Knowledge Management and Polanyi

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ABSTRACT

In this paper, I assess the impact of Polanyi's epistemology on the business discipline of knowledge management (KM). Polanyi's epistemology has been misunderstood and misapplied in KM literature because of the influence of Ikujiro Nonaka. This misunderstanding is rooted in the misidentification of Nonaka's tacit knowledge with Polanyi's tacit knowing, a conflation of a shallow bifurcation of categories of knowledge with a rich process of knowing. I explore these misunderstandings as myths about Polanyi in KM literature. Finally, I conclude by arguing that indwelling is the best way of explaining and advancing Polanyi's epistemology and attempt to provide the essentials of Polanyi's epistemology in one sentence, one paragraph, and one page.

Introduction

I have witnessed a persistent misunderstanding of Polanyi's epistemology across both scholarly and popular materials. Excluding the present company of Polanyi scholars, it seems that most everyone misunderstands Polanyi's epistemology. The dominant and persistent explanation and application of Polanyi's epistemology relies on a bifurcated view of knowledge. According to this view, Polanyi simply divided knowledge into explicit, it can be articulated, or tacit, it cannot be articulated. Have they even read *TD*?[1]

My five-month-old grandson, Isaac Straw, can recognize his 16-year-old uncle, Caleb Wynn, from five feet away. The joy on Isaac's face is evidence enough that he made a new friend during the two weeks when Isaac, Caleb, and Isaac's parents traveled across the southern United States together. Isaac's recognition of Caleb is certainly an example of Polanyi's tacit knowing, but not because Isaac cannot articulate how he recognizes Caleb. And, not because Isaac has one kind of knowledge called tacit and another called explicit. No. Isaac's recognition of Caleb is an example of Polanyi's tacit knowing because Isaac's act of recognizing Caleb's face is based on indwelling. Isaac has indwelled the clues that contribute to recognizing Caleb's face as a whole. On the other hand, Isaac has not yet indwelled the clues that contribute to recognizing my face as a whole. Instead, he prefers to focus on one of the clues and spends most of his time pulling on my beard. Isaac's knowing has nothing to do with what he can or cannot articulate. This is surely an example of the richness of Polanyi's epistemology and the poverty of the bifurcated view of knowledge. Why, then, do so many people focus on the bifurcated view? Worse yet, why do so many persist in reducing Polanyi's epistemology to the bifurcated view?

Polanyi's epistemology is the "act of knowing based on indwelling" (*TD*, 24). I am either crazy or on to something significant. This paper will help me, and others, determine which of these

options is more correct. To that end, this paper serves two purposes. First, this paper is my attempt to identify key misunderstandings about Polanyi's epistemology in the business discipline of knowledge management (KM).[2] In section one, I introduce the business activity and research discipline of KM. In section two, I explore the impact of Ikujiro Nonaka's misunderstanding of Polanyi's epistemology on KM literature. In section three, I identify and address four myths about Polanyi's epistemology in KM literature. I have included an appendix with examples for each of these three sections in order to illustrate my arguments from KM literature. The fourth section marks a transition point where I turn from KM literature to Polanyi's epistemology. In this fourth section, I further address one of the four myths about Polanyi by investigating the narrative arc of *TD*. In doing this, I arrive at Polanyi's conclusion and his epistemology, which leads to the final section of this paper.

I conclude this paper with a section entitled, Essentials of Polanyi's Epistemology. This section fulfills the second purpose of this paper, which is to articulate my understanding of Polanyi's epistemology. In this section, I offer my understanding of Polanyi's epistemology in one sentence, one paragraph, and one page. My goal in this final section is twofold. I hope to garner correction and guidance from Polanyi scholars, and I hope to provide scholars outside of philosophy with the minimum required understanding of Polanyi's epistemology.

Introduction to Knowledge Management

KM is the business activity and research discipline focused on leveraging knowledge for organizational competitive advantage. I can best illustrate this formal idea with two simple examples: a twelve-year-old's kickball game and a one-man motorcycle shop. These examples will provide an easy onramp to our brief exploration of KM.

When twelve-year-old Bobby picks his kickball team on the playground he engages in the pragmatic form of the formal discipline called human resource management (HR). To facilitate his HR task Bobby uses KM in the form, "Does Joey know how to play kickball?" Later, during the game, Bobby will continue his use of KM by yelling, "Run Joey!" and whispering, "Sally. Kick the ball to Fred; he can't catch." Bobby, and the others playing with him, will rely on a knowledge repository for the rules of the game, perhaps their shared memory or Google. The creation and maintenance of the kickball rules repository for Bobby's community is a KM practice. Bobby learned his KM for kickball in the process of learning to play kickball. No one had to sit him down *after* he learned the game to inform Bobby that knowledge about kickball was important in playing kickball. Pragmatic KM is what twelve-year-old kickball players do. Holistically. Interactively. KM is part of the game.

