

***MEASURING KNOWLEDGE SOURCE TACITNESS AND
EXPLICITNESS: A COMPARISON OF PAIRED ITEMS***

Theme: Methodology

Gerard, Joseph G.

The University of Georgia

Contact author: Gerard, Joseph G.

Univeristy of Georgia
Department of Management
Terry College of Business
Athens
GA 30602-6256
Greece

Telephone: 706-425-2960

E-mail: jgerard@arches.uga.edu

Abstract

Research looking at tacit knowledge has been hindered by a lack of clarity regarding the relationship between explicitness and tacitness. Specifically, knowledge is commonly conceived of as possessing an explicit/tacit dichotomy, where it is either tacit or explicit, or continuous, where high (low) tacitness reflects low (high) explicitness. This paper extends work in the measurement of both explicit and tacit knowledge by employing overlooked aspects of Polanyi's epistemology. 225 knowledge source assessments are tested across 36 paired items. Results show strong support for separation between explicit and tacit knowledge constructs along with differential relatedness based upon the knowledge source under examination. Additionally, little support is found for a dichotomy, suggesting important implications for future research and practice.

This paper uses Polanyi's tacit and personal knowing theories (Polanyi, 1958a/1962, 1966) along with Searle's work on intention and speech acts (Searle, 1969, 1983; Searle & Vanderveken, 1985) to empirically examine the argument that tacit knowledge and explicit knowledge are related but separate constructs. This paper addresses criticisms of the tacit knowledge dichotomy in knowledge-based research (Acar & Burns, 2001; Gerard, 2001; Gray, 2001; King & Zeithaml, 2001; Kogut & Zander, 1992) and builds a more comprehensive instrument for explicit and tacit knowledge's examination in an effort to improve upon tacit knowledge's utility and falsifiability (Bacharach, 1989). Because the items in this examination combine current conceptions of tacit knowledge in a unique manner, this study examines their content validity along with their content adequacy (Schriesheim, Cogliser, Scandura, Lankau, & Powers, 1999; Schriesheim, Powers, Scandura, Gardiner, & Lankau, 1993).

Specifically, this study examines assumptions surrounding explicit and tacit knowledge's status as either dichotomous descriptors or anchors on a continuum, while also exploring the alternative Polanyian view that they are related, but separate, constructs. This is expected to especially inform areas of knowledge-based study that have traditionally relied exclusively upon the tacitness descriptor, absent measures of explicitness. Such studies include knowledge transfer in strategic alliances (Larsson, Bengtsson, Henriksson, & Sparks, 1998; Mowery, Oxley, & Silverman, 1996), joint ventures (Inkpen & Dinur, 1998; Steensma & Lyles, 2000b) and best practices (Szulanski, 1996b), just to name a few. Implications for future measures, and for managerial theory and practice are discussed.

Introduction and Theoretical Background

This study is built upon Polanyi's epistemological view that (1) knowledge need not exist in articulated form to be considered knowledge, (2) articulated knowledge originates in the unarticulated, or "tacit," knowledge, (3) the articulated is, in some way, related to a mass of unarticulated and possibly unarticulable tacit knowledge, and (4) coming to know what one knows is a *simultaneous* and complex individual/group interaction, rather than an exclusively social or individual phenomenon (Polanyi, 1958a/1962; Polanyi, 1958b; Polanyi, 1966, 1969). The constructs examined will, therefore, focus upon two relationships central to knowing; the association between articulated and unarticulated knowledge.

The paper begins with a discussion of existing views of tacit knowledge in management literatures, focusing on the most popular and advanced measure of tacit knowledge constructed by Zander and Kogut (1995) as well as foundational work by Winter (1987), Nelson and Winter (1982) and Polanyi (1958a/1962; Polanyi, 1958b; Polanyi, 1966). Briefly, Polanyi's thinking was influential throughout Nelson and Winter's 1982 work on evolutionary organization theory, and the authors explicitly credit his philosophy's impact on their skills (p.76) and organizational capabilities and behavior (p.97) chapters. Polanyi's work was also highly influential in the construction of Winter's (1987) oft-used knowledge taxonomy, making it, in essence, the foundation work on tacit knowledge and strategic knowledge-related work in competencies (King et al., 2001; Zander et al., 1995), capabilities (Helfat, 2000; Helfat & Raubitschek, 2000; Kogut & Kulatilaka, 2001; Kogut et al., 1992; Leonard-Barton, 1992), dynamic capabilities (Eisenhardt & Martin, 2000; Galunic & Eisenhardt, 2001; Teece, Pisano, & Shuen, 1997), routines (Cohen & Bacdayan, 1994; Dougherty, 1992; Nelson et al., 1982), organizational knowledge (Narasimha, 2000; Nonaka, 1994; Spender, 1994), and knowledge management (Dutrenit, 2000; Gorelick & April, 2001; Hansen, 1999; Szulanski, 1996).

Because the measurement of knowledge and "tacit knowledge" is in its infancy, the purpose of this article is not to comprehensively survey existing theory or measurement, but rather to take a more detailed look at whether or not the empirical indicators for tacit knowledge correspond their theoretical definitions. In other words, do the measures of these constructs correspond to our conceptions and treatment of them? In order to examine the content adequacy of tacit knowledge constructs, it has been necessary to rely upon existing measures of tacit knowledge (esp. King et al., 2001; Ranft, 1997; Subramaniam & Venkatraman, 2001; Zander et al., 1995) while expanding upon its other explicit knowledge aspects following Polanyian theory. In so doing, this paper addresses two major gaps in prior literature. First, it takes an empirical look at those commonly held and frequently unstated assumptions of dichotomy or continuum that form the basis for much knowledge-based research. Second, these are compared to each other as well as to a newly introduced Polanyi-based conception and measurement of tacit knowledge. Specifically, this paper conceptually introduces and empirically examines tacit knowing's explicitness and tacitness sub-constructs in the comparison of parallel questionnaire items.

This study constitutes the first step in expanding the knowledge construct by drawing upon past work in knowledge-based literatures (Grant, 1996b; Nonaka, 1994; Spender, 1996b; Spender, 1993; Winter, 1987) and more adequately tapping the aspect of Polanyian theory emphasizing integration between explicit and tacit knowledge. This is in contrast to dichotomizing studies that assume that explicit and tacit knowledge are two completely separate types of knowledge – which often subsequently prescribe the "conversion" of tacit knowledge into explicit knowledge (Nonaka, 1994). By including parallel measures of knowledge explicitness, this study improves upon the popular use of relatively limited variables to describe the "tacitness" of knowledge (Berman, 2002; Nelson et al., 1982; Polanyi, 1958a/1962, 1966; Subramaniam et al., 2001; Zander et al., 1995). Essentially, this paper examines unique explicit knowledge components in conjunction with tacit knowledge in order to measure those articulable aspects of knowledge overlooked, assumed unimportant, or subsumed under the dichotomy-based tacit knowledge constructs. In so doing, this study also tests a unique and alternative conception of knowledge by placing added importance to the explicit knowledge concept. The articulable (i.e., explicit knowledge) dimension is then tested alongside existing tacit knowledge measures in order to build upon prior work and to

highlight the necessity of looking at both. A basic and central assumption of this paper, following Polanyi (1958a/1962), is that the explicit is generated from tacit knowledge and those concepts are, therefore, related but separate. This is a *critical* aspect of Polanyi's theory of knowledge that is too often overlooked (Gerard, 2001; Gray, 2001; Jha, 2002).

Organizational Knowledge

There are many different ways to view organizational knowledge. Walsh (1995) notes some scholars consider "organizational knowledge" to be a simple terminological convention (Huber, 1991) and a product of individual learning aggregated organizationally (Argyris & Schon, 1978; Cohen, 1991; Huber, 1991; Simon, 1991); while others view organizational knowledge as a type of "collective mind" produced through organizational learning (Durkheim, 1964; Halbwachs, 1992; Sandelands & Stablein, 1987; Walsh & Ungson, 1991), and distinctive from a sum of all individual learning. Walsh and Ungson (1991) point out that organizational analysts are often unclear about whether there can be any kind of organization-level knowledge. The lack of specification in the assumed structure - that is, whether or not learning and knowledge are individual or organizationally based, or a mix of the two results in a high level of ambiguity in organizational knowledge and learning literatures as to what "knowledge" and "learning" actually mean. Regardless, knowledge - whether the analysis is at individual and organizational levels (or somewhere else) - is central to theorists that hold knowledge-based resources (Barney, 1991; Penrose, 1959), rents (Peteraf, 1993) or assets (Kroll, 1999; Nelson et al., 1982) as primarily important to organizational performance and sustained competitive advantage (Barney, 1991; Berman, Down, & Hill, 2002; Spender, 1999). Within this paper, organizational knowledge is not only assumed to be composed of knowing at both individual and organizational levels (also in accordance with Polanyian theory) but controls for macro and micro knowledge constructs in the instrument's design.

Accordingly, our definition of organizational knowledge is viewed as the overarching act of knowing at the organizational level that arises when individuals act and work with knowledge in a collective environment. One reason this seems especially feasible is the emerging notion that the firm is actually defined by and modeled as a collection of knowledge sets or skills (Amit & Schoemaker, 1993; Barney, 1991; Berman et al., 2002; Grant, 1996b; Prahalad & Hamel, 1990). While definitions for knowledge are at times vague (Eisenhardt et al., 2000; Priem & Butler, 2001a, 2001b; Williamson, 1999), some relevant conceptions of these knowledge sets are beginning to take shape in the strategy literature, and include dynamic capabilities (Eisenhardt et al., 2000; Grant, 1991; Subramaniam et al., 2001), competencies (King et al., 2001; McEvily, Das, & McCabe, 2000), competitive advantage (Henderson & Cockburn, 1994; Teece et al., 1997) and *combinative* capabilities (Amit et al., 1993; Grant, 1996a; Kogut et al., 1992; Pisano, 1994). These more frequently used categories, however, are subsets specific to organizations and organizational behaviors, like strategy making (Burgelman, 1991; Grant, 1991; Liebeskind, 1996), human resource management (Hitt, Bierman, Shimizu, & Kochhar, 2001a; Watkins & Marsick, 1993), strategic alliance management (Harrison, Hitt, Hoskisson, & Ireland, 2001; Larsson et al., 1998; Mowery et al., 1996), firm acquisitions (Harrison et al., 2001), and technology transfer (Bierly & Chakrabarti, 1996; Epple, Argote, & Devadas, 1991; Subramaniam et al., 2001; Szulanski, 1996b). Nearly all of these studies make reference either to the value created by or the difficulty in obtaining that complex type of knowledge commonly referred to as tacit knowledge.

Tacit Knowledge

Not only is tacit knowledge central to the study of knowledge, it is often said to be the *most* important aspect through which knowledge sustains competitive advantage for firms (Barney, 1991; Berman et al., 2002; Eisenhardt et al., 2000; Lado, Boyd, & Wright, 1992; Moingeon & Edmondson, 1996; Nahapiet & Ghoshal, 2000; Narasimha, 2000; Spender, 1996a). The definition of tacitness within the organizational knowledge and learning literatures can be unclear, however, and it experiences the types of problems that surround arguments backing individual versus organizational-level knowledge. Therefore, what tacit knowledge means from paper to paper is frequently a source of ambiguity. Much of our current conceptions of tacit knowledge in strategic management literature comes from Nelson and Winter's (1982) adoption of Polanyi's work in evolutionary organization theory and Winter's subsequent book section (1987). These two works essentially form the gateway through which knowledge and/or competencies have been linked to Michael Polanyi's work. Since then, however, our conception and measurement of tacit knowledge has not moved much beyond the preliminary work of Nelson and Winter (1982), especially with respect to greater uses of specific details of Polanyi's epistemology.

In line with its indicators proposed in Winter's taxonomy, tacitness is commonly conceived of as a descriptor of non-articulation (Nelson et al., 1982), difficulty in teaching (Nelson et al., 1982; Winter, 1987), and complexity (Dougherty, 1992; Reed & DeFillipi, 1990; Szulanski, 1995) or ambiguity (Rivkin, 2001; Simonin, 1999; Zander et al., 1995). Major untested assumptions about tacit knowledge include the definition and restriction of its domain at the individual or collective level. Discussions of tacit knowledge and individual behavior or cognition or often used to underscore the belief that individuals possess more than just technical or skill-based knowledge, but that they also possess interpretive knowledge. This interpretive capability of the individual, however, can be a weakness, as can be the position of the individual in an organization – restricted to contact with certain organizational structures, a functional role, interactions with a limited number of people and limited intellectual powers.

Discussions of these limitations often lead to debates concerning the level of embeddedness (or lack thereof) of the individual in a greater collective. Once this happens, dialogue about tacit knowledge and its place within the collective is also likely to occur. With respect to any collective (i.e., dyad, group, team, division, corporation, culture or society), tacit knowledge is believed to be a central underpinning of that "collective mind" (Weick & Roberts, 1993) produced from shared experiences. This type of knowing has been described as an important "synchronous" product of social/organizational behavior because the individual lacks full knowledge, the capacity for its full sharing, and capacity for its maintenance even through the use of a common language (Berman et al., 2002).

Regardless of whether the tendency is to believe that tacit knowledge is more an individual or group level characteristic or phenomenon, tacit knowledge is credited with the most tangible and measurable increase in efficiency in organizations. Tacit knowledge is – at least theoretically - the driver behind faster production (Epple et al., 1991; Henderson et al., 1994; Kim & Kogut, 1996; Zander et al., 1995) through decreased communication time (Brown & Eisenhardt, 1997; Ching, Holsapple, & Whinston, 1992; Epple et al., 1991), increased communication accuracy (Brown & Duguid, 2001; Brown et al., 1997) and enhanced innovative capacity (Brown et al., 2001; Kim et al., 1996; Rosenkopf & Nora, 2001). Tacit

knowledge is believed to bring about coordinated action and mutual adjustment between individuals within the collectives in question (Berman et al., 2002; Henderson et al., 1994), the value of which described at length within organizational learning, managerial and organizational cognition, and the strategic knowledge and resource-based views. The questions then arise, “How is tacit knowledge acquired?” and “Once it is acquired, how does it work?”

