that individual differences can exert a significant effect on attitudes and preferences toward technology. For example, Hiltz (1987), in a study of adult learners, found that individual differences, primarily differences in learning style, affected preference for online education vs. traditional teaching modes. Miller (1999) in a study of students enrolled in a professional agriculture degree program, found that respondents' cognitive learning style had a significant effect on their attitude toward instruction delivered by distance education technologies. Trede and Whitaker (1998) found that beginning farmers rated "cutting edge" instructional technologies much lower than traditional instructional techniques, perhaps owing to lack of familiarity and prior experience with these technologies. Moore (1990) commenting on the need for more work in this area, noted that research is "not yet sufficient to draw conclusions about the extent of variations in preference for on-line education among the adult population at large" (p.15).

One of the motivating forces which underlies formation of attitudes and beliefs with respect to adoption of new technologies in general is innovativeness, an innate personality characteristic which has been explored extensively in the consumer behavior literature. Innovativeness, a construct that evolved out of diffusion theory, was originally associated with the adoption and use of new technological innovations (Rogers and Shoemaker, 1971). Many subsequent consumer behavior studies have used the concept of consumer innovativeness to examine purchase behavior related to adoption of new products.

Given the parallels between consumer adoption and use of new products and students' similar ability to "adopt" and "use" (i.e., "take") an online course, the purpose of this study was to attempt to extend the concept of consumer innovativeness to the instructional setting and to determine whether students' levels of innovativeness can be used to predict attitude and intent to enroll in a technology delivered course. Given the investment agricultural schools and colleges are currently making in technology driven education, it is important to have a better understanding of the factors which influence students' attitudes and behavior towards acceptance of new instructional technologies, with a view towards developing a model that can be used to enhance technological delivered instruction in agricultural settings.

Conceptual and Theoretical Framework

Innovativeness as a Characteristic of Personality

In its original conception, Rogers' defined innovativeness as "the degree to which an individual is relatively earlier in adopting an innovation than other members of his social system," (Rogers & Shoemaker, 1971, p. 27). Hirschman (1980) defined innovativeness as the desire for new experience, and traced the development of the construct to its

roots in the diffusion and personality literature. According to a study by Venkatraman and Price (1990), consumer innovativeness can be defined as a latent personality trait that predisposes people to buy new products.

Although innovativeness was measured as a singular trait in the original diffusion formulation, consumer innovativeness has also been viewed as having more than one dimension. An example of this is Price and Ridgeway's (1983) conceptualization of a three tiered hierarchy of innovativeness, which differentiates between innovativeness as an innate trait and as an observed behavior. Drawing on Allport's (1937, 1961) notion of the hierarchical nature of traits (cardinal, central, secondary) Price and Ridgeway's model viewed innovativeness as an inherent central trait, and proposed a set of innate secondary traits or tendencies which underlie observable behaviors. Goldsmith and Hofacker (1991) also argued that innovativeness might be multidimensional, as some facets are not able to be captured by a single scale. Others have followed this idea and have expanded it to include factors which tap into associated constructs, such as cognitive/effective predisposition and its effect on consumer information processing (Venkatraman and Price, 1990).

Drawing on the work of cognitive response researchers Petty and Caccioppo (1982) and Hirschman (1984) as well as the novelty seeking literature, exemplified by Pearson (1970) Zuckerman (1979) and Faison (1977), Venkatraman and Price (1990) attempted to differentiate cognitive and sensory traits that predispose individuals to seek stimulation of the mind, which they defined as cognitive innovativeness, vs. the senses (sensory innovativeness).

In the researchers' model, cognitive and sensory dimensions form higher-order factors, and each of these is comprised of internal and external dimensions. Conceptual definitions of these lower order factors, adapted from Pearson's 1970 study, differentiated internal cognitive innovativeness as the "tendency to like unusual cognitive processes that are focused on explanatory principles and cognitive schemes"; while external cognitive innovativeness is the "tendency to like finding out facts, how things work and learning to do new things". Internal sensory innovativeness, on the other hand, is the "tendency to like experiencing unusual dreams, fantasy or feelings that are internally generated"; while external sensory innovativeness is the "tendency to like active physical participation in thrilling activities".

