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# The Examination of Relationship between Individual's Cognitive Styles and Their Perception of Usefulness of IT

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## ABSTRACT

Understanding how individuals perceive an emerging technology can have a profound impact on how successfully the technology is adopted. We conjectured that the cognitive style of an individual would have a significant bearing on the way the person perceives the technology. We conducted a laboratory experiment to investigate whether cognitive styles affect the perception of RFID, one of the emerging technologies. The findings suggest that a person's cognitive style does indeed matter how he/she perceives the usefulness of the technology. Individuals of thinking and judging cognitive style are more likely to perceive higher value with RFID than those of feeling and perceiving cognitive style. We also provide discussion on the managerial and theoretical implications of our findings.

## Keywords

Cognitive Styles, MBTI, IT Adoption, Technology Evaluation, Individual Perception, RFID

## INTRODUCTION

As competition intensifies, companies need to find new opportunities beyond existing competences to survive in the competitive business world (Sambamurthy, Bharadwaj and Grover, 2003). It is increasingly important for firms to identify and deploy new innovative information technologies for new opportunities to gain competitive advantage over their competition. Adopting an innovative information technology early can provide significant first mover advantages as evidenced in the adoption of ATM by some pioneering financial organizations (Dos Santos and Peffer, 1995).

To adopt a new technology a firm must first identify and recognize the technology and its potential. In general, a firm's search for innovative new information technologies tends to be limited to areas where it is familiar or has succeeded in the past (Teece, Pisano and Shuen, 1997). By focusing on existing and familiar technologies, the firm is very likely to lose sight of the potential of emerging technologies for competitive advantage. Studies have found that successful companies often fail due to their ignorance or inability to recognize disruptive technologies (Christensen, Suarez and Utterback, 1998). A firm's ability to identify and exploit emerging technologies plays an increasingly important role in surviving and succeeding in the hyper-competitive business environment.

Despite growing interest in exploiting new opportunities brought on by emerging information technologies, there is little understanding why some organizations are better at identifying such opportunities than others. To better understand the difference in the ability to recognize the opportunity of an emerging IT, we first need to understand how individuals perceive and recognize the opportunity rendered by the technology. Ultimately it is the people in organizations who recognize the emerging technology and not the organizations themselves (Krueger, 2000). Every day, individuals are exposed to new technologies. They interpret the new technologies, arrive at different perceptions and ultimately make different decisions regarding the technologies. Understanding the process of opportunity identification may help us better understand why some individuals are more effective in identifying opportunities for innovation.

This research attempts to address the question: Why do some individuals recognize the opportunity of an emerging IT more readily than others? Why do some individuals perceive value and usefulness in an emerging technology while others do not?

Cognitive style may offer some clue to this question. An individual, faced with decision-making situations, shows relatively repetitive patterns for solving them (Benbasat and Taylor, 1978). Individual differences in their behavior are the logical consequences of a few basic, observable differences in mental functioning (Myers and Myers, 1980). These fixed patterns are cognitive styles (Alavi and Joachimsthaler, 1992). Cognitive style is a set of relatively stable mental structures that people prefer when they perceive and evaluate information and behave on that interpretation (Jung, 1938). It has been developed in the course of an individual's childhood as he/she naturally prefers one style over the other (Myers and Myers, 1980). Individuals' beliefs about the value of a technology are the outcomes of information-processing through their cognitive style (Blaylock and Rees, 1984).

The objective of this study is to gain insights into how an individual's cognitive style impacts their beliefs about usefulness of an emerging information technology such as RFID. The rest of the paper is organized as follows. First, we discuss the research model and hypotheses. Then, we describe research method and data analysis employed by the study and present the results of the study. We conclude with a discussion of the practical and theoretical contributions of the paper.

## RESEARCH MODEL AND HYPOTHESES

### Cognitive Styles

Cognitive style research in IS domain has faced criticism for several reasons (Huber, 1983; Taylor and Benbasat, 1980). Confusion about the nature of cognitive style plagued cognitive style research (Zmud, 1979). In addition, various measures of cognitive style (e.g., field-dependent/field-independent, systematic/heuristic dimension) were used in IS research (Zmud, 1979), and those different instruments were not interchangeable and differ in their implications (Benbasat and Taylor, 1978). In response to this criticism, Keen and Bronsema (1981) proposed to use Jung's theory of psychological types measured by the Myers-Briggs Type Indicator (MBTI) because of their proven record.