Paradoxically, tacit knowledge’s value is believed to exist precisely because the ambiguity in its acquisition protects its possessor from easy non-intended transfer, theft, mimicry or behavioral circumvention by competitors. It is said that tacit knowledge “cannot be taught by reading manuals or listening to lectures” and “must be learned through experience” (Berman et al., 2002) that it is cumulative in nature and it is itself a product of the need for its diffusion. The question “How does tacit knowledge work?” then comes to mind. Where is it stored and how is it accessed? Galunic and Eisenhardt (2001) say it is stored in logics or mindsets produced and described by the economic and social realities of a firm, while Berman and colleagues (2002) credit the existence of pattern recognition. These are both similar to those organizational properties of knowledge that are believed to be shared and sustained by organizational members through their use of common language (Walsh et al., 1991), whose meaning is in turn reliant upon logics and pattern-making for context. It is particularly striking, given these observations, that for both theoretical and measurement purposes tacit knowledge is frequently assumed an opposite to explicit knowledge in a predominantly dichotomous sense (where tacit or explicit knowledge exist in the exclusion of the other) or, almost as frequently, a continuous sense (where more of tacit or explicit knowledge can be expected to accompany less of its counterpart, respectively).

The result is that explicit knowledge is, in essence, left out of measurements that propose to measure only the emphasized tacit knowledge which, is then characterized as ambiguous, complex and difficult to articulate (King et al., 2001; Ranft, 1997; Subramaniam et al., 2001; Zander et al., 1995). It does not necessarily follow that explicit knowledge (again, often equated with that which *is* articulated) is then necessarily unambiguous, uncomplicated or even something opposite tacit knowledge. There are, for instance, many bodies of knowledge easily described as simultaneously high in tacit and explicit knowledge. The health care industry, for instance, employs a large percentage of MDs who possess a high degree of very explicit, shared and standardized knowledge resulting from traditional training delivered in very standard ways. MDs spend most of their early educational careers learning a voluminous baseline vocabulary, among other things, that new residents will only just begin to employ in a very practical sense upon graduation from medical school. This explicit knowledge may be described in terms of its high levels of complexity, ambiguity and articulability. While the description of that explicit body of knowledge will share some things in common with the tacit body of knowledge attached to it, it will have striking differences as well.

To begin with, take the assessment of its complexity: The sheer quantity of explicit medical terminology and the interrelatedness of those words would cause some to classify that articulate knowledge as complex. The vocabulary does not vary widely in its definitions, though, and is very scientific in nature and is considered fairly impervious to individual interpretation. Would this cause other individuals to conclude that medical schooling was very explicit (or non-complex) or would researchers simply refer to this as explicit knowledge? Alternatively, can we say that when a body of knowledge, such as medical school knowledge that is composed of a vast quantity of explicit artifacts, is labeled “tacit,”

or labeled as tacit knowledge, that it then has a high quantity or high degree of tacitness? Although highly standardized, does the fact that the large body of explicit knowledge learned in medical school will be employed in different ways change that assessment, and lead us to believe that basic medical training is very diverse? There are, in fact, a number of different ways researchers and practicing managers use the tacit and explicit knowledge designations. Most often, however, they are used as synonyms for knowledge that may be described as more or less teachable, articulable, observable, complex, or individual (Nelson & Winter, 1982; Winter, 1987; Zander & Kogut, 1995), possessing more or less tacitness, asset specificity or complexity (Reed & DeFillipi, 1990), or resulting from more fertile, communication and relationship-friendly associations (Szulanski, 1996) involving more motivated or intelligent groups or individuals (Szulanski, 1996). While most of these treatments of knowledge have come from Polanyi's "we can know more than we can tell" statement (Polanyi, 1966: 4), they do not strongly adhere to Polanyi's theory. Many definitions of tacit knowledge contrast rather strikingly in their use with what Polanyi's theories would imply (Gerard, 2001; Jha, 2002). Therefore, to complement and advance current work in organizational knowledge and knowledge resource disciplines, this paper maintains close observance to the assumptions found in Polanyi's work.

In contrast to simply identifying knowledge's tacitness (i.e., extent to which knowledge is unexpressed, unspoken or inexpressible) while assuming its explicitness (i.e., extent to which knowledge is expressed, spoken, or expressible) will be oppositely expressed, this study looks at *both* explicit knowledge and tacit knowledge. This, without dependence upon what Ferreiro refers to as its troublesome dichotomous assumption (Ferreiro, 1994). The questionnaire includes explicit knowledge and some of its proposed forms (i.e., written documents, spoken language, descriptions of processes, mathematical algorithms and supporting vocabulary, blueprints and pictures) and does not assume the absence of tacit knowledge in the explicit. Indeed, it is expected that organizational knowledge will exist in mutually inclusive (tacit knowledge and explicit knowledge concurrently) versus traditionally exclusive ways. This allows us to expand the concept in response to criticisms of its utility (Acar et al., 2001; Berg, 1994; Evans & Easterby-Smith, 2001; Gray, 2001), move out of typically modernist conceptions of knowledge that have crept into past studies (Gill, 2000; Jha, 2002) and employ, as a result, different conclusions and implications with the expanded but familiar measures that follow. This test of those "familiar but different" measures is, additionally, one of the first tests of Polanyi's theory of knowledge.

Item Pairings and Questionnaire

This questionnaire places special emphasis on the development of indicators of *both* explicit and tacit knowledge (i.e., explicitness and tacitness) so that they may be simultaneously measured. This is reiterated to highlight the assumption of this paper that knowledge may be, at the same time, very tacit *and* very explicit, rather than only very tacit and *not* very explicit. Most empirical studies of tacit knowledge use some form (e.g., scale item, open-ended interview question, and structured interview question) of Zander and Kogut's (1995) conception and operationalization of tacit knowledge. These studies generally characterize such items, however, as dichotomous if only made apparent by their de facto exclusion of explicitness.

Tacit Knowledge and Explicit Knowledge

Most knowledge studies describe knowledge as being either tacit *or* explicit (Hitt, Bierman, Shimizu & Kochhar, 2001: 14; Subramaniam, 2001: 361). The consequence of this assumption is that the two are polarized and the conversion of tacit to explicit is prescribed (Nonaka, 1994; Osterloh & Frey, 2000; von Krogh, Ichijo, & Nonaka, 2000). For example, Hansen & Haas (2001) ask in their 7-point codifiability survey, “What *type* [emphasis added] of knowledge is used in selling and delivering client projects in your areas?” with anchors “mainly practical know-how” and “mainly reports, manuals and documents” (p. 18). Here, the dichotomy is placed upon practical know-how and written reports, manuals and documents. Does a four response (the center response for the item) imply that both practical and written know-how are used equally, that neither are used, or that the respondent has no way of answering the question? Answering the question is easier when assuming that the use of practical know-how and the use of written documents are mutually exclusive, but much more difficult if they are complementary or even mutually dependent. Zander and Kogut (1995), in another example of codifiability, ask for a response to the statement “Large parts of our manufacturing control are embodied in standard type software that we modified for our needs” (p.88). This is ambiguous with respect to what each respondent considers “large,” “our needs,” and even “standard” for that matter. How does one determine what “standard type software” is, and what changes must be made before it is considered “modified?” This question appears to simultaneously probe relative importance (i.e., high quantity of manufacturing control), universality (i.e., standard type software), heterogeneity (i.e., modified for our needs), and asset specificity (i.e., embodied in software). How does a participant respond if all the above are true, but the clarity of the “standardized software” aspect of the item is unclear to the respondent? Does this question indicate high tacit knowledge if the standardized software is considered quite complex? What if the software is both complex as well as perceived to be highly modified to meet company needs by all competitors? Does that mean they all have tacit knowledge? The last question described dichotomizes tacit knowledge in so many ways within one sentence that it is difficult to tell what is being measured by any given response.

One weakness of the dichotomous approach just described is that it forces respondents to characterize knowledge as one or the other, when that choice may not be possible. Then, troubles are compounded when questions are asked of multiple respondents, without providing those persons filling out the surveys a clear and commonly agreed upon delineation between explicitness and tacitness. This has led, at least partially, to a fundamental debate about what, exactly, explicit and tacit are (Evans & Easterby-Smith, 2001: 138) and to the conclusion that “dichotomizing knowledge into tacit and explicit categories is less enlightening than previously assumed” (Acar & Burns, 2001: 9). The differences among firm or industry members in their conceptions of tacit and explicit knowledge may indicate a critical gulf between high and low performing firms or, within firms, a weakness in the knowledge structure itself.

Prior studies set up and further complicate this explicit versus tacit knowledge dichotomy by defining tacit knowledge as complex versus simple (King & Zeithaml, 2001: 77; Simonin, 1999; Zander & Kogut, 1995), non-codified versus codified (Zander & Kogut, 1995), not articulable, non-articulated or hard to articulate versus articulated (Hansen & Haas, 2001; Hitt, et al., 2001; Nelson & Winter, 1982; Szulanski, 1996), objective versus subjective (King & Zeithaml, 2001: 77; Subramaniam & Venkatraman, 2001: 362), tied to a larger or more

complex system versus independent or stand-alone (Dierickx & Cool, 1989; Winter, 1987) and only acquired by experience versus traditional “book-learning” or formal education (Grant, 1996; Hansen & Haas, 2001; Hitt, et al., 2001: 14; Pisano, 1994; Sternberg, 1993).

This study does not assume that explicit and tacit knowledge must be described in a polar manner by respondents, but rather that it may be important to measure aspects of *both* explicit and tacit knowledge. Differences as well as similarities between assessments of knowledge explicitness and tacitness may be essential in better understanding organizational and strategic knowledge. It may be important to describe when sources of information are perceived as being high in their explicitness and simultaneously high in their perceived tacitness to determine when these assessments complement one-another and when they do not. When, for example, do sustained competitive advantage, knowledge sharing within firms, and knowledge transfer in strategic alliances and joint ventures require a high or low measure in tacitness combined with a respective low or high measure in explicitness?

Some fields may depend upon a high number of technical specialists that work within what would be considered very explicit knowledge, for example, but the sheer *quantity* of explicit materials with which the technician must be familiar may lead some technicians to describe their industry’s knowledge as very tacit (given some traditional measures) based upon the complexity that each individual perceives. On an industry level, however, managers of similar firms may see the skills of those same engineers as highly modular or substitutable, requiring little more than intermittent recruiting at a local school of engineering. Such technical skills are evaluated quite differently when viewed from different perspectives. Competitive advantage in a high-tech industry may derive from a manager’s ability to identify just how explicit that knowledge is, not over-valuing the firm’s skilled labor, and maintaining a better, more efficient balance between recruiting, retaining and compensating those employees. Measures of tacit knowledge may, therefore, benefit from the inclusion of explicitness measures and a more detailed view of the technology in question.

The explicitness concept has been expanded in this paper to complement traditional tacitness measures (King et al., 2001; Simonin, 1999; Subramaniam et al., 2001; Zander et al., 1995) with the purpose of eliciting more detailed information from respondents to better inform future knowledge studies. Those knowledge sources that traditionally represented either explicit or tacit knowledge in past studies have been duplicated in this study’s instrument. In this way, perceptions of both explicitness and tacitness of these knowledge sources may be expressed by the respondent without prior classification by the individual researcher. The removal of this perhaps incorrect preconception imposed upon respondents is expected to better inform research through the use of a more fine-grained measure.

Some explicitness and tacitness items introduced have been adapted from Zander and Kogut’s study (1995), that has served as the starting point for much of the questionnaire and interview-based research (Hansen & Haas, 2001; Subramaniam & Venkatraman, 2001; Simonin, 1999) constructed to explain and explore tacit knowledge. These adaptations are used to inform specific knowledge source items in this paper’s questionnaire such that a simultaneous examination of their explicitness and tacitness can be performed. Specifically, sources of knowledge in general business education are examined in such a way so as not to summarily exclude any of them as being characteristically explicit or tacit.

Separating Explicit from Tacit Knowledge

The logic for excising explicit knowledge from tacit knowledge in this paper is largely based upon Polanyian theory that suggests the explicit to be but one product of tacit knowing coupled with the suggestion that they then may well measure different concepts. Of course, this then has implications for the top measures of tacit knowledge in the management field (e.g., Hansen & Haas, 2001; Simonin, 1999; Subramaniam & Venkatraman, 2001; Zander & Kogut, 1995). Breaking the survey into explicitness and tacitness halves allows the separate measurement of each assuming that asking questions about explicitness will provide unique information about each knowledge source. Polanyi's epistemology suggests that the manner in which explicitness is related to tacitness, furthermore, should matter and that explicit knowledge results from tacit knowledge. The way in which they may be related should be important and may tell us something about the underlying structure of knowledge. In this case, that structure under examination includes the macro-level general business knowledge provided as context for this set of questionnaire items. Empirical findings should generally support Polanyian logic of separate but related constructs through limited item intercorrelation between explicitness and tacitness questions. Specifically, low or absent correlations between paired item questions will fail to support the existence of dichotomous or continuous structures, should they exist. Or, if strong correlations are found between paired items, this study should provide evidence for the commonly assumed alternatives (i.e., dichotomy, continuum) to this paper's assertions of separate but partially related explicitness and tacitness constructs.

