An Exploratory Study of Public Accountants' Perceived Technological Competency and Cognitive Style In a Knowledge-Based Industry

Lewis Shaw*
Associate Professor

Laurie Pant
Professor

The Sawyer School
Suffolk University

*Corresponding author
Suffolk University
8 Ashburton Place
Boston, MA 02108
Phone 617-573-8205
Fax 630-604-7520
lshaw@suffolk.edu

We are grateful for the helpful insights of Tracy Noga, Elizabeth Connors, Roland Kaye, and the research support provided by the Sawyer School.

An Exploratory Study of Public Accountants' Perceived Technological Competency and Cognitive Style In a Knowledge-Based Industry

Abstract

Partnership duties in large professional accounting firms have moved far beyond pure technical expertise to reflect the broad functional responsibilities of CEOs. Today's business model requires managing a multinational client base, a portfolio of audit and non-audit services across complex industries, and an increasingly technology-centered knowledge capital. Auditors are among those professionals who have had to acquire technology skills on the job. Has this learning been sufficient?

Additionally, the challenges of more comprehensive business lines preclude relying on textbook solutions to uniquely accounting questions. Rather, they require a contextual, integrative and non-traditional mode of learning from and adapting to the environment. Such demands are less suited to the Concrete Sequential (CS) learning style, as defined by Gregorc (1979). Yet Shaw (2002) found that more than 70% of accounting majors exhibit CS. This strong bias in public accounting recruits' cognitive style suggests that a socialization process has occurred. Either the CS style thinker leaves the firm before making partner, or he/she adapts the necessary skills to manage these complex entities.

To address these alternatives, we administered a self-perception technology questionnaire and the Gregorc Style Delineator to 100 practitioners in several large public accounting firms. Results indicate that as expected, perceived technological competency diminishes with rank. Further, practitioners at all ranks and in all areas of public accounting score high in the CS cognitive style. We also find a relationship between respondent's cognitive style at the two lower of three levels of perceived technological proficiency. These findings suggest that previous CS accounting recruits have adapted to at least of the technological demands of the profession in successfully survived the socialization process of becoming partner. <u>There is also some evidence that recent public accounting firm hires include significantly larger proportion of other cognitive styles.</u> To conclude, we raise implications for the professions, research, and accounting education.

Data and research instruments available upon request.

An Exploratory Study of Public Accountants' Perceived Technological Competency and Cognitive Style In a Knowledge-Based Industry

CPAs… making sense of a changing and complex world. (AICPA, 2002)

The practice of accounting in general and auditing in particular has grown increasingly complex. Generic solutions give way to industry and technology specific treatments. Systems perspectives reveal the interplay and consequences between and among different periods, functions, and strategies. Competitor, customer, and supplier response times continue to shorten. Public accounting firms, in turn, have utilized knowledge management tools and techniques to maintain parity in their traditional markets, and to make inroads into new service markets under the rubric of information systems. Technological innovation, in particular, has provided a spectrum of competitive resources ranging from increased cost efficiencies to strategic products offerings. For auditors, a lag in personal technical proficiency would challenge the individual's currency and could contribute to audit failure. Partners or those with the most time in the firm are more likely to lack the technological expertise of newer recruits who grew up using these tools. Thus a first research question of this paper is to assess whether auditors' self-perceived technological competency is related to seniority.

Another challenge in coping with the accelerating change of complexity is the lack of existing standard solutions and models for understanding and responding to business challenges. These difficulties preclude relying on textbook solutions to uniquely accounting questions. Rather, they require a contextual, integrative and non-traditional mode of learning from and adapting to the environment. Such demands are less suited to the Concrete Sequential (CS) learning style, as defined by Gregorc (1979). Yet Shaw (2002) found that more than 70% of accounting students exhibit CS. This strong bias in public accounting recruits' cognitive style suggests that a socialization process has occurred. Either the CS style thinker leaves the firm before making partner, or he/she adapts, developing the necessary skills to manage these complex entities. This study explores the socialization process by asking first, whether the cognitive style of accountants differs by rank or seniority, and second, whether there is a relationship between cognitive style and technical proficiency.

To address these alternatives, we administered a self-perceived technological proficiency questionnaire and the Gregorc Style Delineater to 100 practitioners in several large public accounting firms. Results indicate that as expected, perceived technological competency does diminish with rank. Also, practitioners at all ranks and in all areas of public accounting in our sample scored higher on the CS learning style, and that cognitive style is correlated with the two lower of three levels of perceived technological proficiency. Finally, there is some evidence that recent public accounting firm hires include significantly larger proportion of other cognitive styles. To conclude, we raise implications for the profession, research, and accounting education.

Literature Review

Knowledge Management Theory

Leadbeater (1998) suggests that by 2010 services will account for close to 80% of economic activity in the UK. The western economic evolution to a service dominated model of enterprise means the creation of knowledge is key to a firm's success. For example, intellectual capital[i] and other intangible assets are the major competitive assets in biotechnology, software and other computer services, consultancy, and other professional service firms (Jordan and Jones 1997).