The Theory of Planned Behavior

A seminal work in attempting to understand and predict behavior and behavioral intentions which has been used extensively in educational research is the Theory of Planned Behavior (Ajzen, 1991). The Theory of Planned Behavior, or TOPB, is an extension of the Theory of Reasoned Action, or TORA (Fishbein & Ajzen, 1975).

The basic proposition of both models is that in order to predict a behavior **B** (such as enrolling in an online course), one must try to measure an individual's intent to behave, or **BI** (such as intent to take an online course), itself a function of attitudes toward the target behavior and subjective norms. In both the TORA model and the later theory of planned behavior (TOPB), attitudes are a function of beliefs about and assessments of perceived consequences of acting in a certain way, such as beliefs about the advantages or disadvantages of technology delivered instruction. Subjective norms refer to an individual's interpretation of what important referents think about the desirability of a behavior, combined with the individual's desire and motivation to comply with what significant others may think or believe should be done.

In an attempt to answer critics of the TORA, who argued that most behaviors are neither volitional (as in the initial model formulation) nor involitional, Ajzen added an additional variable to the TOPB called perceived behavioral control, which measures perceptions of individual control over the target behavior. The resulting predictive equation can be written as follows:

$$B \approx BI \approx (AB + SN + PBC) = w_1AB + w_2SN + w_3PBC$$

where **AB** is attitude towards the behavior, **SN** is subjective norms, and **PBC** is the degree of perceived behavioral control a subject feels over the behavior. The TOPB has been employed extensively by educational researchers in studies designed to predict students' attitude and behavioral intentions toward enrolling in various types of courses. Prislin and Kovarlija (1992) in a study of low and high self-monitoring and student behavioral intent, found that respondents' intentions to attend a class lecture were best predicted by attitude of the low and subjective norms of the high self-monitoring groups. Crawley and Black (1992) used the model to test causal linkages between attitudes, subjective norms and perceived behavioral control with respect to secondary science students' intentions to enroll in physics classes. The model has also been used to predict intention of tenth graders to enroll in subsequent mathematics courses (Choe, 1992) as well as to predict success in an undergraduate computer science course (Shaffer, 1990).

Message Congruity

Cognitive consistency theorists have argued that we tend to be more attracted toward messages which are consistent with our attitudes, beliefs and personality traits (Festinger, 1957; Heider, 1958). Once exposed to information which is congruent with their personal make-up, their attitudes or belief systems, individuals may be more motivated to process the message (Petty, Haugvedt & Smith, 1995) and their subsequent evaluations may be more favorable.

In a marketing communication application, Baker (1993) proposed the Relevance Accessibility Model, or RAM, for determining effectiveness of advertising. In this model, relevance can be explicit, as in consumers actively seeking out specific information they find important, or implicit, implying a subtle influence of information that can automatically drive behavior, such as familiarity or classical conditioning. In this context, message congruity is related to both relevance of the message and involvement, which is the degree to which an individual finds a message important, and worthy of being processed (Petty & Caccioppo, 1979b).

Message congruity, in terms of its influence on attitude and subsequent behavioral action, is also related to the TORA and the TOPB. According to Ajzen & Fishbein's (1980) principle of correspondence, attitudes can be expected to predict behavior depending on the degree of correspondence between action, target, context and time. In the context of this study, it can be assumed that a message containing information about technologically delivered instruction that is more or less congruent in terms of its appeal to cognitive or sensory innovators should have an influence on attitude and corresponding behavior toward taking a TDI course.

Rationale for the Study and Hypotheses

The rationale for this study is based on looking at the demand economy currently driving adoption of technology delivered instruction in agricultural schools and colleges around the country as having some similarities with the consumer marketplace. Students in this environment, much like consumer prospects, have the ability to choose to take courses, and in some cases, entire degree programs, that are characterized by a wide variety of course technologies and delivery mechanisms. Extending this "student as consumer" concept to measures of consumer behavior, it is possible to hypothesize that some of the same variables that influence consumer behavior in the marketplace may also impact student attitudes and behavioral intent with respect to taking online courses. Further, it is possible that an adaptation of Venkatraman and Price's (1990) model of innovativeness might be used to predict differences between internal and external cognitive innovators with respect to attitudes and behavioral intent toward taking a TDI course.

Given the volitional nature of the target behavior and students' expectation and experience that taking a class is a cognitively oriented process, it can be argued that there should be a relationship between levels of cognitive innovativeness and attitude and behavioral intention. Rationale for this approach is based on Venkatraman and Price's own work, which showed a highly significant relationship between higher education and cognitive innovativeness, but not sensory innovativeness (Venkatraman & Price, 1991, p. 309).