Explicitness

Explicitness, by definition, will relate to those sources of information or knowledge respondents view as articulated. Explicitness items should help us to answer the question, "What is the state of explicitness in understanding general business knowledge?" and deals with statements about those attitudes concerning the *state of articulation* surrounding knowledge sources in the form of documents, software, technology, and other spoken knowledge sources as well. While some studies ask about the potential for articulation (i.e., Zander & Kogut, 1995), this study follows a more conservative conception of the current state of explicitness in business-related knowledge. Top management or other decision makers' assessments of the *potential for articulation* (e.g., we may be able to discuss this knowledge, infer from blueprints, develop comprehensible mathematical formulas, or interpret computer code) ask respondents to speculate on a possible future state and are therefore engaging in more speculation than is desired in this study. While such assessments are still important, the main purpose of this questionnaire is to evaluate respondents' detailed assessments of specific knowledge source explicitness and tacitness. This helps respondents focus on the *current* state of understanding present in their acquisition of business knowledge and should be something they are better equipped to answer. This should provide greater accuracy in their responses. These explicitness statements therefore most closely follow the approach used by Hansen (1999), and Hansen and Haas (2001) since they directly acknowledge and focus upon the articulated aspects of the state of knowledge in a business program. Specifically, business students are asked to assess the nature of those sources of information and knowledge within their program to provide us with insight as to how they view that general state of knowledge. Characteristics of knowledge and knowledge source explicitness are generally assumed, in most other studies, to be indicated by the absence of tacit knowledge. For example, manuals and reports, software and computer code, spoken

language and expression, training and education, best practices and standards, as well as processes and routines are often assumed to be explicit knowledge sources or “artifacts” (Hansen & Haas, 2001; Hitt, Bierman, Shimizu & Kochhar, 2001; Simonin, 1999; Subramaniam & Venkatraman, 2001; Szulanski, 1996; Zander & Kogut, 1995). These are knowledge sources that are measured by paired explicitness and tacitness assessments within this study.

Tacitness

Likewise, items are also included that are generally, in empirical work on knowledge from the management field (e.g., Hansen & Haas, 2001; Hitt, Bierman, Shimizu & Kochhar, 2001; Simonin, 1999; Subramaniam & Venkatraman, 2001; Szulanski, 1996; Zander & Kogut, 1995), assumed to be tacit. These include professional and personal experience, body language, intuition, and personal thinking about business. Based upon a deeper extraction of Polanyi’s theoretical work, these should not possess strictly low explicitness ratings by item respondents. Their inclusion alongside typically explicit items, however, will further test whether support exists for assumptions about their nature in current knowledge-based work. I expect to find greater support for our conceptual argument (i.e., separate but related explicitness and tacitness) based upon a strict adherence to Polanyian assumptions.

In addition to my use of field literature to identify potential knowledge sources, I relied upon judgments from a panel of experts that were interviewed to provide and content analyze the items included in this study’s questionnaire (see Appendix). This panel included interviews with business school instructors and students which additionally informed the inclusion of items for the questionnaire.

Testing the Items

While this study is designed to develop and test paired items using a general business knowledge format, it has been constructed with flexibility in order that it be applied to knowledge sources in other knowledge-intensive environments. The main thrust of this study is to examine knowledge source pairings in terms of their tacitness and explicitness. Such an examination begins with a look at the 36 explicitness/tacitness pairings (the items listed under explicitness and tacitness portions of the questionnaire). The examination should help determine if enough statistical discrimination exists between tacitness and explicitness items to indicate that these constructs provide us with additional information about those knowledge source – or if respondent assessments of knowledge sources for these dimensions provide us with no unique information. Different statistical analyses should also provide information supporting dichotomous, continuous, or related but separate constructs.

This study also takes a somewhat exploratory look at the data to examine whether or not measurements of explicitness and tacitness tell us anything about the structure of individual knowledge sources or general business knowledge from an undergraduate perspective. The study is described in some detail below, including a description of participants, the data collection procedure, and development of the paired item questionnaire.

Pilot Study and Paired Item Questionnaire Construction

Construction and testing of this paired item questionnaire (see the questionnaire in the Appendix) follows Spector's process (1992). First, appropriate constructs were defined and argued to encompass both explicitness and tacitness in the assessment of knowledge sources. The questionnaire currently shows the thirty-six items listed under a definition of a direction about respondent questions about knowledge source explicitness. The tacitness portion of the questionnaire is identical except for the definition of tacitness and directions to circle the knowledge source's tacitness component, rather than its explicitness component. A knowledge source is said to possess a tacit component if it provides knowledge that is not articulated or is difficult to articulate clearly. Respondents are asked to circle a number - 1 being "very little" and 5 being "very much" - to indicate the extent to which the listed source of knowledge has a tacit component.

Second, the format, response, and instructions of the survey were chosen. Specifically, single subject knowledge sources were chosen to simplify the respondents' assessments of each object (one per item). This was designed to eliminate as much "noise" as possible to facilitate the comparison of explicitness and tacitness on the same object. Knowledge sources composing the 36 items were chosen based upon past studies – especially Zander and Kogut (1995) – and multiple interviews with business educators. Third, pilot surveys were administered to an expert panel of researchers versed in survey construction as well as Ph.D. students cognizant of management literature. Multiple iterations took place between the construction and revision of step two and the critical review during step three. The panel also assessed whether or not the instrument was accessible to respondents – i.e., that they did indeed have access to the constructs of interest. The fourth step, the questionnaire's first full administration and analysis, is reported here and in the results section. This positions the questionnaire for further validation and norming. This includes an assessment of the questionnaire's explicitness and tacitness content adequacy following Schriesheim and colleagues (1993) and Keller and Dansereau (2001). A description of the participants, the procedure for administering the questionnaire, and a description of the paired item instrument follows.

Participants

Participants were 225 undergraduate students from a business school at a large university in the southeastern United States. The survey was given to students in both upper and lower division courses. Only 4.5% of the participants were in their 2nd year of college; 25.5% were in their 3rd year; and 70% were in their fourth year or above. The average age of participants was 22 years old and 60% were male. Most of the participants (86.2%) were U.S. nationals, 84% identified themselves as white, 6.3% black, and 6.3% other which included multi-race responses as well as non-U.S. nationals' responses such as Indian, Pacific Islander, and Asian.

Procedure

Participants were asked to complete a short, self-administered survey in the context of assessing the typical body of knowledge dealt with in business schools. Prior to receiving the survey participants were given brief instructions about the completion of the survey, including the items they would keep (i.e., a copy of informed consent and optional

instructions) and items to be returned to the instructor (e.g., the three-page survey and signed informed consent). Participants were also told they would be entered in a drawing for a \$50 cash reward if they completely filled out and returned their survey and demographic questionnaire. A red two-part coupon was stapled to the return materials with the bottom half of the coupon to be removed and kept by the participants. Instructors were also given a \$50 incentive for high percentage response rates from their students. This likely influenced a response rate close to 100%, with only one survey thrown out due to missing data. In addition to response rate, the administration of the survey was designed to emphasize careful and thoughtful completion of each survey. The informed consent cover letter provided greater detail of the study and assured respondents that (a) their participation was voluntary, (b) that their responses were confidential, and (c) that they would be entered into a drawing for \$50 to be paid out no later than the 15th of March, 2003. Instructors' use of the \$50 response-rate incentive was left to their discretion.

Instrument

The survey consisted of 36 repeat items asking participants to assess general business school knowledge. That is, the same 36 knowledge sources (e.g., newspapers, class lectures, student discussions) were to be assessed by participants in terms of two characteristics: the extent to which a source provided an explicit component and the extent to which a source provided a tacit component. Each of the 36 item types was designed to be paired with its counterpart such that the similarity or difference between the items could be assessed. This would also allow us to see whether or not the data provided evidence of a dichotomous or symmetric/continuous relationship between explicit and tacit knowledge. That is, the paired item questionnaire was designed to test the null hypothesis that no real difference existed between the assessment of a knowledge source's explicit components and the assessment of that same source on its tacit components. The alternative hypothesis, supported by tacit knowing theory, was that a statistically significant difference does exist between explicit and tacit knowledge assessments. This directly addresses the continuum research question, "Are tacit and explicit knowledge two ends of a continuum?" and the dichotomy question, "Is something labeled tacit therefore not explicit?" Theoretical arguments suggest that explicit and tacit knowledge may be related but separate constructs and, therefore, measure very different things. However, if a dichotomy or continuum relationship between tacit and explicit knowledge is supported, it should be evident given the above paired-item test.

An additional benefit of this study's design is that it asks questions specific to knowledge sources that provide participants access to the body of knowledge provided within the general business context. The questions, as an aggregation of knowledge sources that provide general insight into business understanding, should be able to tell us something about the nature and structure of general business knowledge as understood by undergraduates in an undergraduate business program. We are therefore able to report upon results generated by our statistical analysis at the item or knowledge source level (because of the paired comparison set up within the design) as well as at a more macro organization or body of knowledge level (because of the general business context asked of the questionnaires).

Results

The results will be reported below in accordance with: (1) the item-level pairings allowing an examination of similarities and differences of knowledge source explicitness and tacitness and (2) a macro level examination of the nature of general business knowledge within undergraduate business programs. The following discussion of results provides an analysis of correlations and various t-tests as they pertain to previously described item and macro knowledge levels.

Correlations

Table 1 provides correlations, as well as means and standard deviations for the items. A number of relationships are worth noting. First, if the relationship between item explicitness and tacitness was consistently dichotomous or continuous, then we would expect to see statistically significant and uniformly negative correlations for the majority of the set of paired items (represented by the shaded boxes). While this is true for many of the items, it is not entirely so. Respondent assessments supporting a negative relationship between explicitness and tacitness items hold true for all but one item (#31). Statistical significance is lacking for another thirteen items (#4, 8, 10, 11, 13, 16, 17, 18, 19, 22, 26, 28, 31), which is a little over 1/3rd of the pairings. Relationships are negative and significant at the $p < .001$ level for another 1/3rd of the items (#1, 2, 3, 5, 12, 15, 20, 21, 23, 24, 31, 35), significant at the $p < .01$ level of six items (#7, 9, 14, 27, 32, 33), and significant at $p < .05$ for five items (#6, 20, 30, 34, 36). To show strong support for a uniformly dichotomous or continuous relationship between raters' assessments of item explicitness and tacitness, not only would we expect greater incidents of statistical significance across the pairings, but we would expect to find those levels of significance to be stronger than we see here. Therefore, there is some support for the idea that explicitness and tacitness are separate but related constructs and much less support than would be expected for a commonly assumed dichotomous and continuous relationship.

Given that this study is, in large part, constructed to identify rater assessments of the explicitness and tacitness of thirty-six knowledge sources, we could discuss the relationships between seventy-two separate knowledge sources and their correlates. Space, however, prohibits a full and in-depth discussion of each. Our next discussion will focus on newspapers, personal business experience, and thinking about business as source of both explicitness and tacitness (items #1, 18, 23, 37, 54, 59). Other interpretations may be made by readers individually, using Table 1's correlation matrix.

In terms of the more macro level nature of general business knowledge, a number of other interesting observations are worth noting with regard to the correlation matrix. First, in addition to lack of support for dichotomous or continuous relationships between knowledge source pairings, even less evidence supports the idea that explicitness and tacitness are, for general business knowledge, dichotomous or continuous. Explicitness items generally appear to correlate with other ratings of explicitness and only a handful of other tacitness ratings. I should reiterate that we would expect the largest and most statistically significant correlation to be a negative correlation with the tacitness pairing. Not only is the tacitness rating for its explicitness counterpart most frequently not the largest correlation, but it is too frequently lacking statistical significance or possessing a correlation much lower than we should expect

if the relationship between tacitness and explicitness ratings were dichotomous or continuous. The snapshot we see here of rater assessments of explicitness and tacitness in sources of general business knowledge also provides greater evidence that explicitness and tacitness are, indeed, somewhat related but mostly separate constructs. Similarly, tacitness ratings sometimes relate to explicitness ratings of certain items, but most frequently, tacitness ratings relate with greater frequency and statistical significance to other tacitness ratings given to other (i.e., non-paired) knowledge sources. A second interesting observation, but not unexpected given the sometimes weak correlations between same-source pairings, is the lack of symmetry in the explicitness and tacitness correlations for any given knowledge source. The general observation at the macro level for general business knowledge in an undergraduate business program does not support the commonly held dichotomy or continuum view of explicitness and tacitness either. Thus, while some correlations do exist between explicitness and tacitness in general, most evidence indicates the more Polanyian view that explicitness and tacitness are partially related but mostly separate constructs. It is particularly remarkable that the correlations indicate an even greater separation between explicitness and tacitness at the organizational (body of knowledge) level. This brings me to a closer assessment of three knowledge source pairings in particular with respect to both their paired item counterpart as well as their place within the macro view of general business knowledge.

The three items I will now discuss were specifically chosen for their commonly assumed place as exemplars representing either explicitness or tacitness. As will be made apparent from their analysis, these examples may also represent another example of the misappropriation of explicitness and tacitness from Polanyi's tacit knowing theory. The first item, newspaper explicitness and tacitness, is frequently assumed to be "explicit" in nature. That is, newspaper-based knowledge, being expressed in blatantly explicit form, would commonly be labeled explicit by definition and, I assert, failure to properly interpret Polanyi's epistemological Theory of Tacit Knowing (Gerard, 2001). My other two items, personal business experience and thinking about business, are generally assumed to be tacit in nature and, therefore, more useful and valuable to an organization. Personal experience and thought about business are, by most definitions, tacit knowledge. However, this fails to take into account any explicitness components that exist to help the sensemaking that inevitably occurs even with these very personal, experiential sources.

Table 2 lists correlations significant at the $p < .001$ level for rater assessments of both explicitness and tacitness for the three knowledge sources just mentioned. While significant correlations (and perhaps insights) exist at lower levels of significance for these same items, a discussion surrounding significance at the $p < .001$ level should provide ample discussion for this paper. Again, with respect to the dichotomy and continuum issue and newspaper explicitness (E1) and tacitness (T1), we observe a relatively small correlation (-0.30) between the explicitness/tacitness item pairing. Also, no other correlations at this level of significance exist between newspaper explicitness and tacitness assessments, not even as negative correlates with those explicitness assessments with which newspaper explicitness does correlate (i.e., items E2, E28, E21, E3, E22, E27, E5 & E6, in order of greatest correlation to smallest). This is an example of support for a non-dichotomous and non-continuous conception of the explicitness and tacitness relationship. That is, evidence of newspaper's explicitness and tacitness suggests separation between their constructs. However, they are not necessarily without some similarity as some shared correlations suggest. Both explicitness and tacitness assessments of newspapers share correlations with magazine explicitness at the

$p < .001$ level of significance. Here again, however, they do not share magazine tacitness similarly (with like correlations at equivalent levels of significance), indicating that they perhaps share some underlying characteristics in common with magazine tacitness, but not all. In addition, when they do share something in common with magazine tacitness (at $r = .19$, $p < .01$ for newspaper explicitness and $r = .69$, $p < .001$ for newspaper tacitness) they are *both* positively related to magazine tacitness, contrary to expectations under a dichotomous or continuous viewpoint. Similar observations exist for correlations between the explicitness of personal business experience (E18) thought about business (E23) that only correlate with other explicitness assessments at our chosen level of significance, except of E23's tacitness pair ($r = -.25$, $p < .001$). Tacitness of personal business experience (T18) also only correlates with other tacitness assessments while thought about business (T23) correlates, of course, to E23, which was just mentioned. Deeper observations of item intercorrelation differences between explicitness and tacitness assessments essentially provide deeper and deeper evidence that the assessment of knowledge sources does not conform to the popular conviction treating explicitness and tacitness as either polar extremes or related but opposite ends of a continuum. On the item level, therefore, even closer examinations do not support commonly held assumptions concerning explicit and tacit knowledge, while evidence does lend credence to Polanyi's related but separate conceptions.