The knowledge enterprise's most important assets, and most of its products, are intangible; moreover, competition will depend on the application of knowledge, ideas and creativity to generate growth and profits (Quintas, Lefrere et al. 1997). In the traditional organizational environment, even one with a rich technological infrastructure, support is given to the transfer of information, but not consciously given to the transfer of knowledge (Harris 1995). In contrast, effective performance and growth in a knowledge-intensive organization requires integrating and sharing highly distributed knowledge (Zack 1999).

Duffy (2001) defines knowledge management as a formal process that engages an organization's people, processes and technology in a solution that captures knowledge and delivers it to the right people at the right time. Nonaka and Takeuchi (1995) argue that the western organizations view knowledge as fundamentally "explicit" or in the form of hard data, scientific formulae, codified procedures, or universal principles, and created through analytical skills and through concrete forms of oral and visual presentation, such as documents, manuals and computer databases. In contrast, the Japanese view of knowledge is that it is primarily "tacit"; that is, highly personal and hard to formalize, making it difficult to communicate or to share with others. Examples included insights, intuitions and hunches, which are deeply rooted in actions, experiences, ideals, values, emotions, interaction among people and professional judgment. Tacit knowledge[ii] contains schemata, mental models, beliefs and perceptions that are highly ingrained. The relationship between tacit and explicit knowledge creation and communication is the basis for knowledge management. Technology facilitates the tacit to explicit knowledge cycle (Gregor and Benbasat 1999). The next section applies knowledge management theory to the global transformation taking place in the accountancy function and links technology as a fundamental driver for that transformation.

Technological Competency

Modern global accountancy firms exemplify knowledge organizations (Empson 1999). Accountants no longer restrict their services to organizing and summarizing financial data into meaningful information. In addition to transforming storing and disseminating that information for the client's high-level strategic decisions, today's accounting professional participates in the actual decision making process (AICPA 2001). Moreover, internally, all aspects of the accounting firms' core operating activities including: economic measurement, financial reporting, managerial planning and control, and auditing have been altered by advances in the codification and transfer of knowledge (Burns 1994).

Technological advance in accounting firms brings significant new communication challenges. Information sharing is instantaneous, the amount of data available is overwhelming, and the information sources are relationally interconnected. Accounting firms have capitalized by building built revenue generating opportunities (e.g., IT strategy, implementation, and maintenance, and internal audit services). And for the accounting firms' own operations, technology allows workers and managers to communicate actively. Information systems make it possible to automate office transactions and create a vast overview of an organization's operations, with many levels of data coordinated and accessible for a variety of analytical efforts (Zuboff 1988).

However, while virtually all areas of accounting were automated over the past half century, the profession has been slow to assess the structural potential of these changes First, until the emergence of the concept of a knowledge organization, accounting firms' technological implementation was used primarily to reduce time and eliminate errors, and repetitive functions (Lee, Bishop et al. 1996). Second, during the early days of computer implementation, the designers of the automated accounting systems were not the users, and generally not overly knowledgeable about accounting processes. Instead, they were from a systems or software design background, familiar with the relational capability of computers that exhibited non-linear, geometrically accessible information (Davis and Monroe 1987). Thus, systems were designed in a non-linear, geometric context to be used by those exhibiting linear, sequential cognitive styles; including accountants. Consequently, the first computer applications were difficult and thus adopted gradually at best.

The mid-1990s gave rise to accounting software that requires no (or minimal) prior knowledge of accounting or accounting systems (Christensen 1997). But Dunk and Roohani (1997) noted that although information technology (IT) has made bookkeeping more comprehensive, accurate, timely and frequent, the way in which IT is often applied does not produce more tailored information. Hawker and Crane (1993) suggest this failure may be due to a "culture gap" between those who specialize in information technology and those professionals with whom they work. Further, this gap may also represent differences between traditional accounting roles and those expected to predominate in the future.

In this new era of accounting, driven partly by innovative technological tools, requires accountants to have different skills and training than in the past. Various studies and surveys (AICPA 2000; Albrecht and Sack 2000; Elliott 1992; and others) emphasize the need for greater oral and written communication skills, analytical thinking skills, development of a global perspective and increased technological proficiency. And research suggests that individuals who possess these newly identified competencies have a different range of cognitive style characteristics from those of someone in a more traditional accounting role (Jones 1994).

Factors Contributing to Technological Proficiency

Prior research has identified perceptions of self-efficacy as the major internal criteria that influence one's proficiency in computer literacy and technological abilities (see for example , Qureshi & Hoppel 1995). Self-efficacy is a major component of one's ability to utilize technological applications and computers, as measured by Bandura's (1977) social cognitive theory. Harrison and Rainer (1997) study the self-efficacy performance model on over 700 university employees and students and find that performance with computers significantly predicts perceptions of high and low self-efficacy, providing additional support to Bandura's theory. Increased performance with computer-related tasks is found to be significantly related to higher levels of self-efficacy. Conversely, decreased performance with computer-related tasks is found to be significantly related to lower levels of self-efficacy.