We can see this same pragmatic KM at work in the hiring practice at a one-man motorcycle shop. Matthew Crawford (2009, 2015)[3] will evaluate the knowledge of any candidate desiring a job. Crawford may formalize his evaluation in a job application, interview process, and reference checks, or he may not. Formally or informally, Crawford will fulfill these functions, in part, to evaluate the knowledge of candidates. Crawford will select the best candidate, which certainly involves more than just evaluating knowledge, for his kickball…er…motorcycle repair team.[4] Once hired, the new employee will both contribute to and acquire knowledge. Included in the new employee and Crawford's KM practices will be the use of notes, service manuals, and YouTube videos (2015, 138). They will use these practices because the practices work. Pragmatic KM is what two-man motorcycle shops do. Holistically. Interactively. KM is part of the game, in kickball and in business.

The popularization of KM as a formal business activity and research discipline began with the publication of ten KM classics between 1993 and 1998 (Lambe, 2011). The roots of KM, however, reside in the economic vision of Peter Drucker (1968). Drucker identified an emerging knowledge economy where knowledge would supersede both capital and labor as the primary source of competitive advantage. In Drucker's economic vision, knowledge workers participating in knowledge work are the key drivers of the economy. There are many reasons to question this economic vision cast nearly 40 years ago.[5] However, when viewed in light of the actions of Bobby and Crawford, KM reveals itself as a simple acknowledgement of reality rather than a grand discovery of a new paradigm. Thus, KM is a recognition rather than an invention. Economic value, as culturally established worth, means that we have decided to acknowledge the value of knowledge in employment and the marketplace as well as formally discuss and attempt to advance knowledge in the organization. KM affords businesses and scholars the legitimacy of a community that supports their inquiry and practice. Because of this legitimacy, KM is a prominent business activity and a thriving research discipline supported by twenty-five peer-reviewed journals (Sorenko and Bontis, 2013).

KM includes activities associated with creation, storage, sharing, and application of knowledge within businesses. KM has significant overlap with organizational communication, HR, information systems, and epistemology. We are concerned with the overlap with epistemology in this paper. However, before we explore epistemology in KM we need to look briefly at the connection between KM and information systems as well as the efficacy of KM practices.

An information system is a computing based system for organizing data, such as Moodle or Blackboard course management systems at universities. Information systems mediate much of the activity of KM in businesses. The rise of computer based data management in the 70s was a critical factor in the rise of KM (Lambe, 2011). Thus, many view KM as an information systems issue. It is not, but there certainly is a strong relationship. We can see this strong relationship by contrasting individual and group KM practices. The Post-it or sticky note is a KM tool for individuals and very small groups. With a Post-it, we can leave a reminder or make a list for our self, our spouse, or a co-worker. But, what if that list is a project plan that we need to retain and use over eight months? Or, what if we need to share the details with 100 people? What then? The only answer today is an information system. All of the solutions for collecting, storing, and disseminating knowledge in large, dispersed organizations are information systems. This has led to an overemphasis of information systems' issues in KM research and practice. However, KM is beginning to mature out of this approach due to the failure of information system centric solutions that have ignored human factors (Arisha and Ragab, 2013).

The efficacy of KM practices in business is widely questioned. Rigby and Bilodeau (2015) have conducted annual or bi-annual global surveys to identify the top 25 business management tools and trends since 1996. KM appeared on the list from 1996 to 2011, but the satisfaction rating with KM never ranked above 22nd. KM has disappeared from the top 25 list in the two subsequent surveys of 2013 and 2015.

Nonaka's Tacit Knowledge in KM Literature

The dominate view of personal knowledge in KM literature is the division of knowledge into the two categories of explicit and tacit (Heisig, 2009). This division as well as the dominant conceptualization of tacit knowledge in KM[6] are due to the influence of Ikujiro Nonaka's Organizational Knowledge Creation Theory (Nonaka, 1994; Nonaka & Takeuchi, 1995).

Nonaka's 1995 book is one of the ten KM classics that launched KM as a major discipline (Lambe, 2011). It was the most cited work in KM literature from 1998 to 2007 by a large margin (Ma and Yu, 2010). Polanyi plays a significant role in KM because Nonaka has consistently cited Polanyi as the basis for Nonaka's conceptualization of tacit knowledge.

In Organizational Knowledge Creation Theory, Nonaka (1994) defined four modes of knowledge conversion: tacit-to-tacit, labeled socialization; tacit-to-explicit, labeled externalization; explicit-to-explicit, labeled combination; and explicit-to-tacit, labeled internalization. According to Organizational Knowledge Creation Theory, individuals create knowledge using the conversion processes of socialization, externalization, combination, and internalization (SECI). However, knowledge conversion using SECI "is a 'social' process *between* individuals and not confined *within* an individual" (Nonaka & Takeuchi, 1995, 61). Thus, individuals require community in order to use SECI to create knowledge. Organizational knowledge creation occurs when the organization amplifies and extends individual knowledge creation by involving larger and larger groups of individuals in SECI. Nonaka called this amplification and extension the spiral of organizational knowledge creation and identified five conditions that support this spiral: intention, autonomy, fluctuation, redundancy, and requisite variety (Nonaka & Takeuchi, 1995). Scholars have challenged the validity of Nonaka's SECI constructs on empirical and epistemological grounds (Gourlay, 2003; Gourlay and Nurse, 2005; Rice and Rice, 2005; Byosiere and Luethge, 2008).

