Adaption-Innovation Theory and Cognitive Diversity: The Impact on Knowledge Use within Organizations

Michael A. Chilton
Kansas State University
mchilton@ksu.edu

James M. Bloodgood
Kansas State University
jblood@ksu.edu

Abstract

The usefulness of data within organizations is proposed to be partially dependent upon the characteristics of those organization members who actually use it. Certain types of data are more likely to be accessed and utilized by organization members when they prefer working with it. The value and usefulness of data is therefore partially determined by the desire of individuals to use it. Because critical data may not be in a preferred format, it can be overlooked or ignored by some organizational members. Moreover, organizational members may also rely too heavily on their favored types of data. Thus, inappropriate access and use of data can occur within organizational decision making. This can result in ineffective decision-making and poor organizational performance. The purpose of this study is to propose relationships between the users of both tacit and explicit knowledge and their preferred cognitive style and to test these proposed relationships using empirical data.

1. Introduction

One key to achieving appropriate access and utilization of data within an organization is to ensure that, like the law of requisite variety [1], an appropriately diverse set of organizational members exists and is involved in decision making using suitable processes [5]. This enables an appropriate mix of information and knowledge to be utilized such that the under- and over-use of key data is avoided. One key factor that may influence the type of data that is used by individuals is their cognitive style. Adaption-innovation theory is used to distinguish the cognitive style of individuals and was developed by Kirton [15]. Cognitive style is a measure of the ways in which people prefer to go about their daily work, solve problems and deal with change. People can adapt and operate outside their preferences, but to do so they must invoke a coping mechanism that may require more emotional energy than the task at hand [16]. Thus, organizational members of a certain cognitive style may favor the use of data of a certain characteristic, while those of a different cognitive style may favor the use of a different type of data. With sufficient member diversity, a wider variety of data is more likely to be appropriately used in decision making. This can lead to improved decision making, particularly in complex situations.

We suggest that a person's cognitive preferences may indicate the degree to which he or she relies on tacit versus explicit knowledge when performing his or her job. The purpose of this paper is to present the results of an exploratory study designed to investigate this notion. Significant findings linking cognitive style with the reliance on a particular type of knowledge (tacit vs. explicit) might pave the way for future studies whose motive is to explore the performance of those groups whose members have been matched along these parameters.

We begin with an expository summary of the theories. Next we provide an explanation of the way in which cognitive preferences may affect a person's reliance on either tacit or explicit knowledge, including testable hypotheses. We then provide the results of our data collection and an analysis of the findings. We conclude by providing a list of limitations of the study, some directions for future research and some implications that our results may have for practical use.

2. Theory and Model

Adaption-innovation theory was developed by Kirton [15], who devised a scale to measure specific cognitive preferences. He labeled the two end points of his bipolar scale as adaptive and innovative, based on the differences discovered between these specific cognitive preferences. It is a measure which can identify a person's attitude toward change (whether it should occur all at once or incrementally) and other behavioral and attitudinal preferences as discussed

1530-1605/08 $25.00 © 2008 IEEE

below. The scale has been shown to be both reliable and valid in a number of independent tests (cf. [2], [10], [11], [30]). Subjects with low numeric scores on the scale are said to be adaptors, while those with higher numeric scores are considered innovators. Adaptors are those who are very focused on the details of the task at hand and prefer to work within a highly defined structure. They prefer to incorporate change incrementally so that they can adapt their current paradigm to fit the new circumstances, because they see massive and abrupt change without due consideration as overly risky behavior. Conversely, innovators are people who would immediately jump-shift from an old paradigm into a new one simply because it is new and different—they may have become bored with the old one. Innovators tend to shun structure and rules when they can and make up their own as they go along, or live at the very edge of those which cannot be ignored. While this is seen as risky behavior to the adaptor, the innovator counters with the view that the adaptor is entirely too resistant to change. The result is that both groups tend to personalize their differences and this has been shown to be detrimental to the work at hand—causing slowdowns, reduced individual performance and group productivity [17]. The opposite is true if the group consists of people who lie close together on the A-I scale [12]. Anecdotal evidence has shown that training individuals who are far apart on the scale can enhance group productivity because the weaknesses of one cognitive style can be overcome by the strengths of another—adaptors and innovators tend to complement one another and when working together can actually improve the outcome over either group working alone. This may be especially true when the problem space becomes more and more complex—adaptors are needed to focus on the finer details of the problem and its solution, while innovators are needed to explore the problem from different angles, challenge assumptions and keep track of the overall direction of the group in relation to the problem at hand.