Another point worth noting, before I comment on the apparent nature of general business knowledge's explicitness and tacitness, concerns what may be said about the three sources of knowledge just examined. First, while lack of negative or positive correlations between explicitness and tacitness assessments suggests separate explicitness and tacitness constructs, the current study is not sensitive enough (nor was it designed to be) to say exactly what underlies shared correlations either across or within item explicitness and tacitness assessments.

Correlations indicate that newspaper explicitness probably does share something in common with those knowledge characteristics that cause raters to assess magazines, popular business books, reports, texts and e-mails as possessing explicitness characteristics – at least, within the context of general business knowledge. It is possible that these sources share certain likenesses with respect to their ease or modality of use, value to the assessor, place within the body of knowledge, or position with respect to other knowledge sources. Newspaper tacitness, on the other hand, looks different. Assessments of newspaper tacitness appear to be driven by something similar (at $r > .30$ and $p < .001$) to what drives tacitness assessments of magazines, texts, popular business books, news shows, and listening to business experts. While explicitness and tacitness assessments, then, appear to be driven by some similarities shared by knowledge sources in some instances, they do not share those similarities uniformly across explicitness and tacitness assessments for identical items. Therefore, even when paired items are viewed according to their explicitness and tacitness correlates from the more global business knowledge pool, they do not share like groupings, indicating that those characteristics driving shared variation are likely different between explicitness and tacitness assessments of paired items. Explicitness items, furthermore, are not simply mirrored by negative correlates of their paired tacitness items. Essentially, not only are explicitness and tacitness more dissimilar than most studies assume, there is probably a lot more going on within and between them than has been considered. Why, for example, does the explicitness assessment for personal business experience correlate with ten items at the $p < .001$ level of significance while the tacitness assessment of the same source correlates with sixteen? Of course, the answer, although it is interesting in its implications, is beyond the reach of this

paper. However, a look at the way that explicitness and tacitness assessments correlate with their paired items (or do not) as well as correlate with other non-paired assessments (or do not) raises some interesting questions. The correlations also put many traditional assumptions about explicit and tacit knowledge on notice.

Assessments of personal business experience tacitness (T18) also correlate with an abundant number of other tacitness assessments at the $p < .001$ level, but most of the correlations are somewhat low. The most significant, for example, include types of potentially related experience, including life experience (T20, $r = .59$), internships (T30, $r = .54$), and working with others (T29, $r = .45$); scholastic activities including listening to shared experiences of other students (T19, $r = .49$) and overall membership and participation in the degree program (T36, $r = .35$); and cognitive, personal activity like personal insight (T24, $r = .40$) and individual study (T15, $r = .33$). However, while I have grouped these items based upon my own assessment of their face-valid placement within these groups, the characteristics that cause them to correlate with newspaper tacitness may be very different than things that these intuitive groupings suggest. While we can say, then, that newspaper tacitness appears to share things in common with these other items within the context of obtaining a general business understanding, we do not know exactly what is driving the similarity of these assessments. While these patterns give us ideas as to the overall shape of general business understanding, then, we must look to design and implement other studies before we can make claims possessing greater certainty. Having stated some of the limitations of a simple correlational analysis of the data, we move to the paper's paired comparison analysis section, which is a more rigorous test of other explicitness/tacitness assumptions frequently made in literatures focusing on knowledge-based concerns.

Paired Comparisons

Table 3 lists the 36 item pairings along its left-hand side along with basic descriptive statistics for both items from each pairing followed by a series of tests of the assumptions mentioned throughout the paper.

Test #1, The T-Test

Test #1 uses a paired samples t-test to test the null hypothesis that the difference in means between two variables is zero. For this test the explicit items have been reverse coded. This has been done to test whether or not explicitness is simply the opposite of tacitness – a relatively simple way to test whether or not they appear to be continuous (where a 4 indicating fair amounts of explicitness would switch to a 2, meaning low tacitness) or strongly dichotomous (the 1 for very little explicitness becomes the same as a 5 for lots of tacitness). In effect, if respondent rating data indicate an overarching pattern of either dichotomy or continuum, then explicitness ratings (reversed) will not differ in a statistically significant way from tacitness ratings for paired items.

The correlations listed are the same as those shaded in Table 1's correlation matrix. The level of significance under the Test #1 header indicates the probability that the measured difference between the two means would occur by chance. Therefore, any item significant at less than $p = .05$ indicates we would observe a result that extreme when the null hypothesis is, in fact, true less than 5% of the time. The lower the observed levels of significance, then, the more

likely it is that we are not improperly dismissing unobserved similarities between item pairings. We can, therefore, reject the null hypothesis (i.e., that there is no difference between item pairings) with greater confidence when levels of significance are small. The results of Test #1 show general support for the idea that respondents report different information about knowledge sources when they answer different questions about source explicitness and tacitness. Therefore, we find little support for dichotomy or continuum conditions between explicitness and tacitness that such redundancy (i.e., no difference between a simple reverse coding of explicitness compared to tacitness) would indicate. Exceptions to this conclusion within Test #1 include thirteen item pairings where significance level do not merit rejection of the null hypothesis and, thus, may indicate knowledge sources that do conform to either dichotomous or continuous relationships between their explicitness and tacitness assessments (see item pairing #4, #8, #10, #11, #13, #16, #17, #18, #19, #22, #26, #28, and #31).

Test #2, The One Sample Test

Test #2 looks for evidence of dichotomy and continuous relationships between pairings in a slightly different way. In a stricter sense, we would expect greater support for dichotomy when high ratings for explicitness (i.e., 5's for the strongest dichotomies) were consistently accompanied by low ratings for that same knowledge source's tacitness (i.e., 1's for the strongest dichotomies) or, alternatively, low explicitness ratings (i.e., 1's) were accompanied by high tacitness ratings (i.e., 5's), respectively. The same would be true for a continuous relationship, except that you would also expect to find fairly consistent patterns whereby low explicitness ratings would pair up with high tacitness ratings (i.e., 2s with 4s, respectively), higher explicitness ratings would pair up with lower tacitness ratings (i.e., 4s with 2s, respectively), and moderate assessments of each would co-occur (i.e., 3s with 3s, respectively). Summing explicitness and tacitness pairings allows us to look for such measures that indicate dichotomy and continuum relationships, because 1s will be paired with 5s, 2s with 4s, 3s with 3s, and so on, we look to reject the null hypothesis that these sums will consistently equal 6. Test #2 takes the sum of explicitness and tacitness assessments for the same item pairings examined in Test #1 and in essence checks to see whether or not their sum would equal 6 by chance. Because the sum is examined, a one-sample test of the mean value of six is employed. Again, most of the results support the rejection of the null hypothesis that no difference exists between the expected sum of six that would occur under stricter assumptions about the data's dichotomy or continuum pattern. Some exceptions exist and are shaded under the significance column beneath the Test #2 header. These include twelve items, eight of them different than those exceptions listed in Test #1 (see item pairings #9, #14, #21, #24, #25, #32, #33, and #34), and four of them repeated (items #10, #17, #22, and #26). All shaded items in Test #2 do not merit rejection of the null hypothesis and, thus, may again indicate knowledge sources that do conform to either dichotomous or continuous relationships between their explicitness and tacitness assessments. It is most interesting to note those items indicating the least support for the null hypothesis' rejection, namely items #10, #24, #25, #26 and #32. These items include sources of general business knowledge such as the giving of presentations, personal insight, the insight of others, statements made by authorities, and body language, respectively.

Test #3, Descriptive Cross-Tabular Support for Dichotomy

Test #3 consists of a relatively simple look for evidence of a dichotomy given a the most lenient definition for such a dichotomy without ruining the actual meaning of the responses.

Using cross-tabular descriptive statistics, evidence supporting dichotomy includes *any* situation where an extreme assessment of explicitness and tacitness (i.e., 1s or 5s) are accompanied by any pairing other than that extreme. In the case of the lowest rating for explicitness, which would be a “1,” tacitness ratings of two, three, four or five would indicate valid support for dichotomy. Test #3’s results are found beneath Table 3’s final header as “E % Low,” which is the percentage of total responses given for low ratings of explicitness (“1”s summed across tacitness or non-“1” tacitness ratings of the same item). Similarly, “E % High” is the percentage of total responses representing all high ratings of explicitness, or “5”s summed across non-“5” tacitness ratings. The rationale behind this rule is that under a dichotomous relationship between explicit and tacit knowledge, any rating supporting some explicitness should be accompanied by the lowest measure for tacitness – an indicator of tacitness’ absence. Likewise, any rating supporting some tacitness should be accompanied by the lowest possible measure for explicitness.

Surprisingly, instead of greater support for the existence of dichotomy even on a few of the 36 total knowledge sources examined, we find little support for the dichotomy view of explicit and tacit knowledge. All 36 items examined show some support for the extreme low or high assessments of both explicitness and tacitness instead of uniform assessments restricted to either extreme under a dichotomy situation. Another source of support would exist for a dichotomous view of explicitness and tacitness if high percentages existed for an extreme measure of one of the constructs, accompanied by high percentage measurements for the opposite extreme on the part of its paired assessment. Note all of the highest percentages in each of the shaded boxes under the high explicitness percentage column for Test #3, just as one example. These should, especially under a dichotomy, be accompanied by somewhat high percentages in the low tacitness column. While these are some of the highest percentages in the tacitness assessments, they neither represent the types of percentages we would expect would accompany their high explicitness counterparts, nor do they serve as even weak indicators of a dichotomy. Thus, one more test looking for support of an explicit/tacit dichotomy - using a liberal definition and arguably the most inclusive calculations - did not yield expected results.

Discussion and Potential Limitations

This study is limited in that it does not test tacitness and explicitness in different contexts. It is therefore not a conclusive test of findings supported by the questionnaire and should not be automatically generalized to other contexts. Neither should it constitute a final indicator of the nomological net of either explicit and tacit knowledge (or tacit knowing, for that matter). This study does, however, indicate some very important things about explicit and tacit knowledge in terms of its measurement, theoretical use and development, and application in management.

Measurement Issues

While explicit and tacit knowledge are frequently treated as polar opposites to one another or as occupying different ends of a continuum, they appear, at least in this study, to be separate constructs altogether. In fact, the test of this questionnaire was designed so as to rigorously test both conceptions by subjecting them to like assessments of 36 distinct knowledge sources in a very well-defined context. That is, not only was the knowledge environment well defined

by restricting discussion to a shared undergraduate business school experience but perspective was also restricted by asking about knowledge source access to general business knowledge. The holding constant of this framework extended to simplified definitions of explicitness and tacitness and use of measurement anchors that allowed for dichotomous and continuous conceptions without forcing either response. Of course, this is just a first step in better understanding these constructs and just one way of examining the adequacy of current instruments used to look at knowledge in organizations. Much opportunity exists with regard to improving measurement in knowledge through intensive examinations not just limited to content adequacy (Schriesheim, 1993). While a look at such sufficiency makes sense in the initial development and ongoing testing of measures, it also suggests the need for a continued reexamination of constructs in pace with the evolution of theory – including more detailed tests of that theory’s underlying assumptions. This study was but one examination of the commonly held assumptions of dichotomy and continuum relationships juxtaposed with the related but separate relationship suggested by advancements in our understanding of Polanyi’s tacit knowing theory (Gerard, 2001; Gill, 2000; Jha, 2002; Sanders, 1988).

Second, while the evidence here supports separate constructs, it also indicates a range of relationships between explicitness and tacitness, suggesting that we reconsider the roles of explicit and tacit knowledge (and their relationship to one-another). This application of Polanyi’s knowing theory to support the construction and test of measures has provided evidence of the need for and benefit to combined measurement of explicitness and tacitness. This opens up the opportunity to build measurement instruments designed specifically for our examination of knowledge and knowing, not just in newly redesigned studies, but in a reexamination of past findings. In an exploratory sense, we need to better understand those characteristics that distinguish explicitness and tacitness from one-another as well as better understand those determinants driving their relatedness. We currently understand very little about explicit and tacit knowledge – and we know even less about how these two aspects of knowing relate to each other. This is fertile ground for an emerging body of work focusing upon the measurement of knowledge. In an explanatory sense, much of what we currently “know” is based upon empirical studies that have not examined explicitness. A strong empirical revisit of this work also represents an area ripe with opportunity.

Potential benefits to examinations of explicitness and tacitness’ similarities and differences are those new insights and opportunities to provide greater prediction and explanation in, for instance, empirical studies that recognize the importance of tacit knowledge (Berman, Down, & Hill, 2002; Nonaka & Takeuchi, 1995; Ranft, 1997; Simonin, 1999; Steensma & Corley, 2000; Subramaniam & Venkatraman, 2001; Szulanski, 1996; Zander & Kogut, 1995). The mere inclusion of explicitness measures is likely to inform and perhaps clarify apparent contradictions between that which has already been learned from these studies. It should be especially important to examine how the inclusion of explicitness measures influences the interpretation of results. This focus upon measurement, then, should provide new insights into knowledge and knowing as stand-alone areas of interest, as well as their integral place in knowledge transfer and sharing, new product development, innovation, creativity, dynamic competencies, and knowledge-based strategy.