The early Nonaka (1991, 1994; Nonaka & Takeuchi, 1995) divided personal knowledge into two categories based on whether or not that knowledge could be articulated (see Appendix A). However, Nonaka eventually claimed that he did not intend this bifurcated conceptualization of personal knowledge (Nonaka & von Krogh, 2009). In spite of Nonaka's later claim, his early Organizational Knowledge Creation Theory literature clearly described "two very different types of knowledge" (Nonaka, 1991, 98) and "two types of knowledge" (Nonaka, 1994, 16; Nonaka & Takeuchi, 1995, 224). Additionally, Nonaka (1994; Nonaka & Takeuchi, 1995; Nonaka & von Krogh, 2009) used the idea of *conversion* to describe changing tacit knowledge into explicit knowledge. Conversion was originally based on the ACT model (Anderson, 1983), which divided knowledge into two categories, and which Nonaka (1994) described as compatible with Ryle's (1949) two categories of knowing. Thus, Nonaka originally intended to describe two categories of knowledge with the conceptualization of explicit and tacit knowledge in Organizational Knowledge Creation Theory.

Nonaka's early literature has had a very large impact on KM research. Ma and Yu (2010) used citation, co-citation, and social network analysis to study KM literature published from 1998 to 2007. In the first period, 1998 to 2002, Nonaka's major Organizational Knowledge Creation Theory literature was number one with a combined frequency of 168[7], while second place had a combined frequency of only 97. In the second period, 2003 to 2007, Nonaka's major Organizational Knowledge Creation Theory literature was number one with a combined frequency of 194, while second place had a combined frequency of 161. In addition, Nonaka has influenced more than just KM. The Wall Street Journal (White, 2008) chose Nonaka as one of the top 20 most influential business thinkers. Nonaka's early works (1991, 1994; Nonaka & Takeuchi, 1995) have a combined Google Scholar citation count over 60,000. For comparison, Polanyi's combined Google Scholar citation count for *TD* and *PK* is just over 40,000.

Nonaka (1991, 1994; Nonaka & Takeuchi, 1995; Nonaka & von Krogh, 2009) has consistently cited Polanyi as the basis for Nonaka's conceptualization of tacit knowledge. Thus, Polanyi plays a significant role in KM literature because of Nonaka. *TD* was the fourth most cited

work in KM literature from 1998 to 2002, while Polanyi was the third most cited author during this period (Ma and Yu, 2010). *TD* was the ninth most cited work from 2003 to 2007, while Polanyi was the seventh most cited author during this period (Ma & Yu, 2010).

Unfortunately, Nonaka's understanding of Polanyi's epistemology was wrong (see Appendix B). Nonaka believed that Polanyi's epistemology was about the division of knowledge into two categories based on whether or not that knowledge could be articulated. Additionally, Nonaka believed that the beginning of Polanyi's argument in *TD*, "We can know more than we can tell" (p. 4), was the summary and conclusion of Polanyi's argument. Many scholars have taken Nonaka and much of the rest of the KM literature to task for incorrectly applying Polanyi's epistemology (Grant, 2007; Gueldenberg and Helting, 2007; McAdam, Mason and McCrory, 2007; Neuweg and Fothe, 2011; Oğuz and Şengün, 2011; Tsoukas, 2003; Virtanen, 2010).

Nonaka (Nonaka & von Krogh, 2009) responded to the criticism directed at his misunderstanding and misapplication of Polanyi's epistemology by claiming that he did not intend a bifurcated view of personal knowledge. Instead, he claimed he intended a knowledge continuum. Nonaka introduced (Nonaka & Toyama, 2003) and then developed (Nonaka & Peltokorpi, 2006) the knowledge continuum, but failed to include it as one of the "central elements" (Nonaka, von Krogh, & Voelpel, 2006, 1179) of Organizational Knowledge Creation Theory until much later (Nonaka and von Krogh, 2009).

Nonaka's (Nonaka and von Krogh, 2009) knowledge continuum consisted of explicit knowledge on one end and tacit knowledge on the other end with dynamic interaction along the full length of the continuum. Nonaka described this continuum as functioning in an analog fashion. The analog attribute permits knowledge to reside anywhere along the continuum. Thus, knowledge has both explicit and tacit characteristics, but more or less of each depending on where it falls on the continuum. Nonaka claimed that the knowledge continuum showed agreement between his work and Polanyi's epistemology, which it does not. Nonaka also claimed that the continuum supported and upheld the distinction between explicit and tacit knowledge in Organizational Knowledge Creation Theory.