The model for this study assumes that high cognitive/low sensory innovators, exposed to a message about a TDI course that is congruent in terms of its appeal, should have a more favorable attitude toward taking a TDI course than those who scored low in cognitive innovativeness (low cognitive/high sensory innovators). Further, there should also be differences between internal and external high cognitive/low sensory innovators.

When the information contained in a description of a TDI course is congruent with cognitive innovative tendencies, it can be argued that those subjects who are high in internal cognitive innovativeness should have the most positive attitude toward taking the course, based on their tendency to enjoy the intellectual challenge of unusual cognitive processes utilizing explanatory principles and cognitive schemes. (See Fig. 1).

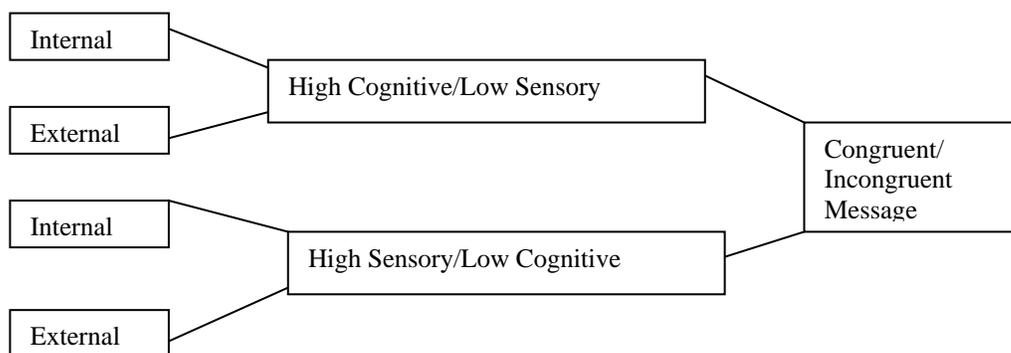


Figure. 1. Internal and External Cognitive/Sensory Innovativeness and Message Congruence

Based on the above, the following hypotheses were generated:

H1: Subjects who score high in cognitive innovativeness should have a more favorable attitude toward taking a TDI course than those who score low.

H2: High internal cognitive innovators should have amore favorable attitude toward the target behavior than high external cognitive innovators.

H3: There should be a three-way interaction between message congruence, high and low cognitive innovativeness and internal/external focus such that:

H3a: High internal cognitive innovators will have a more favorable attitude toward taking a TDI course than low internal cognitive innovators;

H3b: High external cognitive innovators will have a more favorable attitude toward taking a TDI course than low external cognitive innovators.

H4: Attitude will prove to be the most significant predictor of behavioral intent for both high internal and high external cognitive innovators.

Methods

Research Design

Subjects were drawn from a sample of college students ($n=373$) enrolled at a large land grant institution. The mean age was 20.9; average class standing was sophomore year. The study consisted of a 2x2x2 factorial design measuring innovativeness (two levels), internal/external focus (two levels) and message congruence (two levels).

A questionnaire was developed which utilized a series of 16 seven point bipolar semantic differential scales derived from the cognitive/sensory innovativeness scale (Venkatraman & Price, 1990) to measure levels of innovativeness as well as the subscale internal and external focus factors. Message congruence was manipulated on the basis of exposure to one of two different versions of a TDI course description. Although both versions of the stimulus described the course similarly in terms of its content, the message congruent version also included an opening paragraph designed to appeal to cognitively innovative tendencies, while the non-congruent version included an opening paragraph with a sensory orientation. Both versions were pretested using a panel of 15 judges who were asked to match each course description to descriptions of hypothetical high cognitive/low sensory and high sensory/low cognitive student respondents.

Procedure

At the beginning of the experiment, subjects were randomly assigned to one of the two message congruence conditions, which were incorporated into the copy of the questionnaire each subject received. In addition to the variables of cognitive innovativeness, internal/external focus and message congruence, the questionnaire included items that were used to construct indices for the dependent variables attitude, subjective norms, perceived behavioral control and behavioral intent. All items on the questionnaire were constructed using seven point semantic differential scales, recoded to range from 1 as being most likely or most favorably to 7 as being least likely or most unfavorable.