An additional factor thought to affect both technological competency and auditor competence is the individual’s cognitive style. The next section reviews our understanding of cognitive style and its role in performance.

Cognitive Style and Technology

Since technological proficiency is key to contribution to a knowledge organization, workers in a professional services firm such as a large accountancy firm are expected to be fluent in a myriad of computer tools, applications, systems, and techniques. Cognitive style has been identified as affecting technological abilities. The specific relationship of cognitive style to the technological tools employed in knowledge organizations is unclear. However, some studies of formulating tacit knowledge, and of codifying explicit knowledge, indicate that, for accountants, certain cognitive styles fit the model of the “knowledge worker” more that others (see for example, Atkinson 1998; Landry, Raymond et al. 1996; Foxall and Bhate 1991; Huber 1992; Alavi and Leidner 2001)

Several authors have predicted that in the future the availability of information and the way in which it is accessed will rely much more heavily on thinking processes which are not linear, concrete, or sequential (Turkle, 1995; Stone et al., 1996; Landry et al., 1996). Not only will thinking processes transcend the limits of linearity and concreteness, they also will be much more abstract, random, non-sequential, and definitely non-linear in nature (Summers, Sweeney et al., 2000; Satava, 1997; O'Brien, 1994; Mani 1995; Landry et al., 1996).   This indicates a possible shift in the cognitive styles traditionally associated with individuals in the accounting field.

Building on Nonaka and Takeuchi's (1995) model of the cycle of transfer of knowledge from tacit to explicit, individuals have different ways of processing information and viewing the world (cognition) (Grant 1996). There is evidence that expertise and other individual characteristics, including cognitive style, have a strong impact on one's ability to function effectively within the model of the knowledge-based organization and the intelligent system (Gregor and Benbasat 1999). The personality and cognitive traits associated with individuals involved in traditional accounting functions arguably differs from those necessary to analyze and communicate complex strategic financial and non-financial information (Stone, Arunachalam et al., 1996; and others).

Cognitive styles[iii] can be defined as "distinctive behaviors that serve as indicators of how a person learns from and adapts to his/her environment. It also gives clues as to how a person's mind operates" (Gregorc 1979). It has also been defined as "information processing habits representing the learner's typical mode of perceiving, thinking, problem solving, and remembering" (O'Brien 1994). Leonard and Straus (1997) in their examination of thinking styles within the knowledge organization define cognitive differences as "varying approaches to perceiving and assimilating data, making decisions, solving problems and relating to others".

The study of cognitive styles has included a thorough examination of the relationship between cognitive styles and computer proficiency (Evans and Simkin, 1989; Myers and McCaulley, 1985; Jones 1994; Evans et al., 1989). Numerous studies of cognitive style over the past two decades have either focused on or included accounting students or practitioners (Soroko, 1988; Gul, Huang et al., 1992; Booth, 1993; Geary and Rooney, 1993; Wolk and Cates, 1994; Auyeung and Sanders, 1996; Fisher and Ott, 1996;

Gul, 1999; Summers et al. 2000; and others). These studies have utilized various instruments that use different terminologies to describe attributes to cognitive style, such as verbal, imagery, adaptive, innovative, concrete, sequential, linear, abstract, random, and many others. In general, these studies characterize accountants as linear-thinking, concrete, sequential, adaptive, and various similar descriptors.

In summary, there are some important issues of personal competency that might affect audit competency. Consequently, we raise the following exploratory questions about technical proficiency and cognitive style.

Research Questions

RQ1: Does the technological proficiency of public accountants differ by rank?

$RQ_{2:}$ Does the cognitive style of public accountants differ by rank?

$RQ_{3:}$ Are the technological proficiency and cognitive style of public accountants related?

Methodology

Subjects and Instruments

For this study, a self-assessment technology questionnaire was administered to 100 practitioners at three large accounting practices. Two of the firms are Big 4 and the third is within the next tier of firms. Of the practitioners participating in the study, 57 were males and 43 were females (see Table 1, Panel A). Fifteen were staff accountants, 28 were seniors, 27 were managers, 17 were senior managers, 12 were partners, and one was a director (partner-level without actual partner status) (see Table 1, Panel B). Ages ranged from 23 to 59, with a mean age of 32 (standard deviation 7.90) (see Table 1, Panel C). The practitioners' years of experience in public accounting ranged from a minimum of one year to a maximum of 38 years, with a mean of 9 years (SD=7.55) (see Table 1, Panel D). Seventy two graduated with accounting degrees, 4 with finance degrees, 3 in information systems, and 21 in other areas. Thirty two respondents indicated advanced degrees (primarily MBA). Fifty seven were Certified Public Accountants, with several holding dual certifications or other certifications (CIA, CFA, CMA, CISA, etc.). The majority (55) indicated that they work primarily in the financial audit area, with 19 in tax, 9 in "other assurance", 7 in technology consulting, 5 in "other consulting", 2 in mergers and acquisitions, and 3 in other areas (see Table 1, Panel E).