There are characteristics of A-I theory that may shed light on whether a person might tend to prefer tacit or explicit knowledge in a given situation. The first is the way in which a person's cognitive preference affects idea generation. The high innovator is less bound to the core of the problem and may proliferate a large number of potential solutions that seem tangential or at the very least, approach the problem from unexpected angles. Unlike the innovator, the high adaptor is very focused on the problem core and may offer only a few potential solutions. These solutions are carefully and explicitly considered, and the high adaptor is convinced that one will work. He often bases these solutions on prior successful work that is closely aligned with the current problem.

Secondly, adaptors and innovators prefer differing amounts of detail as they work. The high adaptor relishes detail, preferring to look at every dotted "i" and crossed "t"—nothing may be left to chance. In contrast, the high innovator disdains detail and prefers to view the problem overall—the "big picture." While the high innovator may overlook important details, the high adaptor may sometimes get lost in them and lose sight of the general direction of the problem and its solution.

The second dimension is reflected in desired amounts of structure. The high adaptor prefers lots of rules and oftentimes assumes that not only do these rules exist, but that they will be explicated at the outset of the problem solving session. The high adaptor also prefers working in groups as this lends more structure to the process—roles of each group member can be clearly defined and other members can be relied upon to adhere to this structure. The high innovator however, prefers less structure, assuming that the only rules needed are those that are basic to the communication process. When the high innovator finds that some rules cannot be ignored, he may try to "bend" them or operate at their outer fringes. The high innovator believes it is not simply possible, but quite the norm to make up rules on the fly when none (apparently) exist. The high innovator prefers to work alone, coming together for meetings with counterparts only long enough to share critical information about what has been accomplished, and what remains to be done.

2.1 Tacit vs. Explicit Knowledge

Individuals acquire knowledge in a variety of ways. For example, knowledge can be gained by reading written materials, listening to others, or through trial and error experimentation. But if we focus on the explicit/tacit characteristic of knowledge we start to see the typical ways that explicit and tacit knowledge come to be known. Explicit knowledge is codifiable and consciously accessed such that it can be easily shared, while tacit knowledge is difficult to codify, is subconsciously accessed, and is thus harder to share [20]. Explicit knowledge, which is easily expressible, is typically learned through accessing written materials and through oral communication with others. The individual is consciously aware that knowledge of this type is being absorbed [9]. Explicit knowledge can also be absorbed through experimentation if the individual remains consciously aware of his activities and the resulting outcomes. As long as an individual is consciously aware of the

knowledge, its details can be expressed to others and it is therefore considered explicit.

Tacit knowledge, which is difficult to express, tends to develop differently than explicit knowledge. It can generally be created and learned in two different ways. The first is its evolution from what was originally explicit knowledge. If an individual continues to use learned explicit knowledge during an activity, and this activity becomes routinized through frequent engagement, then that person will become less aware over time of the specific steps, but will continue to use the knowledge, yet no longer require conscious access to its details [8]. At times, the individual may not even be aware of possessing the knowledge. If the explicit knowledge is not used frequently enough, however, it may never become tacit because the individual must continue to make himself consciously aware of it during each usage. The process reacquaints the individual with the details of the knowledge.

Another way in which tacit knowledge can be gained is through non-conscious means [13], [14]. Unlike the previous example, in this case the knowledge starts out tacit and remains tacit. Tacit knowledge of this type is gained primarily through immersion in an activity rather than through formal instruction [26], [27]. Although the individual may consciously focus on some parts of the activity and its outcomes, other parts of the activity and outcomes are not given conscious attention. The brain still absorbs some of the information and knowledge that is not being consciously attended to. For example, researchers in cognitive psychology have used artificial grammar experiments to show that subjects learn complex grammar rules while attending to simple artificial word copying tasks [22], [23], [24]. In these studies, the subjects were not aware they had learned the rules, and they were unable to accurately identify them even when they were asked to document them. This type of knowledge acquisition is more common in complex situations where multiple stimuli and responses exist. The individual is consciously attuned to only a subset of what is going on in the situation. Tacit knowledge gained in this manner can also be accessed later in an automatic manner without conscious awareness [26].