Results

Exploratory factor analysis was conducted on all of the variable indices in the study, resulting in a one-factor solution for all of the indices used in the analysis. For hypotheses one through four, subjects' level of cognitive innovativeness was calculated, as in the original instrument's formulation, by developing an average mean score on the cognitive/sensory innovativeness scale and then using mean splits to recode subjects into high and low cognitive and internal/external focus categories. Reliability analyses for all of the indices used in the study were subsequently run using Chronbach's alpha statistic. The resulting standardized item alpha for the cognitive innovativeness scale was .72. Standardized item alpha for the attitude index was .91; for subjective norms .98; and for behavioral intention .91. Perceived behavioral control was a one-item measure for each of its components.

Hypothesis 1, which predicted that subjects who scored high in cognitive innovativeness would have a more favorable attitude toward taking a TDI course than those who scored low was supported. To test this hypothesis, a 2 x 2 ANOVA model was run, utilizing innovativeness (two levels) by message congruence (two levels) as between subjects factors. A main effect was found for innovativeness, $F(1, 368) = 7.07$, $p < .01$, which indicated that high cognitive/low sensory innovators ($M = 4.57$) had a more favorable attitude toward the target behavior than low cognitive/high sensory innovators ($M = 4.10$).

For hypothesis 2, which predicted a main effect for internal cognitive innovativeness, a 2 (internal/external focus) x 2 (message congruence) ANOVA was run. Results revealed a two way interaction between internal/external focus and message congruence, $F(1, 368) = 5.39$, $p < .02$, as well as a main effect for internal/external focus, $F(1, 368) = 6.59$, $p < .01$. Comparison of means showed that subjects high in internal cognitive innovativeness who received a congruent message had the most favorable attitudes toward taking a TDI course. (See Fig. 2).

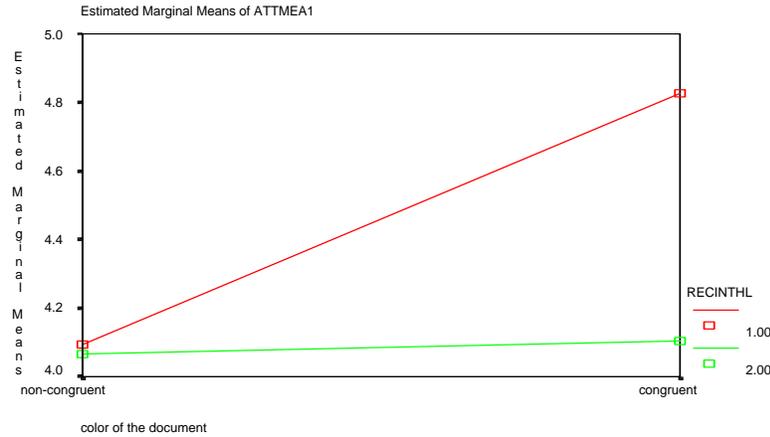


Fig. 2. Effect of Internal/External Focus on Attitude Toward taking a TDI Course.

Hypothesis 3 predicted a three-way interaction on the dependent measure of attitude toward taking a TDI course. To test this hypothesis, an ANOVA was run utilizing cognitive innovativeness (two levels), internal/external focus (two levels) and message congruence (two levels) as between subjects factors. Although the three way interaction was not significant, $F(1, 368) = 1.45, p < .23$, a simple main effect was found for external cognitive innovativeness, $F(1, 368) = 7.38, p < .01$, indicating that subjects high in external cognitive innovativeness who received a congruent message stimulus had more favorable attitudes than those who received a non-congruent message.

Further analysis of the simple main effects in H3a and H3b were supported. ANOVA results indicated a significant difference between the means for high and low internal cognitive innovators, $F(1, 186) = 4.70, p < .03$, and for high and low external cognitive innovators, $F(1, 186) = 5.04, p < .03$. Table 1 displays the resulting means table for the effect of internal/external focus and message congruence on attitude toward taking a TDI course. (See Table 1).

Table 1.
Attitude Means for Effect of Message Congruence on High and Low Internal and External Cognitive Innovators.