[Insert Table 1 about here]

Computer proficiency was measured by using a questionnaire, which assesses technical proficiency in the areas of computer usage and knowledge of computers, computer applications, network applications, and computer systems. This questionnaire is based on a survey of prior instruments used in various studies (Loyd and Gressard, 1984; Nickell and Pinto, 1986; Heinssen, Robert et al., 1987; Francis, 1993; Harrison and Rainer, 1997; and others).

This questionnaire was pre-tested prior to administration of this study. The questionnaire utilizes a five-point Likert Scale, where 1 is the lowest possible range and 5 is the highest. Further, the section measuring practitioners' self-assessed computer proficiencies is divided into questions at three levels. The first level is basic computer literacy skills. The second level is proficiencies well established as essential to success in accounting (for example, setting up a financial spreadsheet application). The third section focuses on advanced computer applications and skills. These include proficiency with higher-level functions of database management programs, familiarity with networked accounting applications, and the like.

Cognitive style was measured using the Gregorc Style Delineator (Gregorc 1979). This instrument has been well tested (Gregorc 1984) and used in a broad range of cognitive and learning style studies. The Delineator has the distinct advantage of ease of administration and relatively short completion time. It was designed as a self-analysis tool to aid an individual in recognizing and identifying channels through which he/she receives and expresses information efficiently, economically, and effectively. These channels provide a person with "mediation abilities", referred to as "style" (Gregorc 1984).

Mediation Ability Theory (a person's capacity to use channels of information) is the basis of the Gregorc Style Delineator, stating that the human mind has channels through which it receives and expresses information most efficiently and effectively (Gregorc 1982). The Styles Delineator focuses on two types of mediation abilities: *perception* and *ordering*. Perception refers to a person's ability to grasp information, and its measures are *abstract* and *concrete*. Ordering refers to the means in which one arranges, systemizes and disposes of information, and its measures are *sequential* and *random*. Gregorc states that there are other individualities that are not measured by the Delineator which affect human behavior, however perception and ordering are two of the more salient measures of style (Gregorc 1982). Gregorc combines these characteristics - abstractness, randomness, concreteness, and sequentialness - to arrive at four mediation channels: *concrete sequential* (CS), *concrete random* (CR), *abstract sequential* (AS), and *abstract random* (AR).

In the Style Delineator, individuals are administered a test consisting of ten sets of four words, which they are asked to rank ('1' indicating "least like me" to '4' indicating "most like me"). Each word corresponds to a particular mediation channel, and, when summed up, gives an accurate measure of an individual's propensity for operating within a specific cognitive style. With a possible score of 4 to 40 in each of the four mediation channels, Gregorc divides the scores in each area into: strong orientation as 27-40, moderate orientation as 16-26, and low orientation as below 16. Gregorc asserts that roughly 90% of individuals have a natural predisposition toward one or two of these channels and that channels serve to indicate how the individuals learn and act upon their environment (Gregorc 1982). The remaining 10% of individuals either have strong orientation in more than two areas or equally balanced scores in all four areas. Research studies have further shown that approximately 37% of the general population is Concrete Sequential, 34% is Abstract Random, 19% is Concrete Random, and only 10% is Abstract Sequential (Seidel and England 1999). Characteristics of individuals who score high in each of the four mediation channels are shown in Table 2.

[Insert Table 2 about here]

Results

Technological proficiency questions were divided into three levels – basic (level 1), intermediate (level 2), and advanced (level 3). Out of a possible 25 points for each level, the level 1 proficiency was self-reported as an average of 18.26 (SD=3.54). Level 2 proficiency was 16.76 (SD=4.08), and level 3 proficiency (database management, network applications, etc.) was an average of 10.76 points (SD=4.89). Overall self-reported computer proficiency averaged 45.78 (out of a possible 75 points) (SD=11.22) (see Table 3). These results are remarkably consistent with those of undergraduate accounting majors (Shaw, 2002).

[Insert Table 3 about here]

In terms of cognitive style, 21 practitioners scored as “pure” Concrete Sequential, 6 as “pure” Abstract Sequential, 10 as “pure” Abstract Random, and 8 as “pure” Concrete Random. The remainder of the respondents scored high in more than one mediation channel. Of those remaining practitioners, 38 scored high in Concrete Sequential and at least one other mediation channel. That means that 59 of the respondents were either “pure” Concrete Sequential or “mixed” Concrete Sequential. There was no significant variation in cognitive style along ranks. Further, gender was not a factor in differences in cognitive style make-up. An examination of practitioners’ scores on the Gregorc Styles Delineator is shown in Table 4. Here again, these results are remarkably consistent with those of undergraduate accounting majors. (Shaw 2002). One anomaly, however, is the very low number staff (first year recruits) exhibiting CS (only one third of the respondents).