Nonaka (Nonaka and von Krogh, 2009) addressed Polanyi's epistemology in more detail than in any of Nonaka's other works. Unfortunately, through all of this analysis Nonaka held to his longstanding view of Polanyi's epistemology: "According to Polanyi's work, tacit knowledge/knowing is impossible to communicate to others through articulation…Explicit knowledge is articulated, and therefore it can be communicated to others" (Nonaka and von Krogh, 2009, 640). However, in endnote three Nonaka distanced his work from Polanyi's epistemology: "Although Polanyi's work inspired the concept of tacit knowledge, organizational knowledge creation theory needed to expand it … Therefore, the concept of tacit knowledge was inspired by but not restricted to Polanyi's work" (648). Nonaka's new knowledge continuum did little to alter his misunderstanding of Polanyi or the influence of Nonaka's early bifurcated view of knowledge on the misunderstanding of Polanyi's epistemology within KM literature.

Polanyi's Epistemological Legacy in Knowledge Management

A number of authors have identified the disparity between the writings of Polanyi and the citations of Polanyi in KM literature (Grant, 2007; Neuweg and Fothe, 2011; Oğuz and Şengün, 2011; Virtanen, 2011). Grant (2007) concluded that over half of the KM authors citing Polanyi had likely not read Polanyi and that nearly one quarter of the papers had significantly misrepresented Polanyi. Oğuz and Şengün (2011) concluded that authors' use of tacit knowledge

in KM literature was closer to Ryle's (1949) knowing-how rather than Polanyi's tacit knowing. Thus, Polanyi is appealed to as an authority to support concepts within KM literature that do not align with Polanyi's epistemology. This has led to four persistent myths in KM literature related to Polanyi's epistemology (see Appendix C). Ultimately, each myth results in something that is not Polanyian even though authors cite Polanyi. Appendix C provides examples of KM literature that perpetuates each myth. All of the examples in Appendix C come from journals ranked among the top 10 most influential KM journals. In addition, all of the examples appeal to *TD* for their support.

The first myth claims that Polanyi was the first to conceptualize knowledge as explicit and tacit. He was not. Both *explicit knowledge* and *tacit knowledge* were phrases used in literature before Polanyi published his epistemology. Examples of the use of the phrase *explicit knowledge* include science (McKay, 1932), psychology (Ichheiser, 1943), sociology (Schütz, 1944), philosophy (Carnap, 1946), and mathematics (Koopmans & Reiersol, 1950). A notable example is Khun (1950), who was a contemporary of Polanyi's and worked within the philosophy of science, as did Polanyi. Examples of the use of the phrase *tacit knowledge* include advertising (Acheson, 1917), education (Jones, 1919), politics (Spurr, 1920), astronomy (Myers, 1931), and psychology (Brussel, 1945). None of these older works developed any kind of a theory or conceptualization of knowledge.[8] They simply paired common English language words together to convey relatively simple concepts. Ascribing the creation of these phrases to Polanyi fails to recognize the richness of his process of knowing and raises the phrases to the unwarranted level of explaining Polanyi's epistemology, which they cannot.

This first myth is significant because it establishes the wrong foundation and direction for understanding and applying Polanyi's epistemology. In addition, this myth contributes to the second myth, that Polanyi's epistemology is about the division of knowledge into the two categories of explicit and tacit (Henry, 2011). It is not. Polanyi's epistemology is the "act of knowing based on indwelling" (*TD*, 24). I offer a defense of this claim in the last two sections of this paper.

Polanyi did use the categories of explicit and tacit as a beginning point to the Lindsay Memorial Lectures of 1958. However, scholars should not make too much of his statement, "in my view…human knowledge is of two kinds" (1959, 12). He described these lectures as an introduction to *PK*, which had just been published. Polanyi presented this bifurcated view of knowledge in the third paragraph of the first lecture as a beginning point for those stuck with the idea that explicit knowledge was the only kind of knowledge. Polanyi proceeded through the remainder of the lectures to explain his early conceptualization of indwelling, which he further developed in *TD*.

The third myth claims that the quote, "We know more than we can tell" (*TD*, 4) is the conclusion of and an ideal summation of Polanyi's epistemology. It is not. Instead, it is simply Polanyi's beginning point in *TD*. If we confuse the beginning with the end, we have not simply misunderstood Polanyi's conclusion; we have failed to engage his argument. I demonstrate this by tracing the narrative arc of *TD* in the next section of this paper.

The fourth myth claims that Nonaka (1991, 1994; Nonaka & Takeuchi, 1995) incorporated Polanyi's epistemology into Organizational Knowledge Creation Theory. He did not. Nonaka built his conceptualization of personal knowledge in his theory on the three myths listed above. Many scholars have taken Nonaka to task for incorrectly applying Polanyi's work (Grant, 2007; Gueldenberg and Helting, 2007; McAdam, Mason and McCrory, 2007; Oğuz and Şengün, 2011; Tsoukas, 2003; Virtanen, 2010). Nonaka claimed to provide an expansion of Polanyi's ideas "in a

more practical direction" (1994, 16). He did not. Unfortunately, this last myth supports and perpetuates the other three myths about Polanyi's epistemology in KM literature.