Jung's theory of psychological types has provided the basis for the most reliable conception of cognitive style (Keen and Bronsema, 1981; Blaylock and Rees, 1984; Nutt, 1986; White, Varadarajan and Dacin, 2003). Jung's theory classifies individuals with four bipolar dimensions of cognitive style: Extroversion-Introversion, Sensing-Intuitive, Thinking-Feeling, and Judging-Perceiving (Myers and Myers, 1980). These dimensions reflect biases toward interaction with the outside world and therefore may have important implications for how one interprets information. The extravert-introvert dimension of cognitive style reflects people's predisposed interest toward their outer and inner worlds, and it is believed to be irrelevant to the decision-making process (Myers and Myers, 1980).

### Sensing- Intuitive (S-N)

An individual obtains information by either sensing or intuition (Jung, 1938). Sensing persons prefer known facts that can be supported through experience and data. Sensing types have a low tolerance for uncertainty and ambiguity, so they are interested in controlling uncertain situations by analyzing in the details (Myers and Myers, 1980). They like stable environments which are illustrated by control, specifications and certainty (Kilmann and Mitroff, 1976). On the other hand, individuals with intuition focus on possibilities and look for concepts and theory (Keen and Bronsema, 1981). They perceive information as they might be (Blaylock and Rees, 1984). When a technology emerges, the details and possibility of the technology is obscure. When individuals come across an emerging technology, intuitive individuals are more likely to recognize beneficial possibilities of the technology than sensing ones because they look for possibilities and accept qualitative and subjective data (Nutt, 1993). Therefore, we posit as follows:

H1: The more intuitive one's cognitive style is, the more useful one perceives an emerging technology.

### Thinking-Feeling (T-F)

Individuals make their judgment about a situation through one of two dichotomous ways: thinking or feeling (Blaylock and Rees, 1984). Thinking types prefer to have a logical or analytical ground for decision making (Mitroff and Kilmann, 1975). They evaluate information impersonally (true or false) (Keen and Bronsema, 1981). Conversely, people with feeling access the situation based on feelings and personal values. They tend to be moral and personalistic (good-bad, like-dislike) (Myers and Myers, 1980). When individuals face a technology, thinking people tend to approach it logically and try to see the potential value of the technology. Feeling people are more likely to emotionally evaluate new technology. They are more sensitive to privacy concerns that new technology like RFID may create. Therefore, we posit as follows.

H2: The more thinking one's cognitive style is, the more useful one perceives an emerging technology.

### Sensing and Feeling (SF) vs. Intuitive and Thinking (NT)

Several researchers, interpreting Jung's theory, contend that individuals develop a preference for one of the information types and decision options that lead to four cognitive styles for choice making: ST (sensing-thinking), NT (intuitive-thinking), SF (sensing-feeling), and NF (intuitive-feeling) (Mason and Mitroff, 1973). Among these four cognitive styles, the intuitive and thinking (NT) and sensing and feeling (SF) dimensions are particularly interesting because both are related to one's tolerance for ambiguity and risks. Individuals with intuitive and thinking dimensions tend to be more flexible, creative, and innovative, and motivated (Jung, 1938). They tend to endure high ambiguity and are thus more tolerant of risk (White et al., 2003). Because of their greater risk-seeking tendency, these people may perceive greater usefulness of a new technology. Studies found that such people tend to adopt potentially risky projects (Henderson and Nutt, 1980). We suggest that people who have more intuitive and thinking cognitive style perceive an emerging technology like RFID as more useful and less risky.

On the other hand, the ones with more sensing and feeling cognitive style are more likely to prefer a more stable environment. They want complete control, certainty, and specificity (Kilmann and Mitroff, 1976). Because of their greater desire for stability and relatively lower tolerance for ambiguity, people with more sensing and feeling cognitive style tend to be more concerned about their ability to control the outcomes of an ambiguous situation (Mitroff and Kilmann, 1975). Then, people with more sensing and feeling types may perceive the greater risk, such as privacy concern of using RFID.

H3: The more intuitive and thinking one's cognitive style is, the more useful one perceives an emerging technology.

### Judging-Perceiving (J-P)

The judging-perceiving dimension of cognitive style refers to individual preference on proactiveness when making a decision. (Myers and Myers, 1980). Judging style tends to be more proactive, whereas perceiving style tends to be more passive when he/she assesses a situation. That is, judging style tends to say a bad decision is better than none while perceiving people solve a problem by seeing to the bottom of it or by seeing it from all the sides (Myers and Myers, 1980). Because of the tendency that they have adequate information to make a well-informed decision, judging types are more likely to perceive an emerging technology to be less risky and uncertain. On the other hand, perceiving people tend to put off a decision as long as possible because they believe critical information is not available. Thus, they are less likely to perceive the usefulness of RFID because of insufficient information.