[Insert Table 4 about here]

Results presented in table 5 indicate that perceived proficiency scores averaged higher for lower-ranked practitioners than for those at the partner level ($p > .005$). Finally, there is a significant relationship between Concrete Sequentialness and Levels 1 ($p > .03$) and Level 2 ($p > .04$) of perceived technological proficiency (Table 6).

[Insert Tables 5 and 6 about here]

Conclusion

This paper reports results of assessing the self perceived technological proficiency and the cognitive style of 100 public accountants. Technological proficiency is measured as the respondent's sense of efficacy and aptitude. Cognitive style was measured using the widely validated Gregoric Styles Delineator (1979). As expected, self-perceived technological competency declined with years of service, and as expected, most subjects were either Concrete Sequential or Concrete Sequential and another style. There was no significant difference in cognitive style across ranks, but the relationship of cognitive style and technology is significant at the two lower of the three proficiency levels.

Though limited, these findings provide evidence to support concerns about auditor competency. An important, but unexamined research question in this era of highly public audit failures is whether professional competency plays a causal role. This exploratory study presents information about two elements of competence: technological proficiency and cognitive style. First, we asked auditors at all ranks to evaluate their own technological proficiency. As expected, self-reported proficiency declined with rank. To the extent that senior managers make astute assessments of their competitive strengths and weaknesses, these results indicate these individuals are at some proficiency disadvantage in a knowledge-based industry highly dependent on technology. However, this discussion also raises some of the study's limitations. The case that competency is a factor in audit failure is still to be made. Further, we do not use an objective measure of technical proficiency. These two issues provide important direction for future studies.

Second, we measure the cognitive style of auditors at all ranks. The persistent presence of the Concrete Sequential style alone or combined with another style is strikingly consistent with previous findings. We did find an anomaly in the junior staff who exhibit a far smaller proportion of CS style, thus raising the question of whether this heralds a change in the characteristics sought in new recruits. Again our study did not establish whether there is any relationship between cognitive style and auditor competency. Future studies can address the validity of this important assertion.

Finally, we find a relationship between the lower levels of perceived proficiency and the CS cognitive style. This raises some very interesting questions for future research. Have the CS style dominated auditors adapted to the more linear demands of technological applications but not the more challenging relational ones?

Our results do tell us that auditors throughout the ranks of public accounting firms will exhibit the Concrete Sequential cognitive style, and given the increasing non-linear demands of an increasingly complex technological infrastructure for handling financial information in our global economy, the challenges for accountants and for accounting education are enormous. Competency is a fundamental condition for guaranteeing the accuracy and thus the utility of this information. An early step in assuring this integrity of process is to understand the extent of the threat to accuracy and the sources of this threat. This paper has raised the question tried to provide some initial understanding.

Bibliography

AICPA (2000). AICPA Core Competency Framework for Entry into the Accounting Profession, AICPA.

AICPA (2001). Vision Statement. New York.

Alavi, M. and D. E. Leidner (2001). "Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues." MIS quarterly **25**(1): 107-134.

Albrecht, W. S. and R. J. Sack (2000). Accounting Education: Charting the Course through a Perilous Future, American Accounting Association.

Atkinson, S. (1998). "Cognitive style in the context of design and technology project work." Educational Psychology **Vol. 18**(Issue 2): 183-195.

Auyeung, P. and J. Sanders (1996). "A cross cultural study of the learning style of accounting students." Accounting and Finance **Vol. 36**: 261-274.

Bandura, A. (1977). "Self - efficacy : toward a unifying theory of behavioural change." Psychological Review **Vol. 84**: 191-215.

Bokoras, M. A., M. B. Goldstein, et al. (1992). "Common factors in five measures of cognitive style." Current Psychology: Research & Reviews **Vol. 11**(No. 2): 99-109.

Booth, P. (1993). "Personality biases of accounting students: Some implications for learning style preferences." Accounting and Finance **33**(2): 109(12).

Burns, J. (1994). "Accounting Education for the 21st Century: The global challenges." AAA & Int'l Assoc. for Accounting Education and Res. Oxford.

Christensen, C. (1997). The Innovator's Dilemma : When New Technologies Cause Great Firms to Fail. Boston, Massachusetts, Harvard Business School Press.

Davis, G. B. and M. C. Monroe (1987). "The problem of information requirements for computer applications." Accounting Horizons **Vol. 1**(Issue 4): 105-110.

Duffy, J. (2001). "The tools and technologies needed for knowledge management." Information Management Journal **25**(1): 64-68.