The Narrative Arc of *TD* Chapter One

Polanyi's epistemological argument in the 55 paragraphs of *TD* chapter one follows a basic narrative arc: it has a beginning, middle, and end. The beginning is in paragraph seven. The middle is in paragraph 36. The ending is in paragraphs 51 and 52.[9]

"I shall consider human knowledge by *starting* …"

"… a *shift* of emphasis in our conception …"

"We have here reached our main *conclusions* …"

If we confuse the beginning with the end, we have not simply misunderstood Polanyi's conclusion; we have failed to engage his argument: we have abandoned Polanyi altogether. To embrace Polanyi, we must move from the beginning, through the middle, to the end. This is obvious enough, but rarely practiced. Literature abounds with those championing the beginning as Polanyi's conclusion. Perhaps the allure for scholars is that Polanyi stated his beginning more eloquently than his conclusion.

> "I shall reconsider human knowledge by starting from the fact that *we can know more than we can tell*. This fact seems obvious enough; but it is not easy to say exactly what it means." (*TD*, 4)

> "We have here reached our main conclusions. Tacit knowing is shown to account…Such indeterminate commitments are necessarily involved in any act of knowing based on indwelling." (*TD*, 24)

Perhaps the beginning is too eloquent. So eloquent that it is irresistible. Google Scholar returns over 2,400 results for the now famous quotation from the beginning of Polanyi's argument, "we can know more than we can tell." A similar search for the conclusion, "act of knowing based on indwelling", returns exactly eight hits.

Quotations of Polanyi's beginning seem appropriate in two situations: (1) to trace the flow of Polanyi's argument for critique, emphasis, or explanation; and (2) to create a new argument that begins at the same place as Polanyi's argument. Yet, the beginning is most often quoted as a surrogate for Polanyi's whole argument or as Polanyi's conclusion. It is neither. Plainly and simply, it is the beginning of his argument. It is the problem statement. Thus, I have a request for scholars quoting the beginning of Polanyi's argument: Please stop. Instead, embrace Polanyi's full argument, which means using his conclusion as his conclusion.

Neither misunderstanding nor mystery should surround Polanyi's conclusion in *TD* chapter one. Polanyi summarized his conclusion in the first sentence of *TD* chapter two, toward the end of chapter two, and then again in the first two sentences of chapter three.

"I have given you an account of the way we exercise our tacit powers of knowing" (*TD*, 29).

"I described in my last lecture the tacit process of comprehension by which we take in the meaning of communication addressed to us" (*TD*, 45).

"My first lecture dealt with our power of tacit knowing. It showed that *tacit knowing achieves comprehension by indwelling*, and that all knowledge consists of or is rooted in such acts of comprehension" (*TD*, 55, emphasis added).

These summaries do not regurgitate the beginning of Polanyi's epistemological argument, which is the problem statement. Rather, they are genuine summaries of Polanyi's conclusion. Scholars seeking to apply or summarize Polanyi's epistemology should follow Polanyi's example. They should not regurgitate the problem statement. Instead, they should take note of the narrative arc of *TD* chapter one, the actual conclusion of chapter one, and Polanyi's own summaries of that same chapter. Based on attention to these items, the epistemological battle cry of every scholar using Polanyi's epistemology should be, "act of knowing based on indwelling" (*TD*, 24).

Essentials of Polanyi's Epistemology

My goal in this section is to state clearly and accurately Polanyi's epistemology in one sentence, one paragraph, and one page. Thus, the duplication that you will encounter is intentional. The one sentence is the first sentence of the one paragraph, which is the first paragraph of the one page. The one page version is formatted to stand alone. Thus, the heading is different and the citations are included as footnotes. The one sentence, one paragraph, and one page are the academic equivalent of soundbites. They are a starting point. I write these soundbites for scholars outside of philosophy who want to apply Polanyi's epistemology in their discipline. To these scholars I say; if you write only one sentence about Polanyi's epistemology, use the indwelling quotation from *TD* found in the one sentence below. If you can only briefly explain Polanyi's epistemology, use the concepts in the one paragraph below. However, you must understand the one page in order to apply Polanyi's epistemology in your discipline.

Polanyi's Epistemology in One Sentence
Polanyi's epistemology is the "act of knowing based on indwelling" (*TD*, 24).

Polanyi's Epistemology in One Paragraph
Polanyi's epistemology is the "act of knowing based on indwelling" (*TD*, 24). Indwelling is incorporating something into your physical-mental self. When we indwell something, we interiorize it, then think and act from it. Indwelling facilitates a *from-to* structure whereby we attend *from* the thing we indwell for attending *to* something else. We attend from the shapes and sounds of an alphabet for attending to words; from words and grammar to the meaning of sentences; from sentences to paragraphs. Polanyi labeled the act of knowing based on indwelling as tacit knowing. "Since all understanding is tacit knowing, all understanding is achieved by indwelling" (Polanyi, 1962, 606).

