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JUST DO IT! WEB 2.0 AND THE BREAKING OF THE TACIT DIMENSION FOR KNOWLEDGE ACQUISITION

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ABSTRACT

Does Web 2.0 facilitate the conversion of tacit knowledge to explicit knowledge? Prior research has focused on the conversion of tacit knowledge to explicit within the context of organizations and builds upon assumptions made during the period when information technologies were not readily available and accessible to the general population. Recently, there have been dramatic changes to the information technology landscape due to the advent of Web 2.0. A unique characteristic of the Web 2.0 era is the dissemination and absorption of knowledge and information by almost anyone at any time. This conceptual research in progress builds upon the theory that explicit and tacit knowledge are dichotomous constructs on a continuum scale. We use this theory to examine how features of Web 2.0 convert increasing kinds of tacit knowledge to explicit knowledge; allowing for greater dissemination and acquisition by the layman and artificial intelligence agents. For the layman, we discuss the current limitations we face in empirically documenting and measuring this phenomenon and the benefits of a randomized digital field experiment. We conclude with the implications of the research for academia and practitioners.

Keywords

Tacit Knowledge, Automation, Information Technology, Skillsets

INTRODUCTION

The literature has recognized two distinct but interrelated types of knowledge, tacit knowledge and explicit knowledge. Explicit knowledge is knowledge that is easily stored, communicated, and transferred (Lam, 2000). This type of knowledge is what one would associate with learning mathematics or learning a new recipe. On the other hand, tacit knowledge has the characteristics of being intuitive, hands on, and comprised of a human element such as emotional intelligence, creativity, intuition. It is the knowledge associated with learning to ride a bike, intentional uses of body language, and recognizing a face. It is knowledge that comes from “doing”. The literature has depicted tacit knowledge as difficult to formalize and communicate (Polanyi, 1966). Like most binary conceptualizations of theory, the literature has begun to view each type of knowledge as polar opposites on a continuum scale (Inkpen & Dinur, 1998; Nonaka & Von Krogh, 2009; Hall & Andriani, 2003). Researchers previously believed that the acquisition of tacit knowledge could only occur within an organization where members needed close interaction as well as the time and space to develop a shared understanding for learning (March, 1991).

Much of the literature lies in the Knowledge Management stream and focuses on tacit and explicit knowledge within the context of organizations, and more specifically for the attainment of organizational goals. Where tacit knowledge is viewed as a valuable strategic resource which can be used as a source of competitive advantage; either by making the tacit knowledge more explicit or by combining it with existing explicit knowledge within the organization (see Lam, 2000; Johannessen, Olaisen, & Olsen, 2001; Munoz, Mosey, & Binks, 2014; Hernandez, 2003; Li & Gao, 2003; Berg, 2008; Miller, Zhao, & Calantone, 2006). There is a research stream (see Johannessen, Olaisen, & Olsen, 2001; Griffith, Sawyer, & Neale, 2003) which specifically discusses the interaction of information technologies with tacit and explicit knowledge acquisition; however, this research is also within the context of organizations. In addition, empirical research has emerged over the last two years regarding tacit knowledge sharing via Web 2.0 however; the research is still within the context of organizations. (see Panahi, Jason, & Helen, 2013; Kaeromane, Dominic, & Rias, 2015; Panahi, Watson, & Partridge, 2015).

Recently, there has been dramatic changes to the information technology landscape within organizations and outside of them where information technology has now permeated all aspects of modern day life due to the ubiquity of wireless, broadband,

and cellular services (File & Ryan, 2014; Wells & Lewis, 2006; Smith, 2014). We refer to this phenomenon as “Web 2.0”. A unique characteristic of Web 2.0 is that it enables the dissemination and absorption of knowledge and information by almost anyone at any time (Sharples, Taylor, & Vavoula, 2005, Cobroft & Towers S.J., 2006). Web 2.0 is also characterized by an unimaginable volume of information creation. There are over 464 billion archived web pages going as far back as 1996, 3.5 billion weekly tweets, more than 757 million daily Facebook users, and every 24 hours individuals watch hundreds of millions of hours of videos on YouTube (DeSilver, 2014; Oreskovic, 2015; YouTube, 2016 ;WayBack Machine, 2016). In the broad, disparate literature stream of Education, researchers have documented that Web 2.0 is transforming the formal educational landscape by allowing individuals more flexibility and opportunity to learn (Bryan, 2006; Ajjan & Hartshorne, 2008; George & Navarette, 2012). However, there is still a glaring research gap regarding Web 2.0’s role in the conversion of tacit to explicit knowledge outside of the context of formal organizations. The broad research question we would like to explore is “Does Web 2.0 facilitate the conversion of tacit knowledge to explicit knowledge?” This question is important for individuals in the workforce as well as the research on artificial intelligence agents.