There are several components that determine the degree of tacitness of knowledge. There is significant support in the literature for three primary components, expressibility, prior learning, and conscious awareness. For clarity, these components will be discussed separately but they actually operate in conjunction with one another much of the time.

Expressibility relates to the ability of the knowledge to be shared or transferred. If the knowledge is codifiable in written or oral form it is considered to be explicit. In practice, much knowledge is in this form. It can be taught to others through a lecture or from the recipient reading a book. But explicit knowledge is usually only part of the picture. Some knowledge is tacit and it is not easily transferred. For example, college students can take a course in managing employees. The students are exposed to explicit facts regarding motivation theory and approaches to decision making in group settings. Although acquiring this knowledge is useful to the students, it is insufficient for the students to immediately begin doing an excellent job as a manager. Much of the knowledge possessed by successful managers is learned through personal experience on the job and is difficult to express (and therefore tacit).

Prior learning of knowledge is associated with its degree of tacitness in several ways. Both explicit and tacit knowledge can be learned from prior activities, but the process may be different [22], [23]. Explicit knowledge is made available orally or in written form and can be used in training processes or other types of learning efforts. The individual who is learning can memorize, delve further into reference material and so increase his understanding, or maintain access to the information in order to increase his explicit knowledge base. As mentioned previously, this type of knowledge can become tacit to the individual if the knowledge is used frequently enough and the process becomes routinized. Thus, the prior learning of explicit knowledge does not mean that the knowledge will always maintain its explicit character. The prior learning of tacit knowledge usually stems from immersion in a situation. The complexity of the situation can provide a number of inputs and outputs that the individual is unable to pay attention to during the engagement of the activity [18]. The individual continues to capture some of the information without realizing it is occurring. This knowledge maintains a tacit character and is less available for conscious inspection.

The conscious awareness component of tacitness relates to the degree to which an individual can recognize that they possess the knowledge and can describe its details. When the knowledge is difficult to describe or the individual is unaware he possesses it, it is considered to be relatively tacit. Obviously prior learning is related to the conscious awareness that the individual possesses. To the extent that prior learning is recent or the individual was paying conscious attention during the learning process, much of the knowledge will be explicit. But conscious awareness is also influenced by the frequency of use of the knowledge. For example, an individual who frequently uses a certain type of knowledge will start to automate

the process and begin to lose their awareness of what they are doing [19]. Learning to type is one example of this. Initially, an individual learning to type will have to consciously think about where the key is they want to strike. They will then direct their finger to push that key. Over time, and with enough frequency, the process becomes automatic and the individual is no longer consciously aware of the commands they are sending to their fingers. In fact, when an experienced typist does try to become more consciously aware of their typing they begin to make mistakes or slow down. This is due to the disregard of tacit knowledge which normally operates with minimal effort by the brain and body.

Complex situations may require the analysis of significant amounts of both explicit and tacit knowledge [8]. Effective decision making in complex situations necessitates that both types of knowledge are appropriately utilized. Given that organizational members may favor one over the other, decision making processes that are not carefully managed may result in the under- or over-utilization of explicit and tacit knowledge. Thus, in order to increase the likelihood that both types of knowledge will be used appropriately, there is a need to match people with the type of knowledge upon which they rely most.

Adaptors, because they prefer to work with finer amounts of detail in a highly conscious manner, seem to rely more on explicit knowledge sources, while innovators do quite the opposite. In general, the preference of each type might be depicted as in Table 1 below.

	Tacit Knowledge	Explicit Knowledge
Adaptor	Weak pref.	Strong pref.
Innovator	Strong pref.	Weak pref.