	Congruent Message		Non-congruent Message	
	High	Low	High	Low
Internal Cognitive Innovators	4.83 (80)	4.11 (107)	4.09 (76)	4.06 (106)
External Cognitive Innovators	4.71 (102)	4.06 (85)	4.20 (83)	3.97 (99)

To examine the relative contribution of attitudes, subjective norms and perceived behavioral control (H4) to the prediction of behavioral intentions for high and low internal and external cognitive innovators, linear regression analysis was performed using SPSS. Results revealed that, for all subjects, all factors made significant contributions to behavioral intent, but attitudes and perceived behavioral control were most significant. (See Table 2).

Table 2.
Prediction of Behavioral Intent to take a TDI Course.

Variables	r	Beta	R ²
All Subjects			
Attitudes	.81	.72**	
Subjective Norms	.54	.08*	
PBC	.41	.09**	.667

* $P < .05$, ** $p < .01$

Regression analysis was subsequently performed for the high and low internal and external cognitive innovator cells. Results indicated that for both low internal and low external cognitive innovators, attitude and perceived behavioral control were the most significant predictors. For high external cognitive innovators, attitudes and subjective norms were significant, while for high internal cognitive innovators, attitude was the only significant predictor variable of behavioral intent. (See Table 3).

Table 3.
Prediction of Behavioral Intent for High and Low Internal and External Cognitive Innovators

Variables	r	Beta	R ²
Low Internal			
Attitude	.75	.64**	
Subjective Norms	.50	.07	
Perceived Behavioral Control	.51	.21**	.63
High Internal			
Attitude	.84	.78**	
Subjective Norms	.57	.07	
Perceived Behavioral Control	.33	.02	.70
Low External			
Attitude	.80	.73**	
Subjective Norms	.50	.02	
Perceived Behavioral Control	.44	.15**	.70
High External			
Attitude	.81	.71**	
Subjective Norms	.58	.12*	
Perceived Behavioral Control	.36	.05	.67

*p<.05, **p<.01

For all groups, attitude remained the strongest predictor of intent to take an online course. Interestingly, for high internal cognitive innovators, attitude alone was highly significant in contributing to the TOPB model, while both attitude and subjective norms were contributory for high external cognitive innovators.

Discussion and Conclusions

This study provides support for the argument that technologically delivered instruction is an innovation that would seem most likely to appeal to highly innovative personalities who are at least somewhat disposed toward cognitively oriented new experiences. When information provided in a TDI course is consistent with these expectations and innate tendencies, cognitively innovative personalities will most likely be attracted, and it is likely that the cognitively innovative personalities will have the most favorable attitudes and correspondingly strong behavioral intent toward TDI courses.

It may be that high cognitive innovators come best equipped to deal with a novel experience that represents a major change from the highly structured classroom environment in which the instructor serves as an anchor and a source capable of providing amplification and context for a linear sequence of activities. Students high in cognitive innovativeness may find themselves drawn to the intellectual challenge of this particular new experience much more so than either those who are more affectively or sensory oriented.

One of the key findings of the current study involves the implications suggested by the observed differences between the internal and external dimensions of cognitive innovativeness in terms of attitude and behavioral intent toward the target behavior. From the study results, internal cognitive innovators would seem most influenced by their attitudes and sense of control over the technology related to online environments, such as familiarity with and access to computers.

External cognitive innovators, on the other hand, would seem to be more influenced by situational subjective norms, in addition to attitude. For this group, the evaluation of peers and academic advisors might come into play more so than for other groups, since these individuals are externally oriented. On the other hand, for both low internal and external cognitive innovators, attitude and perceived behavioral control seem to be important predictors. Since these groups are less attracted to new and potentially unfamiliar situations, this may affect their feelings of control over both the technology and their own ability to function and perform well in a TDI course environment.

From a theoretical standpoint, this study supports the contention that innovativeness is not a homogenous construct, but one that can be defined according to predispositions that represent aspects of the innovativeness trait. This may be an important distinction, since, as results of this study show, internal and external cognitive innovators differ,

both in terms of their relative levels of innovativeness (high vs. low) and also in how the internal or external aspects of the trait may influence evaluations of behavior and intent to behave. Educators utilizing TDI may be able to address these differences in the course design process, or consider utilizing a trait-based survey technique at the beginning of a course to ascertain the level and dimensions of the innovativeness construct present in the represented student population.

In the context of agricultural education, these differences may have important implications for constructing agriculture courses that try to tap into dimensions of innate personality traits, in an attempt to enhance outcomes of the TDI course experience.

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