Essentials of Polanyi's Epistemology on One Page
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Polanyi's epistemology is the "act of knowing based on indwelling."[1] Indwelling is incorporating something into your physical-mental self. When we indwell something, we interiorize it, then think and act from it. Indwelling facilitates a *from-to* structure whereby we attend *from* the thing we indwell for attending *to* something else. We attend from the shapes and sounds of an alphabet for attending to words; from words and grammar to the meaning of sentences; from sentences to paragraphs. Polanyi labeled the act of knowing based on indwelling as tacit knowing. "Since all understanding is tacit knowing, all understanding is achieved by indwelling."[2]

Tacit knowing relies on two types of awareness: focal and subsidiary. Our focal awareness is on the thing that has our physical-mental focus, such as a word. Our subsidiary awareness is everything we have indwelled that facilitates understanding at the focal level, such as the shapes and sounds of an alphabet. Focal awareness is about knowing a whole. Subsidiary awareness is about the indwelled clues that contribute to knowing that whole. Our integration of the clues is the meaning of the whole. We know a word by attending to that word (focal awareness) and relying on our indwelled knowledge of the shapes and sounds of an alphabet (subsidiary awareness). In this way, we attend *from* the alphabet *to* the word.

Focal and subsidiary awareness are bound together in the *from-to* structure of tacit knowing. We cannot know a word without relying on our subsidiary awareness of an alphabet. Likewise, we cannot know a word by focusing on a single letter of the alphabet. Tacit knowing is always from the clues (subsidiary awareness) to a whole (focal awareness). We can only know the joint meaning of the clues (letters) as we indwell them and attend from them to a whole (word). Thus, our subsidiary awareness of the indwelled clues must be tacit: it must be outside our focal awareness. As soon as we choose a single letter as our whole (focal awareness), we destroy it as subsidiary: it is no longer tacit. It is no longer indwelled. It is no longer a clue for a whole. It is the whole, and it requires its own set of indwelled clues as our subsidiary awareness.

We frequently shift our focal awareness. As we do, our tacit subsidiary awareness follows and serves our new focal awareness. We rely on an alphabet to know a word. We rely on words and grammar to know a sentence. This pattern of subsidiary awareness following and serving focal awareness holds true for paragraphs, chapters, books, and every act of knowing. We may choose to focus on a single letter of an alphabet, a whole book, riding a motorcycle, a murder mystery, or the impact of technology on society. In each case, our ability to know the whole is dependent on our subsidiary awareness of indwelled knowledge. In this way, all understanding is achieved by indwelling.

"The nature of tacit knowing means that our body is the instrument by which we know the world."[3] Focal awareness is distal, situated away from us. However, indwelling is an incorporating into or extending of our body. Thus, our subsidiary awareness is proximal, near to the center of us. We use our subsidiary awareness as we use your body, for attending to things outside it. Thus, there is "*personal participation* of the knower in all acts of understanding."[4]

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[1] Michael Polanyi. *The Tacit Dimension*. New York: Doubleday & Company, 1966; University of Chicago Press edition, 2009, 24.

[2] _____. "Tacit Knowing: Its Bearing on Some Problems in Philosophy." *Reviews of Modern Physics,* 34, no. 4 (1962): 601-615, 606.

[3] Richard Gelwick. *The Way of Discovery: An Introduction to the Thought of Michael Polanyi*. Oxford University Press, 1977, 70.

[4] Michael Polanyi. *Personal Knowledge: Towards a Post-Critical Philosophy*. Chicago: University of Chicago Press, 1958; University of Chicago Press, 1974, vii.

Appendix A
Nonaka's Significant Descriptions of Tacit Knowledge

Source	Description of Tacit Knowledge
Nonaka (1991)	One of "two very different types of knowledge" (98). "Not so easily expressible" (98) as explicit knowledge. "Tacit knowledge is highly personal. It is hard to formalize and, therefore, difficult to communicate to others" (98). "Tacit knowledge is also deeply rooted in action and in an individual's commitment to a specific context" (98). "Tacit knowledge consists partly of technical skills—the kind of informal, hard-to-pin-down skills captured in the term 'know-how'" (98). "Tacit knowledge has an important cognitive dimension. It consists of mental models, beliefs, and perspectives so ingrained that we cannot easily articulate them" (98).
Nonaka (1994)	The "distinction [between tacit and explicit knowledge] represents what could be described as the epistemological dimension to organizational knowledge creation" (15). One of the "two types of knowledge" (16). "On the other hand, 'tacit' knowledge has a personal quality, which makes it hard to formalize and communicate" (16). "Tacit knowledge is deeply rooted in action, commitment, and involvement in a specific context" (16). "Tacit knowledge involves both cognitive and technical elements. The cognitive elements…include schemata, paradigms, beliefs, and viewpoints…the technical element of tacit knowledge covers concrete know-how, crafts, and skills that apply to specific contexts" (16). "Tacit knowledge is a continuous activity of knowing … [with an] 'analogue' quality … [where] communication between individuals may be seen as an analogue process that aims to share tacit knowledge to build mutual understanding" (16).
Nonak, Byosiere, Borucki, and Konno (1994)	Identical to Nonak (1994).
(continued)	