Table 1: Mapping of Cognitive Styles to Preferred Knowledge Base

We suggest that adaptors prefer explicit data that they can analyze incrementally in order to solve a problem or address an issue. Innovators, on the other hand, prefer to sift through data more quickly and cursorily than their adaptive counterparts; and much of it subconsciously (by default). Given this premise, we propose that decision making that should rely on significant new explicit knowledge would be more successful if more adaptors were actively involved than innovators. Alternatively, decisions that rely on significant quantities of tacit knowledge would be better served if they were assigned to innovators. Expanding this line of reasoning, decisions that require large amounts of both explicit and tacit knowledge may be best served by having a mix of adaptors and innovators involved in the decision making. When this occurs, however, sufficient attention must be given to how the decision making group is managed. Adaptors and innovators, like any group of diverse individuals, may have difficulty understanding each other's points of view and subsequently have difficulty making progress. Understanding the theory and utilizing it in group settings forces people to view the problem space from someone else's perspective who may be at the opposite end of the A-I scale. This is analogous to the kind of role playing suggested by [25], in which people are encouraged to immerse themselves in a complex situation in order to help them learn how the simple can quickly grow into the complex and how order can spring from chaos. Managers who recognize this are in a better position to manage the composition of organizational teams and the data they have available to improve organizational decision making in both simple and complex environments.

We now turn to forming a testable hypothesis. In order to do so, we begin by proposing that those people with highly adaptive traits are expected to prefer to work with knowledge in a more explicit form than those who have highly innovative traits. By examining the traits of adaptors as explained previously, we can easily surmise that people who prefer focused ideas and lots of detail and structure would more readily operate in an environment in which facts are made explicit. Adaptors are characteristically looking for instructions, for clearly defined problems, and they are focusing their efforts on finding an explicit solution. Conversely, innovators should be able to utilize knowledge that is difficult to transmit to others (tacit) because they are attacking the problem at hand from tangential angles to the point of questioning the very assumptions that gave ground to the process of solving the problem in the first place. Following this line of logic we offer a formal proposition:

> *Adaptors prefer to work with explicit knowledge; Innovators prefer to work with tacit knowledge.*

In order to convert this proposition into a hypothesis, we need metrics. We can measure adaption-innovation with the Kirton Adaption-Innovation Inventory (KAI) and the propensity to use tacit knowledge during a particular project with a scale developed by Chilton & Bloodgood [7]. The KAI is a 33 item instrument, which utilizes a blind scoring technique on a 5-point Likert type scale with a minimum of 32 and a maximum of 160 (one item is not scored). Lower KAI scores indicate a propensity toward adaption, while higher KAI scores portend

innovation. The Tacit/Explicit (T/E) instrument contains 16 items, which is administered electronically and utilizes a blind scoring mechanism. Scores are converted to a Likert 5 point scale (range is from 16 to 80) in which lower scores indicate a greater reliance on explicit knowledge, while higher numeric scores indicate a greater reliance on tacit knowledge. We would expect subjects with a high reliance on explicit knowledge (low T/E score) to have a low A-I score (adaptor), and those with high reliance on tacit knowledge (high T/E score) to have a high A-I score (innovator). Our hypothesis is therefore:

H: The adaption-innovation score for an individual is positively correlated to his reliance on a specific knowledge type.

Based on the dimensions of tacit and explicit knowledge as discussed earlier, we can subdivide our hypothesis into 3 components:

H(a): The adaption-innovation score for an individual is positively correlated to his reliance on a specific knowledge type about which he is consciously aware.

H(b): The adaption-innovation score for an individual is positively correlated to his reliance on a specific knowledge type, which can be expressed to others.

H(c): The adaption-innovation score for an individual is positively correlated to his reliance on a specific knowledge type, which has been learned previously.

3. Methodology

Subjects consisted of 75 students in an advanced MIS networking class. Subjects were asked to complete the Kirton Adaption-Innovation Inventory at the beginning of the semester and the scores were recorded. The scale has a minimum score of 32, indicating highly adaptive, and a maximum score of 160, indicating highly innovative, with a theoretical mean of 96. Previous studies have consistently indicated a normal distribution of all samples taken in several populations with an empirical mean of 95.6 [10, 11, 12, 15, 16]. Our sample showed a mean of 95.7, a standard deviation of 13.5, both of which are comparable to other studies.