According to Forbes, in 2013 firms spent \$70 billion on employee training and education (Bersin, 2014). In addition, individuals owe the federal government over \$1 trillion in student loan debt despite a purported U.S. skillsets shortage (Chopra, 2013; Mutikani, 2015). Understanding tacit knowledge acquisition via Web 2.0 can enhance an individual’s personal competitiveness in the labor market, allow for additional sources of income via a new skillset, and can even reduce costs for employers, as they do not have to hire and train new talent. We posit that Web 2.0 allows for continuous learning and exposure to information for tacit knowledge acquisition. This research is also important to the academic research on artificial intelligence where codifying the so-called “tacit dimension” is one of the only remaining barriers to automation (see Autor, Levy, & Murnane, 2003; Frey & Osborne, 2013). The use of emerging analytic capabilities on existing Web 2.0 content may be the unlocking key. For example, a human or a robot cannot learn a task from viewing one or even three YouTube videos. There are variances in the quality and relevancy of the videos, especially for a complex task. However, if multiple videos are viewed patterns will begin to emerge. Researchers at Cornell University and the University of Maryland have both developed robots that can watch a large number of YouTube videos and pick up these patterns. Once these patterns are identified for a task; common steps can be derived, ordered, learned, and then executed by the robots (Griffin, 2014; Epstein, 2015). In another example, sophisticated recommender systems have the tacit ability of persuasion and intuition. By analyzing digital traces that internet users leave behind, suggestions can be made for new products, new content to view, and even new friends. Next, we discuss our theoretical framework, then measuring and documenting the phenomenon, followed by our discussion and conclusion.

THEORETICAL FRAMEWORK

Our theoretical framework is a synthesis of the theory proposed by Jasimuddin et al (2005) which describes features of tacit knowledge and explicit knowledge as constructs on a continuum scale; as well as the technology knowledge management taxonomy proposed by Al-Aama (2014). Two causal mechanisms motivate our theoretical framework, 1) Disseminators of content utilize Web 2.0 tools for tacit knowledge creation, sharing, and distribution 2) Acquirers of tacit knowledge utilize Web 2.0 tools for capturing knowledge. Our theory is that Web 2.0 facilitates the creation of content that can be disseminated using a number of information technologies and absorbed by the users utilizing their favorite content creators and information technology(s) of choice. Figure 1, is an illustration of our theoretical framework. In this section, we provide more details on our theoretical framework.

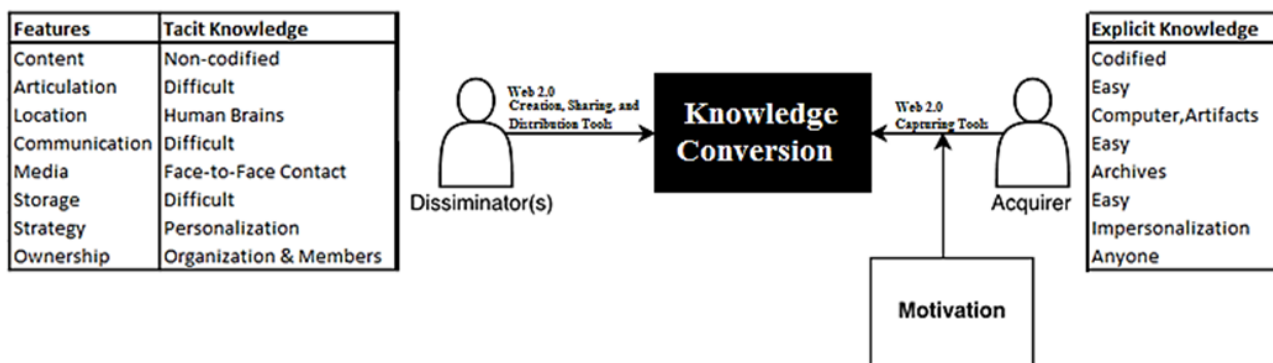


Figure 1- Illustration of Theoretical Framework

*Acquirer also refers to artificial intelligence agents in which case motivation as a mediator would not apply

Tacit Knowledge Conversion

The scope of our research is to understand whether Web 2.0 converts increasing kinds of tacit knowledge to explicit knowledge. At the moment, we do not focus on unpacking the proverbial black box of knowledge conversion. Figure 2, are examples of tacit knowledge now made explicit due to Web 2.0 mechanisms.