Nonaka and Takeuchi (1995)	"… *tacit knowledge,* which is hard to articulate with formal language. It is personal knowledge embedded in individual experience and involves intangible factors such as personal belief, perspective, and the value system" (viii). "Tacit knowledge is highly personal and hard to formalize, making it difficult to communicate or to share with others. Subjective insights, intuitions, and hunches fall into this category of knowledge" (8). "Tacit knowledge is deeply rooted in an individual's action and experience, as well as in the ideals, values, or emotions" (8). "Tacit knowledge can be segmented into two dimensions. The first is the technical dimension, which encompasses the kind of informal and hard-to-pin-down skills or crafts captured in the term 'know-how'" (8). "Tacit knowledge contains an important cognitive dimension. It consists of schemata, mental models, beliefs, and perceptions so ingrained that we take them for granted" (8). "But the subjective and intuitive nature of tacit knowledge makes it difficult to process or transmit the acquired knowledge in any systematic or logical manner" (9). One of the "two types of knowledge" (225).

Appendix B
Nonaka's Significant References to Polanyi's Epistemology

Source	References to Polanyi
Nonaka (1991)	"Tacit knowledge is highly personal. It is hard to formalize and, therefore, difficult to communicate to others. Or in the words of the philosopher Michael Polanyi, 'We can know more than we can tell'" (98).
Nonaka (1994)	"One dimension of this knowledge creation process can be drawn from a distinction between two types of knowledge—'*tacit knowledge*' and '*explicit knowledge*.' As Michael Polanyi (1996, p. 4) put it, 'We can know more than we can tell' (16). "Polanyi classified human knowledge into two categories. 'Explicit' or codified knowledge refers to knowledge that is transmittable in formal, systematic language. On the other hand, 'tacit' knowledge has a personal quality, which makes it hard to formalize and communicate." (16). "In Polanyi's words, [tacit knowledge] 'indwells' in a comprehensive cognizance of the human mind and body" (16). "While Polanyi articulates the contents of tacit knowledge in a philosophical context, it is also possible to expand his idea in a more practical direction" (16). "As Polanyi noted, 'commitment' underlies human knowledge creating activities" (17). "As Nisbet (1969, p. 5) noted, '(m)uch of what Michael Polanyi has called 'tacit knowledge' is expressible—in so far as it is expressible at all—in metaphor'" (20).
Nonak, Byosiere, Borucki, and Konno (1994) (continued)	Identical to Nonak (1994), with the following exception. "Building from concepts introduced by Polanyi (1966), Nonaka's (1994) dynamic theory of knowledge creation identifies four major knowledge conversion modes which are based on the interchange between tacit and explicit knowledge" (348).

Nonaka and Takeuchi (1995)	"As for the epistemological dimension, we draw on Michael Polanyi's (1966) distinction between *tacit knowledge* and *explicit knowledge*" (59). "Polanyi contends that human beings acquire knowledge by actively creating and organizing their own experiences. Thus, knowledge that can be expressed in words and numbers represents only the tip of the iceberg of the entire body of knowledge. As Polanyi (1966) puts it, 'We can know more than we can tell' (p. 4)" (60). "Polanyi contends that human beings create knowledge by involving themselves with objects, that is, through self-involvement and commitment, or what Polanyi calls 'indwelling'" (60). "While Polanyi argues the contents of tacit knowledge further in a philosophical context, it is also possible to expand his idea in a more practical direction" (60). "As Nisbet (1969, p.5) noted, '(m)uch of what Michael Polanyi has called 'tacit knowledge' is expressible—in so far as it is expressible at all—in metaphor'" (66). "As Polanyi notes, commitment underlies human knowledge-creating activity" (75). "We did not include Polanyi in Chapter 2, because he is still considered minor in Western philosophy because of his view and background…Polanyi's philosophy has implicit or explicit agreements with those of 'later' Wittgenstein and Merleau-Ponty…see Gill(1974)" (endnote 5, 91).