Subjects were then divided into groups and asked to complete several projects throughout the course of the semester. Each project involved testing certain concepts and principles related to computer networking in a laboratory setting and submitting a report of findings, which included a description of the project, an analysis of the results and a discussion regarding any variance that may have been experienced from what was expected. Students were also asked to discuss potential business solutions for each of the concepts studied in the lab, allowing them to rely on previous knowledge or to perform some minimal research to augment their findings. Areas in which students were exposed included installing and configuring Windows 2003 server software both as a member server and as a domain controller; installing and configuring a web server capable of hosting multiple web sites simultaneously; installing and configuring an e-mail server with list service capability; installing a protocol analyzer and using it to inspect packets; hard-disk imaging and software deployment; security, including symmetric and asymmetric encryption; and providing telephone technical support aimed at solving networking issues. Each of the required projects was non-trivial in nature and required some background knowledge to complete. For example, in the web server lab, students were asked to download the Apache web server software from its web site, install it on a computer and modify the configuration file so that it could begin serving web pages. Students would then create a web page and place it in the appropriate directory so that Apache could begin providing the web service. Much of this activity required prior knowledge, but much was also provided in written instructions that required the student to think through each step as he or she performed it. The students then created a second web page for a different domain so that the server could provide web services for each domain. In the protocol analysis lab, students were required to use their knowledge of the web server to capture packets and trace the TCP/IP stream so that a visited web site could be reproduced on a machine placed between the client and the server. As students worked through the steps in each lab project, they had to apply previous knowledge as well as utilize the instructions to accomplish the tasks. We believe that the projects were complex enough to elicit actual tacit knowledge (as opposed to memorized steps in a process), and to require a thought process that would cause the students to invoke both tacit and explicit knowledge. We used our T/E survey instrument [7] to help determine the extent to which each student relied on tacit vs. explicit knowledge during the accomplishment of each of the assigned projects.

Student experience in networking concepts varied from very little, where students had set up rudimentary home networks, to very much, where students had worked for companies and performed intermediate

networking tasks, such as providing live telephone IT support. Based on this range of experience, the projects could be completed without relying totally on either of the two knowledge types, tacit or explicit. Rather, students could accomplish each task within the projects either by primary reliance on tacit, primary reliance on explicit, or various combinations of both. Upon completing each project, subjects were then asked to complete the T/E survey discussed previously to help determine the extent to which they had relied on either tacit or explicit knowledge in order to complete the project. A total of 417 usable observations were recorded. The scores for each lab project were pooled and recorded as T/E scores and matched with each subject's A-I score and correlated in order to test the hypotheses. We pooled the T/E scores because our sample, when analyzed lab-by-lab, does not have the statistical power to discover significant differences, should they exist. In addition, our research question suggests that adaptors tend to rely more heavily on explicit knowledge while innovators tend to rely more heavily on tacit knowledge. If this is true, then the proportion of tacit to explicit knowledge that a student relies upon may vary from project to project, but should generally be in the same direction. Pooling the scores would then account for any large variances in this result, which might mask a more general tendency. Indeed, A-I theory itself allows for people to operate outside of their preferred styles.

Scores from each of the instruments were matched by subject name and correlated. The correlation matrix is shown in table 3 and the results are discussed in the next section.

4. Results

The sample was tested for internal consistency using coefficient alpha and the result was calculated to be 0.73. The sample was also tested for validity using confirmatory factor analysis techniques. Construct, discriminant and convergent validity measures were all within acceptable limits and similar to those found in previous studies [c.f., e.g., 2, 7, 16, 17, 30]. The mean and standard deviation scores for each of the components as well as the overall scale of the tacit-explicit (T/E) instrument for our sample are shown in table 2.

	CA	EX	PL	TE
Mean	14.9	11.5	7.8	34.1
Std. Dev.	6.2	4.7	1.7	3.7

Table 2: T/E Sample Statistics

Correlations demonstrated a statistical significance in two of the 3 T/E constructs as shown in table 3. Reliabilities (coefficient alpha) are shown on the diagonal.

	CA	EX	PL	TE	KAI
CA	0.75				
EX	0.03	0.84			
PL	0.53**	0.16*	0.73		
TE	0.72**	0.69**	0.64**	0.77	
KAI	0.28**	0.21**	0.06	0.30**	0.82

** $p < 0.001$; * $p < 0.01$

Table 3: Correlation Matrix

We note that the results of the correlations between conscious awareness (CA) and adaption-innovation, and between expressibility (EX) and adaption-innovation are significant, and so we can sustain hypotheses H(a) and H(b). We further note that the correlation between prior learning (PL) and adaption-innovation is non-significant and so we reject hypothesis H(c). We conclude that the preference for tacit or explicit knowledge types is directly related to an individual's preferred problem solving techniques and his need for explicit structure in the problem domain. Individuals who prefer to rely upon knowledge about which they are consciously aware are likely to be adaptors; while those who prefer to rely upon knowledge which cannot be easily expressed to others are likely to be innovators.