Dunk, A. S. and S. J. Roohani (1997). "A Framework Analysis of the relation Between Information Technology and Performance : The Influence of Operational Change Factors and Organizational Culture, Advances in Accounting Information Systems." **Vol. 5**.

Elliott, R. K. (1992). “The third wave breaks on the shores of accounting.” Accounting Horizons: 61-85.

Empson, L. (1999). “Knowledge management : in search of the philosophers' stone.” Business Strategy Review **Vol. 10**(No. 2): 67-71.

Evans, G. E. and M. G. Simkin (1989). “What best predicts computer proficiency?” Communications in the ACM **Vol. 32**(No. 11): 1322-1328.

Fisher, D. G. and R. L. Ott (1996). “A study of the relationship between accounting students' moral reasoning and cognitive styles.” Research on Accounting Ethics **Vol. 2**: 51-71.

Foxall, G. R. and S. Bhate (1991). “Extend of computer use: relationships with a adaptive-innovative cognitive style and personal involvement in computing.” Perceptual and Motor Skills **Vol. 72**(No. 1): 195-202.

Francis, L. J. (1993). “Measuring attitude toward computers among undergraduate college students : the affective domain, Computers in Education.” **Vol. 20**(No. 3): 251-255.

Geary, W. T. and C. J. Rooney (1993). “Designing accounting education to achieve balanced intellectual development.” Issues in Accounting Education: 60-70.

Grant, R. M. (1996). “Toward a knowledge-based theory of the firm.” Strategic Management Journal **Vol. 17**: 109-122.

Gregor, S. and I. Benbasat (1999). “Explanations from intelligent systems: theoretical foundations and implications for practice.” MIS quarterly **23**(4): 497-531.

Gregorc, A. F. (1979). “Learning/teaching styles: potent forces behind them.” Educational Leadership: 234-237.

Gregorc, A. F. (1982). “An Adult's Guide to Style.” Educational Leadership.

Gregorc, A. F. (1984). “Gregorc Style Delineator: Development, Technical and Administrative Manual.” Columbia.

Gul, F., Huang, et al. (1992). “Cognitive style as a factor in accounting students' perceptions of career-choice factors.” Psychological Reports **Vol. 71**: 1275-1281.

Gul, F. A. (1999). “Qualified audit reports, field dependence cognitive style, and their effects on decision making.” Accounting and Finance **Vol. 30**(No. 2): 15-27.

Harris, D. B. (1995). “Creating a knowledge centric information technology environment.” Unpublished paper.

Harrison, A. W. and R. K. Rainer Jr. (1997). “Testing the self-efficacy - performance linkage of social - cognitive theory.” Journal of Social Psychology **137**(1): 79-88.

Hawker, A. and J. Crane (1993). “Information technology and the culture gap.” Management Accounting **Vol. 71**(No. 1): 38-42.

Heinssen Jr., K. Robert, et al. (1987). “Assessing computer anxiety: development and validation of the computer anxiety rating scale.” Computers in Human Behavior **Vol. 3**: 49-59.

Huber, G. P. (1992). “Response to Rao, et al: how to deal with cognitive style.” MIS Quarterly **16**(2): 153-155.

Hunton, J. E., A. Wright, et al. (2002). The impact of more frequent external financial statement reporting and independent auditor assurance on quality of earnings and stock market effects, Working Paper.

Jones, W. P. (1994). “Computer use and cognitive style.” Journal of Research on Computing in Education **Vol. 26**(No. 4): 514-523.

Jordan, J. and P. Jones (1997). “Assesing your company's knowledge management style.” Long Range Planning **Vol. 30**(No. 3): 392-398.

Landry, J., M. Raymond, et al. (1996). “Computer Usage and Psychological Type Characteristics in Accounting Students.” Journal of Accounting and Computers **Vol. 12**.

Leadbeater, C. (1998). “Who will own the knowledge economy?” Political Quarterly **69**(4): 375-386.

Lee, T. A., A. Bishop, et al. (1996). “Accounting History from the Renaissance to the Present.”.

Leonard, D. and S. Straus (1997). “Putting your company's whole brain to work.” Harvard Business Review.

Loyd, B. H. and C. Gressard (1984). “Reliability and factorial validity of computer attitude scales.” Educational and Psychological measurement **Vol. 44**: 501-505.

Mani, B. (1995). “Progress on the journey to total quality management: using the Myers-Briggs Type Indicator and the adjective check list in management development.” Public Personal Management **Vol. 24**(No. 3): 365-406.

Myers, I. B. and M. H. McCaulley (1985). “Manual: A Guide to the Development and Use of thr Myers-Briggs Type Indicator.” Consulting Psychologists Press.

Nickell, G. S. and J. N. Pinto (1986). “The computer attitude scale.” Computers in Human Behavior **Vol. 2**: 301-306.

Nonaka, I. and H. Takeuchi (1995). The Knowledge-Creating Company. New York, Oxford University Press.