Tacit Knowledge Made Explicit	Potential Web 2.0 Mechanism
Organizational Culture and Social Norms	Reddit, GlassDoor, Askamanager
Most types of formal education including Physics, Engineering, Music, and Writing	Massive Online Open Courses (e.g.MIT, Stanford, Coursera). YouTube , site like Khan Academy Internet search engines
Emotional Intelligence	YouTube, Reddit, and Social Media
Life skills including car and home repairs, personal grooming, and learning a new language	YouTube, Skype, Language Exchange Sites
Driving a car	Algorithms
Persuasion and Selling	Social Media, Digital Traces, Algorithms
Cooking	YouTube and Algorithms
Interpreting Sentiment	Social Media and Algorithms

Table 1- Tacit Knowledge Made Explicit with Web 2.0

Content, Storage, and Location

In a world with Web 2.0, words and symbols take on deep and multifaceted meanings; allowing content to be noncodified and its full meaning to be absorbed by others. This allows many different types of individuals to express their deepest thoughts, opinions, and biases; ranging from the mundane such as their favorite food to their place of employment, television shows, and even their favorite subject matter. The storage of tacit knowledge prior to Web 2.0 was difficult and elusive and resided within one or more persons within an organization. The growth of information technology and its artifacts has led increases in the capacity for the computation, storage, and retrieval of thoughts, habits, and biases (Lyon, 2003). Where the location of the tacit knowledge has gone from humans to Web 2.0 tools such as the internet search engines, smartphones, laptops; even twitter hashtags can store tacit knowledge. This has given way to emerging analytic capabilities that makes unlocking the storage of tacit knowledge even easier. Emerging analytic capabilities coupled with artificial intelligence agents such as machine learning algorithms can now have greater insight into the tacit dimension; unlocking sentiment, societal biases, and even pattern development.

Media, Ownership, and Communication

There are multiple modes of communication in the age of Web 2.0 each with its own unique characteristics and rules. Boyd (2008) posits that the internet is comprised of “Network Publics”. These are public spaces on the internet where different conflicting contexts and social norms co-exist. This has allowed users of Web 2.0 to develop sophisticated communication strategies to get a message across. In addition, the rich content creation capabilities enabled by Web 2.0 now allow for tacit knowledge acquisition without the learner having to be there in person. Previously, tacit knowledge was only obtained via face-to-face contact. Web 2.0 circumvents this by the archiving of face-to-face storytelling via interactive videos on sites such as YouTube. Furthermore, Web 2.0 enables the dissemination of tacit knowledge to individuals who would not be considered members of the organization for which the tacit knowledge is intended. Web 2.0 disintegrates the notion that an organization and its members can only own knowledge. There are numerous examples of this phenomenon with sites such as GlassDoor.com, Reddit, and askamanager.com. Anonymous outsiders have the ability to attain tacit knowledge such as how to personally present them, negotiate salary, interview, work within an organizations culture, and even how to resolve interpersonal conflicts.

Articulation and Strategy

Web 2.0 enables the dissemination of knowledge and information as it allows an individual access to subject matter experts for the attainment of knowledge in increasingly complex subject areas. Individuals now have access to subject matter experts who “look and speak” in the same way the learner does or prefers. One such example of a subject matter expert is Salman Khan of Khan Academy who has an uncanny ability to break down complex topics into their simplest forms and to do so in a

way that does not make the learner feel self-conscious. From Web 2.0 individuals can learn how to fix a headlight, dancing, learning an instrument, and building furniture. This is enabled by the easy articulation of tacit knowledge as users can quickly seek clarification from other learners and the content creator as they acquire the knowledge on their own.

Motivation as a Mediator

We posit that a mediator to tacit knowledge acquisition via Web 2.0 is an individual's motivation to capture the knowledge. Individuals may be motivated to use Web 2.0 tools for tacit knowledge acquisition for a couple of reasons, 1) The individual possesses high personal innovation 2) The fear that current skillsets will become outdated due to technological change. Regarding high personal innovation, the literature on skill biased technical change has noted that new technologies previously favored individuals with college educations (see Bresnahan, Brynjolfsson, & Hitt, 2002; Bright, 1958; Katz & Margo, 2012; Haskel & Ylva, 1999). Overtime, as the availability of information technologies increased it was more likely to be used by those not only with formal educations but also individuals with a high openness to personal innovation. Agarwal and Prasad (1998) argue that this trait much like an individual's personality is a relatively stable descriptor of an individual and does not change across environments. We argue that as information technologies have become more accessible to the general population, individuals may have found themselves to possess high personal innovation despite their formal education attainment. Thereby, motivating these individuals to utilize information technologies for tacit knowledge acquisition. Second, Behaghel et al (2014), argue that the demand for older workers has been negatively impacted by rapid information technology development, which causes acceleration in the loss of skillsets for these workers regardless of educational attainment. This is compounded by the fact that IT driven organizational changes causes firms to let go of workers because they find it unprofitable to retrain them. For many "at risk" individuals' continuous learning and exposure via Web 2.0 serves as a hedge against the outdatedness of their skillsets, whether it is interpersonal or technical. Next, we discuss our difficulties with measuring and documenting the phenomenon and our plans for future research.