Another final area of interest in knowledge measurement concerns those assumptions about the multilevel versus individual or organizational nature of knowledge. A potential weakness of this study, as perceived by some, might concern its construction based upon multilevel assumptions already outlined in this paper. The questionnaire, for example, controlled for

variance at the organization level by restricting the sample to a very specific undergraduate business population and structure within that type of general business knowledge provided by a business school. On a somewhat mezzo level, knowledge sources were selected according to their importance to students with respect to attainment of general business knowledge as well as precedence within knowledge-based research. While overarching patterns between explicitness and tacitness were examined, the main thrust of this study was not in examining the characteristics of explicit or tacit knowledge but, rather, differences in individual assessments of knowledge sources based upon specific knowledge sources. Demographic differences or characteristics of individuals were not examined. This study attempted to control for various characteristics but, in so doing, did not vary things like the body of knowledge (e.g., general business knowledge versus technical knowledge), population (e.g., business students versus professionals, art students, philosophy majors), or demographic differences (e.g., male versus female, Western versus Asian). Also, while the study used knowledge sources assumed to possess properties that serve as integrators across those levels, this was not expressly measured. Therefore, many opportunities exist in a future studies that more closely examine phenomena at any of these levels or, especially important, at various levels. With knowledge in particular, there are too many arguments supporting its influence and impact between and across traditional individual versus organizational levels of analysis. This study's look at explicitness and tacitness may provide one avenue for the examination of such integrating mechanisms because of the proposed importance of explicitness and tacitness at so many levels of analysis.

Finally, as Hansen (1999) states, no established scale of tacit knowledge exists, and few studies directly measure this variable. I believe this questionnaire with its use of paired items to assess explicitness and tacitness of knowledge sources takes a step in the direction of a direct measurement of tacit knowledge. My hope is that providing a more comprehensive set of items that rely more heavily upon epistemologies or theories of knowing (such as Polanyi's) will better inform the future construction of scales and meet the expressed need for more accurate measurement of knowledge constructs. This includes providing, at some point in the future, better and more direct measures distinguishing between knowledge, knowing, and learning as well as examining mechanisms that compose these constructs. Emphasizing the important inclusion of explicitness with tacitness measures is but one advancement in this area.

An important area in the study of knowledge in organizations is the subject of strategic knowledge. This often includes, for example, the identification of core competencies (Henderson et al., 1994; King et al., 2001) or competitive knowledge-based advantages (Berman et al., 2002; Hansen et al., 2001; King et al., 2001) that are often included as controls within knowledge-based studies. However, this initial identification of competencies is itself an exercise of a few individuals based upon an organizational or industrial knowledge context that may be viewed quite differently by individual researcher and respondents. Polanyi's conception of focal and subsidiary or non-focal awareness (Polanyi, 1966) suggests that this identification (or focus, in Polanyian terminology) is subject to change. The measurement of that focus in future studies will likely require more inductive, phenomenological or qualitative methods (Bouty, 2000; Denzin & Lincoln, 1998; Ellinger, 1997; Ellinger & Watkins, 1998; Flanagan, 1954; Van Manen, 1990) to capture that focal process over time and in different contexts.

Issues with Theory

This study, while mostly engaged in measurement issues, is built upon a different interpretation of Polanyi based upon the adoption of more detailed aspects of his epistemology. This paper goes beyond his important argument that knowledge need not exist in articulated form to be considered knowledge - proposing that articulated knowledge in fact originates in the unarticulated, or “tacit,” knowledge, and that the articulated is, in some way, related to a much larger mass of unarticulated and possibly unarticulable tacit knowledge. For knowledge theory to progress, the one step beyond “knowing more than we can tell” is but one step in the more sophisticated and much-needed adoption not just of Polanyi’s theory of knowledge, but of other epistemologies as well. These well-developed theories of knowledge are, not surprisingly, especially well positioned to address many of the issues that are salient to knowledge-based research. For example, Polanyi’s theory suggests that coming to know what one knows (i.e., tacit knowing) is a *simultaneous* individual/group interaction, rather than an exclusively social or individual phenomenon. Theories of knowledge provide support for work proposing individual, group, organizational, and social interaction perspectives that have been largely untapped. As we dig deeper into these theories, we will undoubtedly run into logical theoretical support for or insight into those contradictions or persistent puzzles that seem to plague knowledge-based research.

Issues for the Practitioner

Likewise, more detailed theoretical and empirical work utilizing epistemological theory may be important for the practitioner, who has focused intently on tacit knowledge. In this paper, for example, epistemology has been used to argue for the importance of explicit knowledge and then its subsequent inclusion in a measurement instrument. The practice of knowledge-management, in particular, has long advocated the value of “mining” tacit knowledge by way of its translation to explicit knowledge. Findings within this paper suggest a separation between the two constructs that would severely hinder that translation and, in fact, propose caution in any attempt at doing so. A translation of tacit to explicit may work very differently for different knowledge sources. The newspaper source, for example, already possesses a highly explicit component that appears to be well-understood. Likewise, much of its explicit and tacit components have been explored in communication, linguistics, or politics literatures. However, different newspapers seem to reflect very different explicit and tacit components from others (e.g., comparing the Wall Street Journal, the Financial Times, or the New York Times). Familiarity with a paper generally lends insight into that paper’s chosen context which may serve as a tangible knowledge frame. Within such a context, certain issues, words, phrases, or commentary by certain individuals will inevitably hold different meaning from their similar use in papers possessing different knowledge frames. That context will probably influence the way that explicit and tacit knowledge come together.

Another possible confound is that explicit and tacit knowledge serve very different purposes in different knowledge contexts and operate differently with the diverse knowledge sources that help define any given knowledge frame. This undoubtedly requires better understanding the roles that explicitness and tacitness play in a given business. It may be that, as Polanyi predicts, the attempted translation of tacit to explicit has devastating effects to pre-existing tacit knowledge. A better understanding of explicit knowledge and knowing and its relationship to tacit knowledge and knowing will probably help to better understand when

such deleterious effects to tacit knowledge may be occurring. This includes better understanding those mechanisms governing how explicitness and tacitness function successfully given their apparently different roles and characteristics. This may help us to understand, for example, when knowledge sources relate one-another in some instances and not in others. What overarching process or processes of knowing drive the nature of that relationship?

In conclusion, this paper lends greatest support for the design and testing of previously assumed and unexamined measures in organizational knowledge. Of course, this paper suggests previously unexpected separation and uncertain relation between explicitness and tacitness. This is largely due to the application of content validity techniques in the examination of tacit knowledge content adequacy. Much work remains just on the explicitness/tacitness front and with key examinations of content adequacy that should help in the initial development of measures. However, other assumptions also abound in knowledge literatures. For example, similar dichotomies exist in both explicit statements and as unspoken assumptions. While this paper did not go in depth into these dichotomies, similar tests should reveal interesting findings for simple versus complex, individual versus social, skilled versus unskilled, as well as numerous other potentially false dichotomies. Many of these dichotomies, not coincidentally, currently sit entangled in different degrees within other measures and other conceptualizations of tacit knowledge. This leads, of course, to even deeper problems that exist at the definitional and more profound conceptual levels underlying tacit knowledge theory. One favored suggestion is to tackle some of these deep theoretical problems by grappling with rich theory already existent within theories of knowledge. This includes developing a deeper understanding and greater application not just of Polanyi, but of other knowledge-based philosophers, including Descartes, Hume, Husserl, Popper, and Ryle, just to name a handful. Beyond researcher and philosopher, lay the practitioners who behave according to interpretation, correct or not, of the management consultant and/or guru espousing simplistic solutions to all life's answers based upon misappropriations of the very philosophies we should employ. Rather than glib prescriptions, however, we can, through research, offer better (though imperfect) information on the topic of knowledge.

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TABLE 1
Means, Standard Deviations and Correlations

		N	M	SD	1	2	3	4	5
1	newspaper (e1)	225	3.94	0.985	1.00				
2	magazine (e2)	223	3.67	1.02	0.58***	1.00			
3	textbook (e3)	224	3.71	0.934	0.34***	0.20**	1.00		
4	indiv course (e4)	221	3.48	0.942	0.14*	0.29***	0.43***	1.00	
5	accounting #s (e5)	223	3.27	1.204	0.24***	0.12	0.30***	0.30***	1.00
6	case study (e6)	224	3.43	0.925	0.23***	0.21**	0.15*	0.32***	0.30***
7	educat'l videos (e7)	223	3.34	0.92	0.13	0.32***	0.15*	0.46***	0.08
8	interviews (e8)	223	3.29	0.995	0.16*	0.32***	0.13	0.32***	-0.01
9	group exercise (e9)	224	3.23	0.983	0.02	0.02	0.07	0.14*	-0.12
10	give present'n (e10)	223	3.28	1.033	0.11	0.09	0.11	0.22**	0.06
11	list'n present'n (e11)	224	2.88	1.033	0.05	0.05	0.13	0.26***	0.12
12	discuss curr evt (e12)	225	3.62	0.918	0.12	0.07	-0.03	0.25***	0.00
13	teacher lecture (e13)	224	3.45	0.813	0.17*	0.16*	0.39***	0.37***	0.23**
14	student discuss (e14)	225	3.21	0.935	-0.04	-0.05	0.18**	0.23**	0.07
15	indiv study (e15)	223	3.38	0.987	0.10	0.04	0.29***	0.23***	0.11
16	listn biz expert (e16)	224	3.56	0.945	0.21**	0.15*	0.14*	0.19**	0.10
17	course project (e17)	223	3.23	0.962	0.13	0.16*	0.26***	0.30***	0.20**
18	pers biz exper (e18)	223	3.81	1.011	0.05	0.11	-0.06	0.13	-0.07
19	share stdt exper (e19)	223	3.48	2.189	-0.03	0.08	-0.01	0.03	-0.04
20	life exper (e20)	225	3.64	1.048	0.04	-0.06	-0.12	0.05	-0.08
21	reports (e21)	225	3.23	0.977	0.41***	0.23**	0.41***	0.16*	0.31***
22	e-mails (e22)	225	3.07	1.14	0.33***	0.12	0.24**	0.13	0.20**
23	think abt biz (e23)	225	2.57	1.007	-0.03	0.08	-0.06	0.06	-0.04
24	personal insight (e24)	225	3.07	1.098	0.00	-0.01	-0.09	0.07	-0.08
25	other's insight (e25)	224	2.98	0.963	0.03	0.16*	-0.02	0.16*	0.03
26	authority stmt (e26)	225	3.12	0.969	0.19**	0.23**	0.19**	0.16*	0.28***
27	news show (e27)	223	3.34	0.973	0.28***	0.54***	0.24***	0.28***	0.13
28	pop biz book (e28)	224	3.42	0.914	0.46***	0.48***	0.29***	0.23**	0.22**
29	wk w/ others (e29)	224	3.46	0.984	0.03	0.01	-0.08	0.06	-0.08
30	internships (e30)	222	3.74	1.013	0.04	-0.07	0.04	0.20**	-0.06
31	listn biz leader (e31)	225	3.35	0.869	0.12	0.25***	0.05	0.22**	0.00
32	body language (e32)	225	2.81	1.159	-0.14*	-0.09	-0.19**	-0.07	-0.09
33	compare biz's (e33)	223	3.10	0.900	0.04	0.18**	0.02	0.12	-0.01
34	long biz conv's (e34)	224	2.73	0.947	0.10	0.25***	0.21**	0.22**	0.10
35	visual info (e35)	225	3.67	1.004	0.15*	0.13	0.09	0.03	0.10
36	degree prog (e36)	224	3.43	0.870	0.10	0.16*	0.29***	0.36***	0.11

TABLE 1, CONTINUED
Means, Standard Deviations and Correlations

		N	M	SD	1	2	3	4	5
37	newspaper (t1)	225	2.56	1.109	-0.30***	-0.23***	-0.11	-0.05	-0.15*
38	magazine (t2)	224	2.71	1.100	-0.19**	-0.29***	-0.05	-0.02	0.03
39	textbook (t3)	222	2.76	1.074	-0.17*	-0.11	-0.38***	-0.10	-0.11
40	indiv course (t4)	223	3.04	0.953	-0.04	-0.06	-0.07	-0.06	0.01
41	accounting #s (t5)	225	2.91	1.216	-0.13	-0.01	-0.13	-0.01	-0.39***
42	case study (t6)	223	2.89	0.935	0.02	-0.01	-0.01	-0.13	-0.04
43	educat'l videos (t7)	224	2.93	0.986	0.03	-0.15*	-0.02	-0.22**	0.01
44	interviews (t8)	222	3.05	1.047	0.05	-0.04	0.01	-0.09	0.12
45	group exercise (t9)	225	2.87	1.034	0.01	-0.04	0.11	-0.07	0.08
46	give present'n (t10)	224	2.73	0.976	0.08	0.02	0.01	0.06	0.03
47	list'n present'n (t11)	225	2.76	1.010	0.05	0.00	0.07	-0.07	0.01
48	discuss curr evt (t12)	225	2.68	1.025	-0.05	0.03	0.05	-0.08	0.02
49	teacher lecture (t13)	224	2.81	0.975	-0.03	0.05	-0.06	0.06	-0.09
50	student discuss (t14)	225	2.73	0.974	0.05	0.03	0.03	-0.02	-0.03
51	indiv study (t15)	225	2.83	1.061	-0.05	0.00	-0.16*	-0.18*	-0.09
52	listn biz expert (t16)	223	2.96	1.010	0.04	0.06	0.04	-0.04	-0.08
53	course project (t17)	223	2.91	0.933	-0.02	0.04	0.04	-0.03	-0.12
54	pers biz exper (t18)	224	2.93	1.231	0.05	0.09	0.00	-0.02	-0.06
55	share stdt exper (t19)	224	2.83	0.976	-0.07	-0.05	0.10	-0.06	0.03
56	life exper (t20)	224	2.87	1.267	0.12	0.13	0.09	-0.06	0.02
57	reports (t21)	224	2.66	0.953	-0.11	-0.07	-0.11	-0.07	-0.08
58	e-mails (t22)	223	2.60	2.968	-0.01	-0.05	-0.15*	-0.12	-0.08
59	think abt biz (t23)	224	3.06	1.115	0.04	0.07	-0.07	-0.13	-0.02
60	personal insight (t24)	225	2.93	1.180	0.00	0.10	-0.02	-0.16*	-0.02
61	other's insight (t25)	225	3.00	0.961	0.10	0.10	0.06	-0.13	-0.02
62	authority stmt (t26)	222	2.90	0.962	-0.05	-0.09	-0.16*	-0.05	-0.04
63	news show (t27)	222	2.95	1.012	-0.06	-0.21**	-0.14*	-0.11	-0.05
64	pop biz book (t28)	223	2.81	0.987	-0.04	-0.01	-0.08	0.01	-0.12
65	work w/ others (t29)	222	2.97	1.131	0.11	0.13*	0.11	-0.07	0.01
66	internships (t30)	222	2.97	1.244	0.03	0.02	0.18**	-0.02	0.01
67	listn biz leader (t31)	224	2.93	1.009	0.01	-0.04	0.01	-0.04	-0.06
68	body language (t32)	224	3.16	1.186	0.22**	0.21**	0.09	-0.04	0.01
69	Compare biz's (t33)	220	3.00	0.922	-0.04	-0.03	-0.04	-0.09	0.00
70	long biz conv's (t34)	223	3.17	1.090	0.04	-0.09	-0.11	-0.08	0.11
71	visual info (t35)	224	2.74	1.181	-0.10	-0.05	-0.16*	-0.24***	-0.22**
72	degree prog (t36)	223	3.07	1.088	0.04	0.00	0.00	-0.09	-0.06

Correlation is significant at the .001 level ***; at the .01 level **; at the .05 level * (2-tailed)
 Shaded cells indicate correlations between paired items.