O'Brien, T. P. (1994). “Cognitive learning styles and academic achievement in secondary education.” Journal of Research and Development in Education **Vol. 28**(No. 1): 11-2

Quintas, P., P. Lefrere, et al. (1997). “Knowledge management: a strategic agenda.” Long Range Planning **Vol. 30**(No. 3): 385-391.

Qureshi, S. and C. Hoppel (1995). “Profiling computer predispositions.” Journal of Professional Services Marketing **Vol. 12**(No. 1): 73-79.

Riding, R. and I. Cheema (1991). “Cognitive Styles - an overview and integration.” Educational Psychology **Vol. 11**(Nos. 3 and 4).

Satava, D. (1997). “Extraverts or introvers: who supervises the most CPA staff member?” Journal of Psychological Type **Vol. 43**: 40-43.

Seidel, L. E. and E. M. England (1999). “Gregorc's cognitive styles: college students' preferences for teaching methods and testing techniques.” Perceptual and Motor Skills **Vol. 88**: 859-875.

Shaw, L. (2002). “The Relationship of Accounting Majors' Cognitive Style and Technological Proficiency: Are Students Prepared to Enter an Increasingly Knowledge-Based Profession?” *Review of Business Information Systems,* Summer 2003.

Soroko, M. P. (1988). “Student learning styles - a teaching consideration in the principles of accounting courses.” Journal of Educaiton fro Business.

Stone, D. V., V. Arunachalam, et al. (1996). “An Empirical Investigation of Knowledge, Skill, Self-Efficacy and Computer Anxiety in Accounting Education.” Issues in Accounting Education **Vol. 11**(No. 2).

Summers, S. L., J. T. Sweeney, et al. (2000). “Problem-solving style and fit in consulting and auditing.” Journal of Information Systems **14**(1): 1-15.

Turkle, S. (1995). Life on the Screen: Identity in the Age of the Internet. New York, Touchstone.

Wolk, C. and T. A. Cates (1994). "Problem-solving styles of accounting students: are expectations of innovation reasonable." Journal of Accounting Education **Vol. 12**(No. 4): 269-281.

Zack, M. H. (1999). "Managing codified knowledge." Sloan Management Review **40**(4): 45-58.

Zuboff, S. (1988). In the Age of the Smart Machine: The Future of Work and Power, Basic Books.

Table 1, Panel A

GENDER	Frequency	Percent	Valid Percent	Cumulative Percent
Female	43	43.0	43.0	43.0
Male	57	57.0	57.0	100.0
Total	100	100.0	100.0	

Table 1, Panel B

RANK	Frequency	Percent	Valid Percent	Cumulative Percent
Staff	15	15.0	15.0	15.0
Senior	28	28.0	28.0	43.0
Manager	27	27.0	27.0	70.0
Senior Manager	17	17.0	17.0	87.0
Partner	12	12.0	12.0	99.0
Director	1	1.0	1.0	100.0
Total	100	100.0	100.0	

Table 1, Panel C

AGE

Minimum	Maximum	Mean	Std. Deviation
23	59	32.14	7.899

Table 1, Panel D

YEARS IN PRACTICE

Minimum	Maximum	Mean	Std. Deviation
1	38	9.05	7.552

Table 1, Panel

ACCOUNTING AREA	Frequency	Percent	Valid Percent	Cumulative Percent
financial audit	55	55.0	55.0	55.0
other assurance	9	9.0	9.0	64.0
tax	19	19.0	19.0	83.0
mergers & acquisitions	2	2.0	2.0	85.0
technology consulting	7	7.0	7.0	92.0
other consulting	5	5.0	5.0	97.0
other	3	3.0	3.0	100.0
Total	100	100.0	100.0	

Table 2 - Dominant Style Characteristics of the Four Mediation Channels of the Gregorc Style Delineator (1982)