5. Discussion

Regarding the lack of significance for the Prior Learning construct, we can offer a few suggestions as to why this might have occurred. The first is the artifact induced by the T/E survey. There are only two items which ask the subject to assess whether he or she relied upon prior learning in completion of the task, and this may not be enough to generate a significant correlation. Another potential reason is that students may not have associated what they had learned previously with the lab projects since the labs were designed to show students something they had not done before. Students were told this prior to performing the labs.

Upon closer inspection of each individual score, we noticed that TE scores remained relatively flat as time progressed, fluctuating by only a few percentage points from project to project. This is the expected result since it shows that those who prefer to deal with tacit knowledge continue to do so over time, and that

this tends to correlate with their preferred cognitive style. In many cases we noted a downward trend in scores (indicating a greater reliance on tacit knowledge components) over time, and this may indicate the amount of learning that may have occurred over the course of the semester.

Our initial proposition, which we used to formulate the hypothesis, was that the high adaptor would rely more on explicit knowledge and the high innovator would rely more on tacit knowledge. Our findings support our view that individuals with differing cognitive styles prefer certain types of knowledge. We expect that organization members will naturally gravitate toward their favored type of knowledge.

Practitioner implications of this finding are many. One implication is that it is important for managers to evaluate the characteristics of the knowledge that is available inside and outside the organization that may be applied to an issue. Although the tacit/explicit character of knowledge was studied here, there could be many other characteristics of knowledge that could also be associated with cognitive style. Once the knowledge characteristics are determined, managers may also need to identify the cognitive style of their employees who will be working on various issues. The most beneficial outcomes might be achieved by matching employees with activities based on the knowledge that is available for these activities and the workers' preferences.

Another implication is that expected activities that fit with future organizational strategies can provide tools with which to classify the workforce. If a certain cognitive style is underrepresented in the available workforce, then an organization may want to consider either hiring more individuals with the underrepresented cognitive style or seeking the help of consultants in order to bring greater cognitive diversity into the problem space. The same could be said for internal promotions.

Training employees in cognitive diversity may be a good idea so that differences can be seen as complementary, and not personalized and made pejorative. Training may also be geared toward the utilization of specific knowledge types—tacit or explicit. In addition, if an individual's cognitive style conflicts with function or with others, but the individual is otherwise valuable in his current position, then training could also focus on getting the individual to be more comfortable using knowledge of a different type than they prefer. Preferences may not be able to be changed, but if a certain type of knowledge is necessary to be used at various times by an individual who does not prefer using that type of knowledge, then training the individual on how to use it may increase their likelihood of success. There is some research that suggests that familiarity with a stimulus causes increased affect for the stimulus [28], [29]. To the extent that is generalizable to knowledge, then training could provide the means to increase the desire in some individuals to use alternative types of knowledge.

From a competitive standpoint, an implication of this research is that the evaluation of competitors takes on a new dimension. Competitive analysis has long suggested the value of identifying the resources possessed by an organization's competitors [3], [21]. For example, the amount of highly-skilled programmers that work for a competitor can influence the ability of that competitor to speed up the introduction of a new or revised software application. Now there is an additional factor to consider. If the competitor's programmers are of one cognitive style and the new software is going to require knowledge that those programmers do not prefer, then there is a strong chance that the software introduction may take longer than expected. This information could be acted upon, by trying to beat the competitor to market.

Another competitive issue that could be affected by this research is an increased understanding of the inimitability of a firm's knowledge resources. Knowledge management researchers have considered the tacitness of a knowledge resource to increase its likelihood that competitors will have difficulty copying it [4]. With the ability to characterize the tacitness of a knowledge resource, a firm should be better able to establish how inimitable it is. For those knowledge resources that are instrumental to a firm's competitive advantage, preventing imitation may be key to achieving sustainable performance.

Researchers also can benefit from the ability to identify the tacitness of a knowledge resource. When examining firms' abilities to create new products and services, engage in successful competitive practices, and establish competitive advantages, researchers may be able to better understand the causal relationships involved when they can assess the role of tacit and explicit knowledge.