H4: The more judging one's cognitive style is, the more useful one perceives an emerging technology.

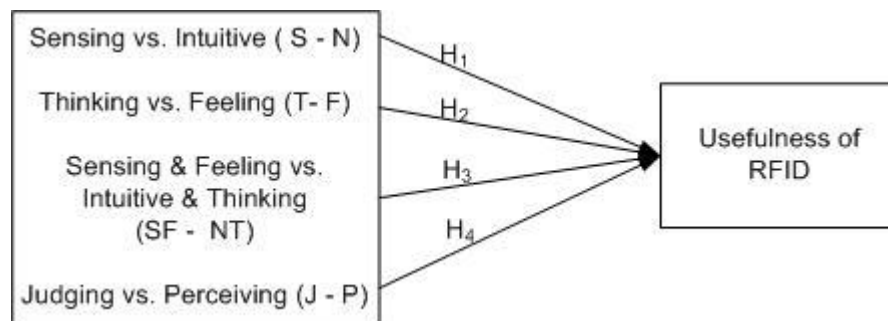


Figure 1. Hypotheses

## METHOD

### Sample and Procedure

The sample frame consists of 67 students from a large southwestern university in the U.S. Despite some criticism of using students as study subjects, it is acceptable to use students when examining certain patterns of relationships (Dickson, 1989). The participants were asked to complete the Myers-Briggs Type Indicator, followed by a survey of demographic information. They were then asked to read a case scenario describing RFID and complete a one-page questionnaire. We used the case scenario methodology to investigate the perceived value of RFID. A major benefit of the case scenario method is that all subjects receive a standardized stimulus in which the benefits and risks of RFID can be balanced (White et al., 2003). The case scenario was a published newspaper article on RFID in the Washington Post (Krim, 2004). The use of a newspaper article is to emulate the situations in which individuals come across an emerging technology in their daily life and evaluate the usefulness of the technology. In fact, innovators and entrepreneurs find innovation opportunities by accident rather than

intentionally seek them (Ardichvili, Cardozo, and Ray, 2003). To ensure it presents a balanced description of information, a knowledgeable panel of IS professors evaluated the newspaper article. They agreed that the article appears to accurately portray the benefits and risks linked with RFID. We also asked experiment participants to evaluate the objectivity of the article, and the result of their responses was consistent with the panel assessment.

### Independent Variables

Cognitive style was measured using the Myers-Briggs Type Indicator (MBTI). The MBTI is reliable and very widely used in industry to understand individual differences. Thus, research findings using the instrument may have greater relevance to organizations (Garfield, Taylor, Dennis and Satzinger, 2001). The MBTI instrument measures individual preferences on four scales: Extraversion-Introversion (E-I), Sensing-Intuitive (S-N), Thinking-Feeling (T-F), and Judging-Perceiving (J-P). Sensing-Intuitive (S-N) and Thinking-Feeling (T-F) subscales were combined into one item, each with four categories (NT, NF, ST, SF).

### Dependent Variables

Perceived usefulness of RFID was measured the extent to which one believes that the technology is useful, improves the quality of life, and allows personalized service. The perceptions were measured using a Likert scale ranging from 1 to 7, with "1" for strongly disagree and "7" for strongly agree. Items were summed up to create a single scale.

### Reliability & Validity

Cronbach's alpha was used to measure internal consistency of dependent variables. The score of 0.769 indicates the variables are reasonably internally related. Table 1 lists the description of variables along with Cronbach's alpha. To verify content validity, a panel of researchers was consulted to ensure all items were on solid conceptual grounds. Based on the feedback from these experts, the items and the wording were revised.

Scale	Mean	S.D.	Sample Scale	Reliability
Useful1	3.2	1.1	I find RFID to be useful in my life	0.769
Useful2	3.9	1.2	RFID makes it easy for me to receive personalized services	
Useful3	3.7	0.9	RFID improves the quality of my life	