Appendix C
Four Significant Myths in KM Literature Related to Polanyi's Epistemology

Myth	Examples of literature that perpetuates the myth
Polanyi was the first to conceptualize knowledge as explicit and tacit.	"… explicit and tacit knowledge – were first introduced by Polanyi (1966)" (Harvey, 2012, 401). "… explicit and tacit knowledge. Polanyi (1966) was the first to introduce these concepts …" (Hassandoust, 2011, sect. 2.1).
Polanyi's epistemology is about the division of knowledge into the two categories of explicit and tacit.	"… Polanyi (1966) classifies knowledge into explicit and tacit knowledge …" (Sharma, Banati, & Bedi, 2012, 3) "Polanyi (1966) categorized knowledge into two types: explicit knowledge and implicit (tacit) knowledge …" (C. Wang & Han, 2011, 804). "Knowledge may be classified into two general categories: explicit and tacit (Polanyi, 1966)" (Nold, 2011, 85). "Knowledge is classified into two types as tacit and explicit by Polanyi (1966, p. 135-146)" (Ramasamy & Thamaraiselvan, 2011, 278). The cited text, *TD* ends at page 99. "The premise of the 'knowledge creation theory' is the supposition that knowledge can be classified as either tacit or explicit (Polanyi, 1966) …" (Magnier-Watanabe, Benton, & Senoo, 2011, 18). "As for knowledge itself we work with Polanyi's concept of two dimensions, explicit and tacit (Polanyi, 1966)" (Mládková, 2011, 252).
"We know more than we can tell" (*TD*, 4) is an ideal summation of Polanyi's epistemology.	"Tacit knowledge is often referred to as knowing 'more than we can tell' (Polanyi, 1699, p. 4)" (Peet, 2012, 47). "Polanyi (1966, p. 4) concisely sums up tacit knowledge with the phrase 'we know more than we can tell'" (Suppiah & Sandhu, 2011, 464).

(continued)

Nonaka incorporated Polanyi's epistemology into organizational knowledge creation theory.	"Nonaka's theory is based on Polanyi's (1966) notion that there are two types of knowledge explicit and tacit" (Arling & Chun, 2011, 232). "… explicit and tacit knowledge. Polanyi (1966) was the first to introduce these concepts then further explained by Nonaka and Takeuchi (1995)" (Hassandoust, 2011, sect. 2.1).

Endnotes

[1] In KM literature, apparently not. Grant (2009) concluded that only 37% of the authors in the papers he evaluated had clearly read Polanyi, in 42% it was unlikely the authors had read Polanyi, and 23% of the papers had significantly misrepresented Polanyi.

[2] My dissertation (Straw, 2013) was my first attempt to explore Polanyi's epistemology in KM literature. Thus, I am sticking with familiar ground. However, I have seen examples of misunderstandings of Polanyi's epistemology, similar to the ones I identify in this paper, in literature associated with other disciplines.

[3] Crawford was scheduled to be the keynote speaker at the conference where this paper is being presented: Polanyi Studies: Past, Present, and Future in Nashotah, Wisconsin, June, 2016. However, I have heard that he will not be able to attend the conference. That is unfortunate. I enjoyed his books, and, as a fellow motorcycle rider, I appreciated his examples. I was looking forward to connecting with him at the conference. Nonetheless, his motorcycle repair work serves as a good example for this paper.

[4] The logical connection here is more than a joke. It is vitally important to a well-grounded understanding of KM.

[5] Crawford (2009) does an excellent job of challenging this vision and painting the ugliness of what passes for knowledge work. "Wherever the separation of thinking from doing has been achieved, it has been responsible for the degradation of work" (37).

[6] I claim that Nonaka's conceptualization of tacit knowledge is the dominant conceptualization, but not that it is without controversy or that KM scholars have reached a consensus. The construct of tacit knowledge has generated much controversy in KM literature. This controversy is far from being resolved. Tacit knowledge has served as a warehouse construct for holding all knowledge that is not explicit knowledge. Competing conceptualizations of tacit knowledge have led to many attempts to clarify the meaning of tacit knowledge. Yet, scholars have not reached a consensus on the meaning of tacit knowledge within KM (Oğuz and Şengün, 2011; Venkitachalam and Busch, 2012).

[7] Ma and Yu (2010) separate specific publications. However, I am most interested in total impact, so I have combined the frequency counts for Nonaka's publications as well as those of the second place author, Davenport. Nonaka and Takeuchi (1995) is the number one single piece of literature during the entire period of 1998 to 2007. It had a frequency count of 104 during the first period, 1992 to 2002, and 143 during the second period, 2003 to 2007.

[8] Turner (2014) traces the idea of tacit knowledge back to Aristotle and connects it to various philosophers throughout the ages, including Polanyi. Turner argues that there is a common epistemological thread through the works of all of these philosophers. That may or may not be correct, but that is not the argument I am making here. I am pointing out that authors have been using the words *explicit* and *tacit* to describe knowledge for a long time, and that their use of these words have largely been without any clear epistemological framework. Turner also illustrates the poor scholarship of those who use Polanyi while at the same time ignoring what Polanyi actually wrote. See page one, paragraph two as well as page nine, paragraph one. Turner has a populist mishmash understanding of Polanyi's epistemology to the point of offering quotations, without citations, that are obviously wrong.

[9] The beginning is *TD*, page four (emphasis added). The middle is on page 17 (emphasis added). The ending is on page 24 (emphasis added).

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