Furthermore, researchers may benefit from identifying the A-I characteristic of the individuals they are studying in firms. Doing so will enable researchers to evaluate the degree to which the A-I/Knowledge match is useful at explaining the success of a host of business practices, in conjunction with other relevant variables, that utilize knowledge resources. For example, a researcher may be studying the relationship between employee access of disparate knowledge resources and pace of innovation. With the introduction of A-I and tacitness/explicitness, a researcher may be able to better explain why some

individual employees or groups of employees are more successful innovators than others.

6. Limitations and Future Research

This study is limited in certain noteworthy areas:
1) The experimental design is a lab experiment, which restricts our ability to generalize;
2) The study attempts to examine tacit knowledge using a survey instrument, which may induce some errors due to self-reporting bias;
3) The survey instrument attempts to measure tacit knowledge, which is beyond conscious reach and subjects will not always be aware of when they are using it; (We have tried to take this issue into account by asking the subjects the degree to which they engage in activities that are usually associated with tacit knowledge. This sort of indirect measurement may be a better metric, however, because it reflects the characteristics of tacit knowledge and not the details of that knowledge. Further, it does not force the subject to make tacit knowledge explicit, which would render the measurement inaccurate from the start.);
4) The survey instrument is applied repeatedly, which may induce a learning effect; (Aside from the learning effect, however, repeated measures which tend to cluster around the same constructs also tends to enhance validity.)
5) The study utilizes students as subjects, which may induce a halo effect; and
6) The results were obtained using a non-probability sample, which also limits our ability to generalize.

Given the results of this study, we can suggest some areas that might be interesting to pursue in further investigation.
1) What specific actions do individuals take when forced to use knowledge they do not prefer to use. Does this slow them down? Do they make more errors? Do they get agitated and get sick and miss work or quit more often?
2) Do organizations that take cognitive style into account when assigning duties perform better than those organizations that do not? What specific projects/activities should be assigned to whom?
3) What other characteristics of knowledge are affected by cognitive style?
4) Should organizations maintain flexibility and keep individuals of both cognitive styles on hand?
5) How do explicit and tacit knowledge affect communities of practice whereby groups of individuals may be able to share tacit knowledge more effectively [6]?
5) What organizational factors influence or modify the relationship between cognitive style and knowledge preference?

7. Conclusions

This initial attempt to identify the association between cognitive style and knowledge characteristic preference provided some interesting findings that open the door for additional research into how cognitive style affects work activities. Knowledge workers and those who employ them seem to be most amenable to benefiting from these findings, but workers in all fields and their organizations can benefit to some degree from taking into account cognitive style and the implications for knowledge utilization. In the race to be more productive over time, this type of employee-type and job requirement matching will not just be advantageous, it will be a requirement for survival.

Since this research is exploratory, the findings should be considered cautiously until future research is able to duplicate these findings. As the research base expands, our understanding of how and why the relationships among these variables are connected, the overall picture of the appropriate use of these findings will develop.

8. References

[1] Ashby, W.R. (1956). *An Introduction to Cybernetics*, London: William Clowes and Sons.

[2] Bagozzi, R. P. and Foxall, G. R. (1995). "Construct validity and generalizability of the Kirton adaption-innovation inventory," *European Journal of Personality*, (9), pp. 185-206.

[3] Barney, J. B. (1991). "Firm resources and sustained competitive advantage," *Journal of Management*, (17:1), pp. 99-120.

[4] Bloodgood, J.M. and Salisbury, W.D. (2001). "Understanding the influence of organizational change strategies on information technology and knowledge management strategies," *Decision Support Systems*, (31:1): pp. 55-69.

[5] Brodbeck, F. C., Kerschreiter, R., Mojzisch, A. and Schulz-Hardt, S. (2007). "Group decision making under conditions of distributed knowledge: The information asymmetries model," *Academy of Management Review*, (32:2), pp. 459-479.

[6] Brown, J. S. and Duguid, P. (2001). "Knowledge and organization: A social-practice perspective," *Organization Science*, (12:2), pp. 198-213.

[7] Chilton, M.A. and Bloodgood, J. (2007). "The dimensions of tacit and explicit knowledge: A description and measure," in *Proceedings of the 40th Hawaii International Conference on System Sciences.*

[8] Cohen, M.D., Burkhart, R., Dosi, G. , Egidi, M., Marengo, L., Warglien, M., and Winter, S. (1996). "Routines and other recurring action patterns of organizations: Contemporary research issues," *Industrial and Corporate Change*, (5:3), pp. 653-698.