TABLE 1, CONTINUED
Means, Standard Deviations and Correlations

	6	7	8	9	10	11	12	13	14
1									
2									
3									
4									
5									
6	1.00								
7	0.47***	1.00							
8	0.35***	0.54***	1.00						
9	0.31***	0.30***	0.39***	1.00					
10	0.22**	0.25**	0.31***	0.63***	1.00				
11	0.15*	0.27***	0.34***	0.44***	0.63***	1.00			
12	0.23***	0.30***	0.31***	0.35***	0.35***	0.33***	1.00		
13	0.10	0.17*	0.12	0.15*	0.30***	0.38***	0.26***	1.00	
14	0.16*	0.23**	0.31***	0.39***	0.32***	0.41***	0.38***	0.29***	1.00
15	0.27***	0.23**	0.14*	0.14*	0.20**	0.18**	0.17*	0.29***	0.32***
16	0.35***	0.31***	0.26***	0.25***	0.28***	0.21**	0.31***	0.22**	0.21**
17	0.27**	0.35***	0.39***	0.50***	0.44***	0.33***	0.20**	0.19**	0.31***
18	0.12	0.20**	0.19**	0.24**	0.24***	0.14*	0.38***	0.12	0.20**
19	0.06	0.21**	0.18**	0.17**	0.09	0.12	0.16*	0.07	0.01
20	0.10	0.13*	0.09	0.26***	0.27***	0.21**	0.30***	0.08	0.19**
21	0.30***	0.13	0.17*	0.14*	0.27***	0.17*	0.08	0.19**	0.16*
22	0.22**	0.07	0.15*	0.20*	0.40***	0.31***	0.12	0.21**	0.17*
23	0.14*	0.24***	0.33***	0.28***	0.24**	0.24***	0.20**	0.17*	0.27***
24	0.13	0.14*	0.27***	0.43***	0.40***	0.28***	0.38***	0.23**	0.31***
25	0.19*	0.27***	0.29***	0.26***	0.27***	0.31***	0.34***	0.19**	0.30***
26	0.20**	0.27***	0.27***	0.21**	0.29***	0.32***	0.15*	0.26***	0.14*
27	0.20**	0.38***	0.34***	0.07	0.10	0.07	0.14*	0.19**	0.02
28	0.27***	0.31***	0.26***	0.02	0.10	0.02	0.06	0.15*	-0.01
29	0.14*	0.22**	0.26***	0.44***	0.42***	0.28***	0.32***	0.06	0.20**
30	0.20**	0.25***	0.22**	0.32***	0.31***	0.26***	0.39***	0.10	0.23**
31	0.19**	0.25***	0.32***	0.27***	0.25***	0.14*	0.21**	0.14*	0.12
32	-0.08	0.01	0.11	0.20**	0.21**	0.23**	0.16**	0.12	0.28***
33	0.11	0.22***	0.25***	0.20**	0.12	0.18**	0.15*	0.16*	0.21**
34	0.17*	0.25***	0.31***	0.25***	0.11	0.22**	0.08	0.16*	0.10
35	0.11	0.11	0.16*	0.14*	0.17*	0.23**	0.14*	0.09	0.11
36	0.15*	0.23**	0.23**	0.28***	0.25***	0.21**	0.29***	0.24***	0.28**

TABLE 1, CONTINUED
Means, Standard Deviations and Correlations

	6	7	8	9	10	11	12	13	14
37	-0.06	-0.08	0.02	0.05	-0.02	0.07	-0.05	0.03	0.07
38	0.07	-0.05	-0.05	0.03	0.02	0.02	0.01	0.08	0.05
39	-0.03	-0.13*	0.05	-0.01	0.02	0.01	0.03	-0.12	-0.08
40	-0.00	-0.15*	0.08	-0.01	0.04	-0.08	0.02	-0.03	0.06
41	-0.01	-0.00	0.16*	0.04	0.03	0.08	0.12	-0.05	0.10
42	-0.16*	-0.12	0.10	-0.23**	-0.20**	-0.17**	-0.10	-0.03	-0.09
43	-0.08	-0.20**	-0.10	-0.09	-0.05	-0.13*	-0.09	0.00	-0.04
44	-0.09	-0.14*	-0.07	-0.12	-0.13	-0.18**	-0.10	0.05	-0.07
45	-0.12	-0.04	-0.04	-0.18**	-0.10	-0.17*	-0.06	0.03	-0.14*
46	-0.03	-0.05	-0.06	-0.10	-0.10	-0.07	-0.04	0.06	0.00
47	-0.14*	-0.10	-0.08	-0.16*	-0.02	-0.12	-0.06	0.08	-0.12
48	-0.10	-0.10	-0.10	-0.18**	-0.09	-0.12	-0.26***	0.00	-0.16*
49	-0.09	-0.10	0.03	-0.04	-0.06	-0.10	-0.04	-0.12	-0.03
50	-0.12	-0.06	-0.08	-0.22**	-0.18**	-0.19**	-0.16*	-0.09	-0.20**
51	-0.05	-0.14*	0.00	-0.06	-0.13	-0.10	-0.10	-0.18*	-0.15*
52	-0.11	-0.07	0.08	-0.03	-0.02	-0.05	-0.05	-0.01	0.00
53	-0.03	-0.13	-0.04	-0.02	-0.11	-0.20**	-0.09	-0.09	-0.01
54	-0.01	-0.06	0.06	-0.04	-0.13*	-0.15*	-0.17*	-0.07	-0.06
55	-0.05	-0.03	-0.01	-0.10	-0.10	-0.10	-0.20**	-0.03	-0.04
56	-0.08	-0.18**	0.00	-0.12	-0.13*	-0.10	-0.19**	-0.04	-0.14*
57	0.03	0.03	0.14	0.02	0.00	0.05	0.07	0.08	0.02
58	-0.04	0.10	-0.11	-0.02	-0.05	-0.07	-0.15*	0.03	-0.13
59	0.02	-0.10	-0.06	-0.19**	-0.16*	-0.19**	-0.1	-0.11	-0.16*
60	-0.19**	-0.21**	0.01	-0.23**	-0.23**	-0.15*	-0.23***	-0.02	-0.13
61	-0.05	-0.05	0.04	-0.21**	-0.10	-0.14*	-0.15*	0.05	-0.13*
62	0.07	0.01	-0.03	-0.03	0.05	0.06	0.04	0.05	-0.01
63	-0.02	-0.10	-0.06	-0.04	0.02	-0.01	0.00	0.02	-0.05
64	0.05	0.05	0.08	0.02	-0.01	-0.01	0.02	0.05	0.03
65	-0.06	-0.06	-0.04	-0.19**	-0.18**	-0.14*	-0.32***	0.04	-0.13
66	-0.08	-0.15*	0.04	-0.13*	-0.13	-0.07	-0.22**	0.04	-0.07
67	-0.02	-0.13	0.03	-0.05	0.00	-0.02	-0.11	0.11	-0.07
68	-0.06	-0.04	0.03	-0.13	-0.06	-0.11	-0.13	0.09	-0.03
69	-0.05	-0.17*	-0.15*	-0.15*	0.00	-0.10	-0.11	0.04	-0.15*
70	0.08	-0.05	-0.04	0.01	0.03	-0.01	0.12	0.03	-0.03
71	-0.14*	-0.15*	0.01	-0.07	-0.17*	-0.11	-0.11	-0.15*	-0.05
72	-0.09	-0.16*	0.03	-0.08	-0.07	-0.04	-0.08	-0.01	-0.09

TABLE 1, CONTINUED
Means, Standard Deviations and Correlations

	15	16	17	18	19	20	21	22	23
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15	1.00								
16	0.33***	1.00							
17	0.19**	0.33***	1						
18	0.17*	0.44***	0.17*	1					
19	0.10	0.10	0.05	.23**	1				
20	0.15*	0.36***	0.09	0.52***	0.22**	1			
21	0.26***	0.17*	0.31***	-0.07	0.09	0.08	1		
22	0.21**	0.10	0.13*	-0.08	0.01	0.09	0.52***	1	
23	0.16*	0.12	0.16*	0.28***	0.13*	0.24***	0.11	0.18*	1
24	0.27***	0.30***	0.14*	0.42***	0.14*	0.46***	0.04	0.18**	0.60***
25	0.21**	0.32***	0.14*	0.35***	0.24***	0.35***	0.07	0.12	0.53***
26	0.30***	0.30***	0.21**	0.11	0.16*	0.13	0.35***	0.29***	0.26***
27	0.08	0.20**	0.16*	0.17*	0.05	-0.04	0.24**	0.06	0.14*
28	0.18**	0.20**	0.16*	0.12*	0.12	-0.02	0.41***	0.21**	0.02
29	0.15*	0.37***	0.20**	0.48***	0.22**	0.45***	0.04	0.12	0.36***
30	0.23**	0.45***	0.23**	0.42***	0.14*	0.37***	0.05	0.03	0.12
31	0.09	0.48***	0.30***	0.39***	0.06	0.19**	0.09	0.02	0.28***
32	0.10	0.25***	0.01	0.35***	0.08	0.46***	-0.12	0.06	0.35***
33	0.11	0.22**	0.27***	0.31***	0.14*	0.15*	0.11	0.03	0.36***
34	0.13	0.22**	0.31***	0.14*	0.21**	0.05	0.24**	0.02	0.30***
35	0.28***	0.17*	0.11	0.16*	0.04	0.12	0.22**	0.26***	0.14*
36	0.15*	0.29***	0.28***	0.31***	0.04	0.11	0.16*	0.07	0.19**

TABLE 1, CONTINUED
Means, Standard Deviations and Correlations

	15	16	17	18	19	20	21	22	23
37	-0.10	0.02	0.03	0.09	0.02	0.04	0.04	-0.13	0.13
38	0.00	0.13*	0.05	0.06	-0.05	0.01	-0.06	-0.07	0.08
39	-0.10	0.02	-0.11	0.12	0.05	0.09	-0.12	-0.07	0.11
40	-0.06	0.01	-0.02	0.03	-0.04	-0.04	-0.01	0.00	-0.03
41	-0.01	-0.08	-0.07	0.13*	0.01	0.06	-0.13	-0.05	0.04
42	-0.11	-0.07	-0.04	-0.11	0.06	-0.06	0.00	-0.08	-0.07
43	-0.03	0.05	-0.10	-0.06	-0.01	0.04	0.01	0.08	-0.14*
44	-0.06	0.04	-0.03	-0.03	-0.12	-0.05	0.08	-0.03	-0.01
45	-0.04	0.01	-0.05	-0.11	-0.08	-0.08	0.07	-0.01	-0.16*
46	-0.10	0.03	-0.06	-0.10	-0.13	0.05	-0.02	0.04	-0.18*
47	0.00	-0.07	-0.03	-0.10	-0.11	-0.08	0.08	0.10	-0.15*
48	-0.07	-0.04	-0.09	-0.08	-0.10	-0.09	-0.05	-0.03	-0.10
49	-0.14*	-0.08	-0.03	0.07	0.01	0.02	0.02	-0.04	0.01
50	-0.03	-0.05	-0.11	-0.04	0.13	-0.04	0.00	-0.08	-0.05
51	-0.25***	-0.17**	-0.04	-0.16*	0.00	-0.14*	-0.04	-0.11	-0.05
52	-0.07	-0.07	-0.02	0.05	-0.04	-0.01	0.04	-0.02	0.11
53	-0.01	0.05	-0.09	-0.03	-0.14*	-0.05	0.02	-0.09	-0.10
54	-0.19**	-0.05	-0.05	-0.11	-0.12	-0.11	-0.02	-0.12*	-0.00
55	-0.05	0.01	-0.03	-0.10	-0.07	-0.14*	-0.04	-0.05	-0.16*
56	-0.18*	-0.03	-0.01	-0.21**	-0.04	-0.24***	0.13	-0.01	-0.13
57	0.12	0.13	-0.03	0.11	0.13*	0.09	-0.28***	-0.13	0.08
58	0.06	-0.04	-0.04	-0.01	0.05	0.02	-0.04	-0.10	0.00
59	0.03	0.01	-0.12	0.01	-0.12	0.02	0.08	0.02	-0.25***
60	-0.19**	-0.05	-0.06	-0.15*	-0.14*	-0.16*	0.02	-0.10	-0.14
61	-0.04	0.01	-0.11	-0.07	0.05	-0.03	0.10	0.08	-0.12
62	0.12	0.05	0.00	0.16*	0.12	0.18**	-0.06	0.06	0.01
63	0.00	0.04	-0.09	0.05	-0.04	0.09	-0.16*	0.04	0.02
64	-0.10	0.01	0.04	0.00	0.00	-0.07	-0.14*	-0.03	0.01
65	-0.09	-0.01	-0.09	-0.19**	-0.06	-0.24***	0.01	-0.10	-0.18**
66	-0.05	-0.01	-0.09	-0.15*	-0.05	-0.17*	0.02	-0.04	-0.07
67	0.00	-0.02	-0.08	0.00	-0.10	-0.02	-0.07	0.03	0.04
68	0.11	0.00	0.03	-0.11	-0.14*	-0.15*	0.17**	0.05	-0.14*
69	-0.02	-0.01	-0.15*	0.02	-0.14*	0.05	-0.04	0.09	-0.09
70	0.04	0.09	0.00	0.09	0.15*	0.18**	0.07	0.13*	-0.05
71	-0.05	-0.04	-0.15*	0.06	0.11	-0.00	-0.15*	-0.20**	0.07
72	-0.09	0.05	0.01	0.03	0.09	0.03	-0.03	-0.09	-0.03