Frames Of Reference	Concrete Sequentia CS	Concrete Random CR	Abstract Randor AR	Abstract Sequen AS
KEY WORDS	Practical	Probable	Potential	Possible
WORLD OF REALITY	Concrete world of physical senses	Abstract world of th intellect based upon concrete world	Abstract world c feeling and emot	Concrete world c activity and abst world of intuitio
ORDERING ABILITY	Sequential step-by- linear progression	Sequential and two- dimensional; tree-lik	Random web-lik multi-dimension	Random three- dimensional patt
VIEW OF TIME	Discrete units of pa present, future	The present, historic and projected future	The moment: tin artificial and res	Now: total of the interactive prese seed for the futu
THINKING PROCE	Instinctive, methoc deliberate	Intellectual, logical, analytical, correlativ	Emotional, psyc perceptive, critic	Intuitive, instinc impulsive, indep
VALIDATION PRO	Personal proof via senses: accredited	Personal intellectual formulae: conventio accredited experts	Inner guidance s	Practical demonstration: p proof: rarely acc of outside author
FOCUS OF ATTENT	Material reality; ph objects	Knowledge, facts, documentation, conc ideas	Emotional attach relationships, an memories	Applications, me processes, and id
CREATIVITY	Product, prototype, refinement, duplica	Synthesis, theories, i and matrices	Imagination, the refinement, relationships	Intuition, origina inventive, and fu
ENVIRONMENTAL PREFERENCE	Ordered, practical, stable	Mentally stimulating ordered and quiet, n authoritative	Emotional and p freedom; rich; ac and colorful	Stimulus-rich, competitive, free restriction
USE OF LANGUAG	Literal meaning an labels, succinct, lo	Polysyllabic words, rationality; highly ve	Metaphoric, uses gestures and boc language; colorf	Informative, live colorful; "words convey true mea
PRIMARY EVALUA WORD(S)	Good, Not Bad	Excellent	Super, Fantastic, Marvelous	Great, Superior
NEGATIVE CHARACTERISTIC	Excessive conform unfeeling, possessi	Opinionated, sarcast aloof	Spacey, overly s smothering	Deceitful, unscrupulous, eg centric

Table 3

Scores on Technological Proficiency by Rank

Rank		Level I	Level 2	Level 3	Overall
Staff	Mean	19.13	17.07	12.53	48.73
	N	15	15	15	15
	Std. Deviation	2.997	3.863	4.596	10.257
Senior	Mean	19.61	18.11	11.61	49.32
	N	28	28	28	28
	Std. Deviation	2.807	3.047	5.398	9.650
Manager	Mean	18.00	16.63	9.89	44.52
	N	27	27	27	27
	Std. Deviation	2.418	3.040	3.693	8.267
Senior Manager	Mean	17.88	17.06	9.82	44.76
	N	17	17	17	17
	Std. Deviation	4.106	4.145	4.876	11.487
Partner	Mean	15.17	13.33	9.92	38.42
	N	12	12	12	12
	Std. Deviation	5.202	6.513	6.331	17.526
Director	Mean	18.00	14.00	10.00	42.00
	N	1	1	1	1
	Std. Deviation	.	.	.	.
Total	Mean	18.26	16.76	10.76	45.78
	N	100	100	100	100
	Std. Deviation	3.538	4.075	4.893	11.219

Table 4

Average Overall Scores of Cognitive Style

	Minimum	Maximum	Mean	Std. Deviation
Concrete Sequential	16	40	27.90	5.43
Abstract Sequential	15	40	25.37	4.44
Abstract Random	11	37	23.17	6.22
Concrete Random	15	38	23.66	5.20

Table 5

Correlation of Overall Proficiency by Rank

		PRTOT	rank code
Proficiency	Pearson Correlation	1	-.278**
	Sig. (2-tailed)	.	.005
	N	100	100
Rank	Pearson Correlation	-.278**	1
	Sig. (2-tailed)	.005	.
	N	100	100

** Correlation is significant at the 0.01 level (2-tailed).

Table 6

Relationship Between Concrete Sequentialness and Technological Proficiency

		CS	Level 1	Level 2	Level 3	Overall
Concrete Sequential	Pearson Correlation	1	.213*	.198*	.082	.175
	Sig. (2-tailed)	.	.033	.048	.415	.081
	N	100	100	100	100	100
Level 1	Pearson Correlation	.213*	1	.791**	.640**	.882
	Sig. (2-tailed)	.033	.	.000	.000	.000
	N	100	100	100	100	100
Level 2	Pearson Correlation	.198*	.791**	1	.698**	.917**
	Sig. (2-tailed)	.048	.000	.	.000	.000
	N	100	100	100	100	100
Level 3	Pearson Correlation	.082	.640**	.698**	1	.891**
	Sig. (2-tailed)	.415	.000	.000	.	.000
	N	100	100	100	100	100
Overall	Pearson Correlation	.175	.882**	.917**	.891**	1
	Sig. (2-tailed)	.081	.000	.000	.000	.
	N	100	100	100	100	100

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

FOOTNOTES

[i] Intellectual capital is used to refer to the intangible creations of human intellect which include technical expertise, problem-solving capability, creativity, and managerial skill (Jordan & Jones 1997).

[ii] Tacit knowledge was first described by Polanyi (1966).

[iii] Dozens of diagnostic tools and descriptive analyses of human cognitive approaches to problem solving, communication, and personality have been developed. These include the Myers-Briggs Type Indicator, the Decision Style Indicator, Kolb's Learning Style Inventory, Lifescripts, Kirton's Innovator-Adaptor Inventory, Paivo's Verbal-Imagery Questionnaire, Riding's Cognitive Styles Analysis Test, and the Gregorc Styles Delineator (Bokoras et al., 1992; Riding & Cheema, 1991). Each of these instruments uses different terminology (and other design features) to describe behavioral traits that the tests are designed to measure.