MEASURING AND DOCUMENTING THE PHENOMENON

For artificial intelligence agents we are able to more readily document and measure tacit knowledge acquisition via Web 2.0. We have observational and artifact data, ranging from patents on emerging technologies to news wires on cutting edge technological breakthroughs; we also have academic research. For the laymen, tacit knowledge acquisition is difficult to objectively measure. One way it can be measured is through skillset changes where skillsets have traditionally been measured via *formal education attainment* (see Berman et al 1993; Bresnahan et al, 2002), *on the job training* (see Borghans et al, 2001; Heckman et al 2002; Lynch, 1991), *off the job training* such as correspondence courses (Veum 1995; Liu & Batt, 2007) or by the *tasks performed within an occupation* i.e. the task model which has the benefit of separating skill from educational attainment (see Berndt et al 1992; Jaimovich & Siu 2012; Shim & Yang 2014; Goos & Manning 2009; David et al, 2006).

A limitation of current skillset or knowledge acquisition schemas is the reliance on employment, education, and occupational data where changes within the datasets may be confounded by the impact of labor supply and demand decisions. Our prior use of econometric modeling methods, which utilized the *task model*, does not appear to be able to adequately control for this. Furthermore, this conceptualization requires a high burden of proof for the utility of Web 2.0. Where we assume that not only did an individual acquire tacit knowledge, they acquired it and changed their occupations or another characteristic related to their employment. With this conceptualization, the empirical identification challenge then becomes accounting for the movement of labor within and between occupations and industries due to Web 2.0. This is not quite what we are trying to measure. In addition, this rigorous conceptualization will not be able to account for knowledge acquisition of the "softer skills" such as human resource management. Because of this, we will not be able to utilize traditional occupation, education, or employment datasets to study this phenomenon for the layman. Surveys and structural equation modeling techniques show promise in documenting and quantifying the phenomenon and show promise in untangling the black box of knowledge conversion i.e. how does tacit knowledge conversion occur via Web 2.0.

To answer our research question for the layman, we are evaluating the efficacy of a randomized digital field experiment utilizing the test bank of an online labor provider, or a similar test bank, to measure tacit knowledge acquisition within a pre-selected tacit knowledge domain. This test bank has the ability to measure numerous tacit knowledge domains ranging from various types of soft skills to performance art and is able to do so in a matter of minutes by measuring an individual's knowledge of the "specific rules of thumb" for a particular domain. This experiment design will inherently control for the effects of labor supply and demand decisions on tacit knowledge acquisition via Web 2.0; by taking advantage of the fact that the online labor provider has an incentive to validate the knowledge base of individuals offering labor on their site

regardless of the individuals formal education, work experience, and professional accreditations. Our experiment will consist of a treatment and control group where the treatment is any use or combination of uses of one or more Web 2.0 knowledge-capturing tools at the learner's discretion. We will be able to control for personal motivation in tacit knowledge acquisition by gamifying the treatment. The tacit knowledge domain will be pre-selected based on features from Figure 1, which can be used to rank tacit knowledge domains. At the moment, our research question does not focus on opening and untangling the proverbial "black box" in regards to the most optimal Web 2.0 tools for tacit knowledge acquisition. However, a post experiment survey will also be conducted to understand if there are patterns regarding specific uses of Web 2.0 tools for future research.

DISCUSSION AND CONCLUSION

This research in progress hopes to advance the literature in a number of ways. First, there is little discussion in the literature on tacit or explicit knowledge acquisition outside of the context of formal education or organizations. However, we do know that individuals are learning in their own space and on their own time. In 2014, the term "How" was the most frequently searched for term on the internet search engine Google. This is an indication that individuals want to and maybe acquiring knowledge whether it is tacit or explicit in nature. Second, the acquisition of knowledge via Web 2.0 whether tacit or explicit raises questions about the measurement of skillsets and who should be considered an expert. Currently, the most common measurement of skillset acquisition is educational attainment however individuals may be acquiring skillsets for which they are unsure how to articulate in the context of formal work. This may hinder organizations who are looking for skillsets but workers will not readily step up to admit that they "learned something online". Third, there is increasing evidence that the massive amount of information and data that we have available coupled with emerging analytic capabilities can soon be the key in breaking the tacit dimension for artificial intelligence agents. Allowing these agents the ability to express intuition in decision-making, social sensitivity, and the execution of seemingly complex tasks like making a sandwich and driving.

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