TABLE 1, CONTINUED
Means, Standard Deviations and Correlations

	24	25	26	27	28	29	30	31	32
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24	1								
25	0.61***	1							
26	0.27***	0.35***	1						
27	0.08	0.13*	0.38***	1					
28	-0.07	0.10	0.22**	0.51***	1				
29	0.48***	0.39***	0.20**	0.05	0.08	1			
30	0.34***	0.29***	0.17*	0.05	0.03	0.44***	1		
31	0.32***	0.36***	0.34***	0.34***	0.27***	0.36***	0.40***	1	
32	0.49***	0.29***	0.15*	-0.03	-0.09	0.42***	0.32***	0.26***	1
33	0.22**	0.32***	0.26***	0.26***	0.24***	0.24***	0.26***	0.44***	0.36***
34	0.15*	0.34***	0.36***	0.26***	0.27**	0.17*	0.20**	0.33***	0.11
35	0.14*	0.14*	0.18**	0.10	0.08	0.22**	0.31***	0.13*	0.19**
36	0.25***	0.17*	0.18*	0.24***	0.22***	0.19**	0.31***	0.40***	0.14*

TABLE 1, CONTINUED
Means, Standard Deviations and Correlations

	24	25	26	27	28	29	30	31	32
37	0.05	0.02	-0.10	-0.06	-0.12	0.07	0.01	0.05	0.11
38	0.04	0.02	-0.05	-0.11	-0.12	0.05	0.04	0.01	0.06
39	0.08	0.10	-0.02	-0.06	-0.12	0.11	0.08	-0.04	0.12
40	-0.02	-0.03	0.03	-0.03	-0.01	-0.09	-0.03	-0.08	0.04
41	0.04	0.05	-0.01	0.00	-0.07	0.12	0.06	0.07	0.12
42	-0.18*	-0.09	-0.01	0.01	0.01	-0.13	-0.19**	-0.08	-0.10
43	-0.04	-0.18**	-0.10	-0.15*	0.01	-0.09	-0.07	-0.16*	0.05
44	-0.03	-0.18**	-0.04	0.02	0.09	-0.21**	-0.10	-0.01	0.01
45	-0.22**	-0.17*	0.05	0.04	0.01	-0.21**	-0.07	-0.05	-0.11
46	-0.21**	-0.21**	0.06	0.01	-0.03	-0.14*	-0.07	-0.06	-0.09
47	-0.18**	-0.14*	0.04	-0.05	0.00	-0.16*	-0.05	-0.07	-0.07
48	-0.18**	-0.04	-0.02	0.03	0.01	-0.23**	-0.11	-0.11	-0.05
49	-0.02	0.01	-0.04	0.00	-0.03	-0.04	0.06	0.03	0.02
50	-0.13	-0.10	0.01	0.00	0.09	-0.20**	-0.09	-0.02	-0.04
51	-0.22**	-0.10	-0.03	0.06	0.03	-0.10	-0.15*	0.07	-0.15*
52	0.00	0.04	-0.03	0.04	0.07	-0.03	-0.10	0.04	-0.05
53	-0.14*	-0.13*	0.01	-0.01	-0.10	-0.04	-0.01	0.03	-0.05
54	-0.06	-0.06	-0.04	0.06	0.10	-0.10	-0.22**	0.14*	-0.05
55	-0.20**	-0.20**	-0.04	-0.08	-0.01	-0.21**	-0.14*	-0.08	-0.14*
56	-0.23***	-0.15*	-0.03	0.10	0.09	-0.25***	-0.22**	0.07	-0.19**
57	0.14*	0.19**	0.15*	0.01	-0.12	0.10	0.21**	0.13	0.17*
58	-0.04	-0.07	0.01	-0.11	-0.11	0.02	0.04	0.00	-0.06
59	-0.14*	-0.20**	0.03	0.04	0.09	-0.13	-0.11	0.01	-0.01
60	-0.24***	-0.21**	0.04	0.10	0.03	-0.30***	-0.23**	0.00	-0.08
61	-0.11	-0.20*	0.05	0.09	0.10	-0.16*	-0.15*	-0.05	-0.05
62	0.06	0.02	-0.01	-0.02	-0.07	0.05	0.13	-0.03	0.08
63	0.07	0.02	-0.11	-0.20**	-0.11	0.08	0.03	-0.02	0.02
64	0.08	0.00	-0.09	-0.01	-0.10	0.13*	0.04	0.10	0.05
65	-0.26***	-0.22**	-0.01	0.10	0.10	-0.31***	-0.20**	-0.09	-0.17*
66	-0.20**	-0.16*	0.05	0.03	0.03	-0.24***	-0.16*	0.03	-0.12
67	-0.02	0.00	0.00	-0.12	-0.04	0.00	-0.05	0.02	0.04
68	-0.20**	-0.18**	-0.01	0.10	0.14*	-0.20**	-0.15*	0.03	-0.22**
69	-0.09	-0.09	-0.02	0.00	0.01	-0.06	-0.18**	0.01	-0.09
70	0.05	0.04	-0.02	-0.04	0.01	0.07	0.03	-0.07	0.15*
71	0.06	0.05	-0.01	-0.03	-0.10	-0.03	-0.14*	0.05	0.04
72	-0.04	-0.01	-0.06	-0.01	-0.01	-0.07	-0.06	0.03	0.03

TABLE 1, CONTINUED
Means, Standard Deviations and Correlations

	33	34	35	36	37	38	39	40	41
33	1								
34	0.51***	1							
35	0.24***	0.21**	1						
36	0.33***	0.32***	0.17*	1					
37	0.14*	0.05	-0.02	-0.02	1				
38	0.04	-0.06	0.01	-0.09	0.69***	1			
39	0.00	0.01	0.04	-0.01	0.42***	0.39***	1		
40	-0.14*	-0.09	-0.04	-0.05	0.25***	0.35***	0.51***	1	
41	0.08	0.05	-0.07	-0.02	0.18**	0.09	0.21**	0.12	1
42	-0.01	0.04	-0.18**	-0.10	0.19**	0.16*	0.19**	0.30***	0.24***
43	-0.12	-0.09	-0.04	-0.04	0.15*	0.28***	0.16*	0.40***	0.03
44	-0.08	-0.01	-0.03	-0.04	0.18**	0.26***	0.10	0.37***	-0.13
45	-0.08	0.04	-0.05	0.02	0.06	0.05	0.13	0.30***	-0.11
46	-0.04	0.03	-0.07	0.04	0.06	0.08	0.11	0.21**	0.00
47	-0.10	-0.10	0.05	0.04	-0.02	0.00	0.09	0.09	0.00
48	-0.07	0.03	-0.03	0.06	0.18**	0.11	0.11	0.23**	-0.06
49	0.12	0.10	0.04	0.18**	0.28***	0.15*	0.48***	0.38***	0.13*
50	0.02	0.06	0.07	0.17*	0.14*	0.03	0.26***	0.24***	-0.08
51	0.04	0.12	-0.08	-0.05	0.16*	0.05	0.08	0.07	0.11
52	0.03	0.05	-0.01	0.09	0.30***	0.21**	0.21**	0.24***	0.09
53	0.03	0.11	-0.06	0.04	0.10	0.01	0.13*	0.23**	0.05
54	0.07	0.12	-0.15*	-0.01	0.16*	0.09	-0.04	0.23**	-0.04
55	-0.09	-0.06	-0.12	-0.02	0.09	0.11	-0.03	0.27***	-0.13
56	-0.03	0.10	-0.07	0.03	0.13*	0.06	-0.04	0.17*	-0.12
57	0.15*	0.12	0.03	0.12	0.25***	0.14*	0.37***	0.17*	0.25***
58	0.04	0.02	0.10	0.07	0.05	-0.05	0.07	-0.04	0.06
59	-0.10	-0.09	0.08	-0.15*	-0.05	0.01	-0.04	0.11	0.03
60	-0.05	0.10	0.02	-0.10	0.14*	0.10	0.02	0.24***	-0.01
61	-0.08	-0.09	0.04	-0.08	0.10	0.11	-0.02	0.21**	0.01
62	-0.06	-0.15*	0.15*	-0.04	0.23***	0.21**	0.28***	0.20**	0.13
63	-0.05	-0.09	-0.03	-0.06	0.35***	0.47***	0.33***	0.35***	0.17*
64	0.07	-0.03	0.05	-0.06	0.39***	0.39***	0.26***	0.20**	0.20**
65	-0.10	0.03	-0.11	-0.09	0.17*	0.11	0.02	0.28***	-0.13
66	-0.09	0.08	-0.10	0.02	0.24***	0.17*	0.14*	0.40***	-0.06
67	-0.05	-0.11	-0.05	-0.07	0.30***	0.33***	0.25***	0.35***	0.17*
68	-0.04	0.02	0.00	-0.08	-0.10	-0.14*	-0.22**	-0.05	-0.06
69	-0.20**	-0.19**	-0.06	-0.01	0.15*	0.18**	0.14*	0.22**	0.07
70	-0.03	-0.16*	0.01	-0.12	0.04	0.17*	0.14	0.18**	0.02
71	0.08	0.07	-0.24***	0.01	0.15*	0.01	0.21**	0.22**	0.13
72	0.03	0.04	-0.03	-0.13*	0.22**	0.27***	0.28***	0.46***	0.08

TABLE 1, CONTINUED
Means, Standard Deviations and Correlations

	42	43	44	45	46	47	48	49	50
37									
38									
39									
40									
41									
42	1								
43	0.40***	1							
44	0.35***	0.48***	1						
45	0.35***	0.25***	0.44***	1					
46	0.25**	0.20**	0.22**	0.58***	1				
47	0.09	0.05	0.15*	0.43***	0.40***	1			
48	0.26***	0.19**	0.27***	0.45***	0.35***	0.40***	1		
49	0.22**	0.19**	0.18**	0.15*	0.24***	0.22**	0.40***	1	
50	0.19**	0.15*	0.20**	0.38***	0.29***	0.39***	0.53***	0.53***	1
51	0.12	-0.05	0.10	0.08	0.02	0.06	0.17*	0.24***	0.17*
52	0.25***	0.28***	0.38***	0.25***	0.15*	0.13*	0.23***	0.36***	0.23**
53	0.29***	0.18**	0.28***	0.43***	0.46***	0.23**	0.35***	0.30***	0.31***
54	0.22**	0.21**	0.32***	0.28***	0.28***	0.02	0.25***	0.20**	0.21**
55	0.25***	0.35***	0.33***	0.33***	0.27***	0.22**	0.36***	0.22**	0.35***
56	0.22**	0.15*	0.33***	0.31***	0.24***	0.13	0.32***	0.18**	0.26***
57	0.18**	0.03	0.00	0.07	0.15*	0.13	0.07	0.24***	0.25***
58	0.13	-0.02	-0.07	0.08	0.16*	0.14*	0.07	0.00	0.09
59	0.11	0.07	0.13*	0.14*	0.02	0.28***	0.09	0.03	0.18**
60	0.27***	0.13*	0.34***	0.33***	0.16*	0.23**	0.36***	0.12	0.24***
61	0.21**	0.26***	0.27***	0.27***	0.11	0.30***	0.31***	0.16*	0.34***
62	0.13	0.12	0.09	0.14*	0.14*	0.13	0.14*	0.18**	0.27***
63	0.28***	0.37***	0.28***	0.21**	0.17*	-0.01	0.07	0.21**	0.07
64	0.18**	0.10	0.13*	0.12	0.22**	0.05	0.11	0.17*	0.08
65	0.31***	0.28***	0.48***	0.44***	0.35***	0.16*	0.40***	0.18**	0.27***
66	0.37***	0.38***	0.40***	0.49***	0.38***	0.12	0.46***	0.23**	0.31***
67	0.27***	0.31***	0.33***	0.24***	0.13	0.14*	0.18**	0.23**	0.15*
68	0.20**	-0.04	0.26***	0.21**	0.13*	0.23**	0.14*	-0.04	0.06
69	0.18**	0.15*	0.24***	0.31***	0.18**	0.28***	0.23**	0.07	0.17*
70	0.09	0.20**	0.16*	0.06	0.10	0.21**	-0.05	0.11	0.09
71	0.24***	0.09	0.17*	0.14*	0.08	0.05	0.22**	0.25***	0.19**
72	0.28***	0.32***	0.32***	0.15*	0.22**	0.09	0.12	0.32***	0.15*