[9] Dane, E. and Pratt, M. G. (2007). "Exploring intuition and its role in managerial decision making," *Academy of Management Review*, (32:1), pp. 33-54.

[10] Foxall, G. R. and Hackett, P. M. W. (1992). "The factor structure and construct validity of the Kirton adaption-innovation inventory," *Personality and Individual Differences*, (13:9), pp. 967-975.

[11] Goldsmith (1986), "Convergent validity of four innovativeness scales," *Educational and Psychological Measurement*, (46), pp. 81-87.

[12] Hammerschmidt, P. K. (1996). "The Kirton Adaption-Innovation Inventory and Group Problem Solving Success Rates," *Journal of Creative Behavior*, (30:1), pp. 61-75.

[13] Hasher, L. and Zacks, R. T. (1979). "Automatic and effortful processes in memory," *Journal of Experimental Psychology: General*, (108:3), pp. 356-388.

[14] Hasher, L. and Zacks, R. T. (1984). "Automatic processing of fundamental information," *American Psychologist*, (39:12), pp. 1372-1388.

[15] Kirton, M. J. (1976). "Adaptors and Innovators: A Description and Measure," *Journal of Applied Psychology*, (61), pp. 622-629.

[16] Kirton, M. J. (1994). "A Theory of Cognitive Style," in *Adaptors and Innovators, Styles of creativity and problem solving*, M. Kirton (Ed.), pp. 1-33, London: Routledge.

[17] Kline, G., Jiang, J. J., and Tesch, D. B. (2002). "Wanted: Project Teams with a Blend of IS Professional Orientations," *Communications of the ACM*, (45:6), pp. 81-87.

[18] Lewicki, P., Czyzewska, M., and Hoffman, H. (1987). "Unconscious acquisition of complex procedural knowledge," *Journal of Experimental Psychology: Learning, Memory, and Cognition*, (13). pp. 523-530.

[19] Nelson, R. and Winter, S. (1982). *An Evolutionary Theory of Economic Change*, Cambridge, MA: The Belknap Press of Harvard University Press.

[20] Polanyi, M. (1967). *The Tacit Dimension*, London: Routledge & Kegan Paul.

[21] Porter, M. (1985). *Competitive Advantage*, New York: The Free Press.

[22] Reber, A. S. (1967). "Implicit learning of artificial grammars," *Journal of Verbal Learning and Verbal Behavior*, (6), pp. 855-863.

[23] Reber, A. S. (1969). "Transfer of syntactic structure in synthetic languages." *Journal of Experimental Psychology*, (81:1), pp. 115-119.

[24] Reber, A. S., Walkenfeld, F. F., and Hernstadt, R. (1991). "Implicit and explicit learning: Individual differences and IQ," *Journal of Experimental Psychology: Learning, Memory, and Cognition*, (17:5), pp. 888-896.

[25] Resnick, M. and Wilensky, U. (1998). "Diving into Complexity: Developing Probabilistic Decentralized Thinking Through Role-Playing Activities," *The Journal of the Learning Sciences*, (7:2), pp. 153-172.

[26] Schutz, A. and Luckmann, T. (1973). *The Structures of the life-world*. Evanston, Il: Northwestern University Press.

[27] Scribner, S. (1986). "Thinking in action: Some characteristics of practical thought," in R.J. Sternberg and R.K. Wagner's (Eds.) *Practical Intelligence*, pp. 13-30, Cambridge: Cambridge University Press.

[28]Seamon, J. G., Brody, N., and Kauff, D. M. (1983). "Affective discrimination of stimuli that are not recognized: Effects of shadowing, masking, and cerebral laterality," *Journal of Experimental Psychology: Learning, Memory and Cognition*, (9:3), pp. 544-555.

[29] Seamon, J. G., Marsh, R. L., and Brody, N. (1984). "Critical importance of exposure duration for affective discrimination of stimuli that are not recognized," *Journal of Experimental Psychology: Learning, Memory and Cognition*, (10:3), pp. 465-469.

[30] Taylor, W. G. K. (1989). "The Kirton adaption-innovation inventory: a re-examination of the factor structure," *Journal of Organizational Behavior*, (10), pp. 297-307.