**Table 1. Scale and Reliability**

### Data Analysis and Results

Four a priori T-tests using SPSS 12 were conducted to test hypotheses. Before conducting T-tests, the assumptions of T-tests such as normality and the homogeneity of variance were examined, and the data met the assumptions. The first T-test measured whether people with intuitive style recognize higher usefulness of RFID than people with sensing style. Because we are looking for a specific direction for the difference between the two population means, we used a one-tail t-test instead of a two-tailed test. The results, presented in Table 2, show that the difference of the perception of RFID between the two groups was not significant at the 0.05 level. The second T-test was performed to measure the perception between people with thinking style and the ones with feeling style. Individuals with more thinking cognitive style showed higher usefulness of RFID. The third T-test suggests that intuitive and thinking (NT) cognitive styles tend to identify more usefulness than sensing and feeling (SF). We identified only nine people with intuitive and thinking style while classifying 19 sensing and feeling people. It was an expected result because people with intuition and thinking style are typically fewer than other styles (Keen and Bronsema, 1981). The fourth T-test indicates that individuals who prefer judging cognitive style are apt to perceive more usefulness than those with perceiving cognitive style. In conclusion, H2, H3, and H4 were supported.

### IMPLICATIONS, LIMITATIONS, AND CONCLUSION

The findings of the study provide empirical support for the contention that an individual's cognitive style influences their beliefs about an emerging technology. Technology adoption researchers found that perceived usefulness significantly influence individuals' attitude and intention to use it (Davis, 1989). We believe that individuals with thinking, intuitive and thinking, and judging cognitive style are more likely to try or learn more about RFID because they see greater value from the technology. Our findings also suggest that individuals with feeling and perceiving cognitive styles are less likely to perceive the usefulness of information technologies than those with thinking and judging types and they are unlikely to try or learn

emerging technologies. By implication, these results suggest that individuals that are feeling or perceiving are less likely to investigate emerging technologies on their own, but rather would tend to rely on the evaluations of others.

		Number	Mean	Std. Deviation	T-test	Significance	Results
H1	Sensing (S)	36	12.2500	3.51629	.238	0.405	<i>Not Supported</i>
	Intuitive (N)	31	12.0323	3.97059			
H2	Thinking (T)	26	13.8077	3.39434	3.101	.0015	<i>Supported</i>
	Feeling (F)	41	11.0976	3.54122			
H3	Intuitive and Thinking (NT)	9	14.5556	3.74537	2.347	.011	<i>Supported</i>
	Sensing and Feeling (SF)	19	11.2105	3.50522			
H4	Judging (J)	39	12.7949	4.00775	1.707	.0465	<i>Supported</i>
	Perceiving (P)	28	11.2500	3.08671			

**Table 2. Test of Hypotheses**

Our results highlight the importance of the match between an individual's cognitive style and their task. In this study, people with thinking and judging cognitive styles compared with those with feeling and perceiving cognitive styles tend to perceive higher usefulness of RFID. That is, they may better perceive the benefits of an innovative opportunity created by the emerging technology and to be proactive in their decision making. Several IS researchers have stressed that the "importance of organizational and individual alertness" to discover and exploit emerging technologies (Zahra and George, 2002, p.148). In that respect, it may be interesting to investigate the relationships between CIO's cognitive style and innovativeness of the firm because one of the main tasks of the CIO is to recognize emerging technologies and use them for innovations. If the CIOs' cognitive style is feeling and perceiving, we believe that they are less likely to recognize the usefulness of emerging technologies and not proactive in deploying those technologies because of their lower risk-seeking propensity. Alternatively, when establishing groups to evaluate emerging technologies, it would seem beneficial to have an appropriate mixture of individuals with thinking/judging and feeling/perceiving styles.

This research can be beneficial in terms of improving the implementation of information systems. While many information systems are required to use, others such as knowledge management systems or decision support systems rely on voluntary use and are prone to be underutilized (Alavi and Joachimsthaler, 1992). When early adoption of a new technology is time-critical for a successful implementation, organizations can benefit by identifying feeling and perceiving individuals and provide them with hands-on training to lessen their risk-averse propensity (Venkatesh, 2000).

There are a number of limitations of this research. First, it could be argued that the use of college students can limit the generalizability of findings. However, there is no reason to believe that the general population would respond in a significantly different manner to issues related to RFID. If a bias does exist in this sample, it would more likely be an age-related bias that would suggest a potential predisposition to acceptance of new technology. In addition, participants may have higher motivation than others, and their motivation may influence different perception about RFID. Another limitation is that we did not measure the perceived usefulness of RFID in a specific situation, so other research in different settings like retail shops or warehouses may find dissimilar results due to the fact that perceptions of using RFID may vary by specific settings.

We have examined how individual's cognitive style plays an important role in forming perceptions about a technology. This research highlights how cognitive style research can be beneficial in several areas. By this effort, we hope to stimulate other's interest in cognitive style research.

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