TABLE 1, CONTINUED
Means, Standard Deviations and Correlations

	51	52	53	54	55	56	57	58	59
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									
51	1								
52	0.28***	1							
53	0.20**	0.24***	1						
54	0.33***	0.27***	0.32***	1					
55	0.09	0.29***	0.19**	0.49***	1				
56	0.41***	0.27***	0.32***	0.59***	0.45***	1			
57	0.09	0.09	0.19**	0.02	-0.03	-0.04	1		
58	0.06	0.03	0.11	-0.09	-0.04	0.00	0.20**	1	
59	0.28***	0.12	0.04	0.17*	0.23**	0.26***	0.02	0.06	1
60	0.34***	0.21**	0.20**	0.40***	0.33***	0.56***	-0.03	0.02	0.54***
61	0.20**	0.30***	0.13	0.22**	0.43***	0.33***	0.07	-0.03	0.49***
62	0.10	0.25***	0.06	-0.06	0.13	0.01	0.40***	0.05	0.24***
63	0.01	0.28***	0.02	0.16*	0.17**	0.02	0.30***	-0.03	0.03
64	0.09	0.21**	0.05	0.21**	0.12	0.10	0.22**	-0.02	-0.01
65	0.19**	0.28***	0.35***	0.45***	0.41***	0.46***	-0.03	-0.01	0.16*
66	0.23**	0.35***	0.40***	0.54***	0.46***	0.52***	0.08	0.00	0.09
67	0.14*	0.54***	0.24***	0.29***	0.30***	0.22**	0.28***	0.10	0.21**
68	0.28***	0.15*	0.18**	0.24***	0.22**	0.45***	-0.13	-0.01	0.36***
69	0.09	0.29***	0.13*	0.11	0.22**	0.16*	0.14*	0.00	0.30***
70	0.03	0.16*	-0.05	-0.06	0.08	0.01	0.29***	0.05	0.34***
71	0.22**	0.23**	0.27***	0.32***	0.18**	0.28***	0.16*	0.00	0.06
72	0.22**	0.33***	0.23**	0.35***	0.26***	0.30***	0.19**	0.00	0.15*

TABLE 1, CONTINUED
Means, Standard Deviations and Correlations

	60	61	62	63	64	65	66	67	68
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									
60	1								
61	0.52***	1							
62	0.05	0.32***	1						
63	0.01	0.16*	0.31***	1					
64	0.12	0.09	0.24***	0.44***	1				
65	0.49***	0.38***	0.03	0.09	0.18**	1			
66	0.46***	0.29***	0.09	0.23**	0.15*	0.66***	1		
67	0.20**	0.31***	0.31***	0.41***	0.27***	0.30***	0.47***	1	
68	0.40***	0.36***	-0.03	-0.06	-0.03	0.36***	0.22**	0.12	1
69	0.13	0.30***	0.30***	0.40***	0.20**	0.16*	0.20**	0.47***	0.16*
70	0.02	0.31***	0.37***	0.32***	0.18**	-0.03	-0.06	0.31***	0.07
71	0.20**	0.06	0.15*	0.15*	0.09	0.24***	0.31***	0.23**	0.05
72	0.26***	0.26***	0.19**	0.33***	0.26***	0.28***	0.38***	0.45***	0.09

	69	70	71	72
69	1			
70	0.31***	1		
71	0.18**	-0.05	1	
72	0.23***	0.22**	0.37***	1

TABLE 2***Sample Comparison of Item Explicitness and Tacitness***

Sig	Newspaper Explicitness (E1)		Newspaper Tacitness (T1)	
***	Source Correlates	Corr	Source Correlates	Corr
	Magazines (E2)	.58	Magazine (T2)	.69
	Popular Biz Bk (E28)	.46	Textbook (T3)	.42
	Reports (E21)	.41	Pop Biz Book (T28)	.39
	Texts (E3)	.34	New Show (T27)	.35
	E-mail (E22)	.33	List'n Biz Expert (T16)	.30
	<i>Newspaper (T1)</i>	-.30	<i>Newspaper (E1)</i>	-.30
	News Show (E27)	.28	Teacher Lecture (T13)	.28
	Accounting #s (E5)	.24	Course (T4)	.25
	Cases (E6)	.23	Reports (T21)	.25
			Internships (T30)	.24
			Authority Stmt (T26)	.23
			<i>Magazine (E2)</i>	-.23
	Explicit to Tacit Count	<u>8/1</u>	Explicit to Tacit Count	<u>2/10</u>

Sig	Personal Biz Experience Explicitness (E18)		Personal Biz Experience Tacitness (T18)	
***	Source Correl's	Corr	Source Correlates	Corr
	Life Experience (E20)	.52	Life Experience (T20)	.59
	Work w/ Others (E29)	.48	Internships (T30)	.54
	Personal Insight (E24)	.42	Students Shr Exper (T19)	.49
	Internships (E30)	.42	Working w/ Others (T29)	.45
	Listen Biz Leader (E31)	.39	Personal Insight (T24)	.40
	Others' Insight (E25)	.35	Degree Program (T36)	.35
	Body Language (E32)	.35	Individual Study (T15)	.33
	Compare Biz's (E33)	.31	Interviews (T8)	.32
	Degree Program (E36)	.31	Course Project (T17)	.32
	Thinking Abt Biz (E23)	.28	Visual Information (T35)	.32
			Listen Biz Leader (T31)	.29
			Group Exercise (T9)	.28
			Give Presentation (T10)	.28
			Listen Biz Expert (T16)	.27
			Discuss Curr Event (T12)	.25
			Body Language (T32)	.24
	Explicit to Tacit Count	<u>10/0</u>	Explicit to Tacit Count	<u>0/16</u>

TABLE 2, CONTINUED

Sample Comparison of Item Explicitness and Tacitness

Sig	Thinking About Business Explicitness (E23)		Thinking About Business Tacitness (T23)	
***	Source Correlates	Corr	Source Correlates	Corr
	Personal Insight (E24)	.60	Personal Insight (T24)	.54
	Others' Insight (E25)	.53	Others Insight (T25)	.49
	Working w/ Others (E29)	.36	Body Language (T32)	.36
	Compare Biz's (E33)	.36	Lngthy Biz Conv'n (T34)	.34
	Body Language (E32)	.35	Compare Biz (T33)	.30
	Interviews (E8)	.33	Listen Presentation (T11)	.28
	Lngthy Biz Conv'n (E34)	.30	Individual Study (T15)	.28
	Listen Biz Expert (E31)	.28	Life Experience (T20)	.26
	Authority Stmt (E26)	.26	<i>Think About Biz (E23)</i>	-.25
	<i>Think Abt Biz (T23)</i>	-.25	Authority Stmt (T26)	.24
	Education Videos (E7)	.24		
	Explicit to Tacit Ratio	<u>10/1</u>	Explicit to Tacit Ratio	<u>1/9</u>

TABLE 3***Paired Comparison Statistics for Explicitness and Tacitness Items***

	Items Pairings	Basic Item Statistics				Test #1		Test #2			Test #3			
		M (E)	Std. Dev.	M (T)	Std. Dev.	Corr.	Sig	t	df	Sig	E %		T %	
											L	H	L	H
1	E1 & T1	2.56	1.109	2.06	0.985	.303	.000	6.023	224	.000	1.3	31.5	19.2	3.1
2	E2 & T2	2.70	1.091	2.33	1.020	.290	.000	4.465	222	.000	2.2	19.6	13.0	3.6
3	E3 & T3	2.75	1.073	2.29	0.939	.384	.000	6.056	220	.000	2.7	18.5	12.2	4.9
4	E4 & T4	3.04	0.945	2.51	0.939	.056	.407	6.043	219	.000	1.4	10.5	4.1	3.7
5	E5 & T5	2.91	1.220	2.73	1.204	.391	.000	2.003	222	.046	5.4	18.4	12.6	10.8
6	E6 & T6	2.88	0.934	2.55	0.915	.161	.016	4.091	221	.000	1.4	10.4	6.8	2.3
7	E7 & T7	2.93	0.988	2.66	0.920	.201	.003	3.327	222	.001	1.4	9.0	8.1	2.7
8	E8 & T8	3.05	1.048	2.71	0.999	.065	.338	3.555	220	.000	2.7	9.9	6.3	5.8
9	E9 & T9	2.88	1.034	2.77	0.983	.184	.006	1.192	223	.235	2.8	7.6	8.1	2.2
10	E10 & T10	2.72	0.968	2.72	1.035	.101	.133	-0.050	221	.960	2.2	11.2	6.3	2.2
11	E11 & T11	2.77	1.011	3.12	1.033	.121	.070	-3.897	223	.000	5.8	6.7	8.0	3.6
12	E12 & T12	2.68	1.025	2.38	0.918	.259	.000	3.766	224	.000	0.5	14.2	13.8	2.2
13	E13 & T13	2.82	0.976	2.55	0.814	.121	.070	3.368	222	.001	0.4	6.8	6.3	2.7
14	E14 & T14	2.73	0.974	2.79	0.935	.196	.003	-0.716	224	.475	1.8	8.9	8.9	2.2
15	E15 & T15	2.82	1.063	2.62	0.987	.253	.000	2.349	222	.020	3.6	11.7	9.9	5.9
16	E16 & T16	2.96	1.010	2.53	0.946	.070	.296	5.869	222	.000	0.9	15.7	8.1	3.6
17	E17 & T17	2.91	0.933	2.78	0.957	.086	.203	1.527	220	.128	3.1	7.6	5.4	2.7
18	E18 & T18	2.93	1.237	2.19	1.011	.112	.097	7.345	221	.000	0.9	21.1	10.4	7.7
19	E19 & T19	2.83	0.969	2.78	2.235	.085	.208	2.038	221	.043	0.9	0.5	7.2	2.3
20	E20 & T20	2.87	1.267	2.37	1.046	.240	.000	5.210	223	.000	2.3	18.8	16.1	9.4
21	E21 & T21	2.66	0.953	2.77	0.979	.279	.000	-1.440	223	.151	3.2	6.7	9.9	2.7
22	E22 & T22	2.60	2.968	2.93	1.129	.100	.135	-1.594	222	.112	3.6	10.8	17.0	13.0
23	E23 & T23	3.06	1.115	3.42	1.004	.245	.000	-4.148	223	.000	13.8	2.7	7.6	9.8
24	E24 & T24	2.93	1.180	2.93	1.098	.238	.000	0.000	224	1.00	5.8	8.6	12.0	8.0
25	E25 & T25	3.00	0.961	3.02	0.963	.199	.003	-0.274	223	.784	5.4	4.5	5.7	6.3
26	E26 & T26	2.90	0.962	2.87	0.971	.005	.937	0.246	221	.806	4.1	3.6	3.6	3.6
27	E27 & T27	2.95	1.015	2.66	0.976	.203	.002	3.426	220	.001	2.7	8.6	6.3	3.6
28	E28 & T28	2.82	0.981	2.58	0.913	.102	.129	2.801	221	.006	0.9	9.0	6.3	3.1
29	E29 & T29	2.97	1.134	2.54	0.984	.309	.000	5.057	220	.000	0.9	13.1	9.0	7.7
30	E30 & T30	2.98	1.248	2.25	1.010	.157	.020	7.304	219	.000	1.4	19.6	12.3	7.3
31	E31 & T31	2.93	1.009	2.65	0.871	-.024	.724	3.122	223	.002	0.4	6.7	6.3	4.1
32	E32 & T32	3.16	1.186	3.19	1.160	.217	.001	-0.319	223	.750	14.3	4.9	5.8	13.0
33	E33 & T33	3.01	0.916	2.89	0.899	.203	.003	1.537	217	.126	2.7	3.6	4.5	3.7
34	E34 & T34	3.17	1.090	3.26	0.948	.147	.019	-1.060	222	.290	6.3	2.3	5.8	9.9
35	E35 & T35	2.74	1.181	2.32	1.000	.242	.000	4.652	223	.000	1.8	21.4	14.8	6.2
36	E36 & T36	3.07	1.088	2.57	0.867	.134	.046	5.832	222	.000	1.8	6.3	8.1	8.1

Appendix

KNOWLEDGE SOURCE EXPLICITNESS AND TACITNESS QUESTIONNAIRE

SOURCE OF EXPLICIT KNOWLEDGE: A source provides explicit knowledge when it provides knowledge that can clearly and easily be expressed in written or spoken form.

Please circle the number that best indicates the extent to which the listed source of knowledge has an **explicit** component. Very little Some Very much

Business newspapers (e.g., Wall Street Journal, Financial Times).	1	2	3	4	5
Popular business magazines (e.g., Forbes, Fortune, Business Week).	1	2	3	4	5
Course Textbooks	1	2	3	4	5
A business course.	1	2	3	4	5
Accounting numbers (e.g., return on assets, net income, sales).	1	2	3	4	5
Business case studies.	1	2	3	4	5
Business-related videos.	1	2	3	4	5
Interviews of people in business-related situations.	1	2	3	4	5
Team/group exercises.	1	2	3	4	5
Giving presentations.	1	2	3	4	5
Listening to presentations.	1	2	3	4	5
In-class discussions about current events.	1	2	3	4	5
Teachers' lectures.	1	2	3	4	5
Student discussions.	1	2	3	4	5
Individual study.	1	2	3	4	5
Listening to business experts.	1	2	3	4	5
Course projects.	1	2	3	4	5
Personal business experience.	1	2	3	4	5
Student sharing of business experiences.	1	2	3	4	5
Other personal life experiences.	1	2	3	4	5
Reports.	1	2	3	4	5
E-mails.	1	2	3	4	5
Thinking about business.	1	2	3	4	5
Personal insight.	1	2	3	4	5
Others' insights about business.	1	2	3	4	5
Statements made by authorities.	1	2	3	4	5
Business news shows (i.e., CNN, CNN Financial)	1	2	3	4	5
Popular business books.	1	2	3	4	5
Working with other people.	1	2	3	4	5
Business internships.	1	2	3	4	5
Listening to business leaders (i.e., CEOs, Managers)	1	2	3	4	5
Body language.	1	2	3	4	5
Comparisons of multiple businesses.	1	2	3	4	5
Lengthy business conversations.	1	2	3	4	5
Visual information (i.e., charts, diagrams, figures, pictures)	1	2	3	4	5
Degree program in business.	1	2	3	4	5