

ATTITUDES TOWARDS VIRTUAL COMMUNITIES OF PRACTICE

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THE EFFECT OF MOTIVATION AND ABILITY ON ATTITUDES TOWARDS
VIRTUAL COMMUNITIES OF PRACTICE: AN ELABORATION LIKELIHOOD
APPROACH

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TITLE: The effect of motivation and ability on attitudes towards virtual communities of practice: an elaboration likelihood approach

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LAY ABSTRACT

A community of practice (CoP) is a group of people with a shared interest who regularly interact to share knowledge and increase their expertise. Virtual CoPs use information and communications technology to support these knowledge-sharing activities, and have been shown to effectively improve knowledge utilization, but researchers have not examined them from a health care practitioner point of view.

The present research aimed to explore the factors affecting how attitudes towards virtual CoPs are formed. The elaboration likelihood model was used to guide this study and suggests that a person's motivation and ability determine the route through which they process information and form attitudes, leading to their intention to use the system. By understanding what influences attitudes, we can better understand how to design and position a virtual CoP for health care practitioners.

ABSTRACT

Sharing of information between health care workers improves evidence dissemination and quality of care. One way to share information is through a community of practice (CoP), whereby members interact regularly towards a common goal. Advances in technology allow CoPs to exist virtually, removing the traditional barriers to information sharing. Virtual CoPs have been shown to be effective, but little is known about why health care workers choose to use them — warranting further investigation.

This exploratory research consisted of 86 participants and took place in partnership with Health Quality Ontario. At the time of data collection, the organization was developing a virtual CoP for those in health care to learn from one another about quality improvement.

The research utilized the elaboration likelihood model (ELM) — a theoretical model of persuasion that posits that one's motivation and ability determines how information is processed — to guide the study of attitude formation. ELM distinguishes between Central Route information processing, whereby one is highly motivated and able and pays attention to argument quality, and Peripheral Route processing, whereby lower motivation and ability cause one to be persuaded by peripheral messaging cues. The sustainability of resulting attitudes is influenced by the route through which information is processed.

Higher motivation to use a virtual CoP was found to be more strongly correlated to the central route than peripheral route, as expected. Post-hoc analysis found that argument quality had the greatest overall influence on attitudes towards virtual CoPs,

regardless of the user's experience level with them. Users with more experience were also influenced by peripheral cues.

The chosen theoretical framework provided insight into the determinants of attitude formation, allowing for a better understanding of how to design and position a virtual CoP for those working in health care — a population yet to be studied through ELM.

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LIST OF ABBREVIATIONS AND SYMBOLS

QI: Quality improvement

HQO: Health Quality Ontario

CoP: Community of practice

VCoP: Virtual community of practice

IT: Information technology

ICT: Information and communications technology

ELM: Elaboration likelihood model

TRA: Theory of reasoned action

TBP: Theory of planned behaviour

TAM: Technology acceptance model

IDT: Innovation diffusion theory

CHAPTER 1: INTRODUCTION

1.1 MOTIVATION

The Institute of Medicine (2000) seminal report, *To Err is Human*, brought attention to the prevalence of medical errors and subsequent need for health care quality improvement. Increasing financial strain on the health care system, as well as growing attention paid to reducing medical errors and patient safety, have resulted in a need to increase health care quality and efficiency. Quality improvement (QI) “is the effort to increase or improve the degree to which health services increase the likelihood of desired health outcomes and are consistent with current professional knowledge” (Sales, 2009, p. 226). Initiatives designed to improve health care quality are often local in nature and difficult to generalize, as they are implemented to deal with specific problems or incidents and address immediate concerns with care for specific patients (Straus, Tetroe, & Graham, 2009). Without a concerted effort to do otherwise, learnings from these initiatives are thus contained within the institution, creating siloed problem-solving.

Health care in Canada and Ontario remains fragmented for access and delivery, and as a result there is a growing push to enhance integration across sectors, locations and providers to improve patient experience (Ministry of Health and Long-Term Care, 2015). This includes greater recognition of the need to improve information sharing and enhanced communication in order to meet these needs (Ministry of Health and Long-Term Care, 2015). One way to achieve this goal is through communities of practice (CoPs), which are increasingly used in health care as a means of advancing

knowledge use and creation through collaborative learning (Li et al., 2009). A CoP is defined as “a group of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis” (Wenger, McDermott, & Snyder, 2002).

Failure to communicate between providers is a known cause of patient safety incidents and reduced quality of care (Vest & Gamm, 2010). Barriers to information access result in negative consequences to patients as well as higher health care costs and increased burden on the system, especially given the shortages in providers. With the growing prevalence of chronic diseases and an elderly population, the sustainability of the health care system depends on efficient resource usage, and information exchange amongst care professionals to increase care coordination is therefore necessary (Vest & Gamm, 2010).

The use of information and communications technology (ICT) has the potential to better connect providers and improve information sharing towards research dissemination. To do so effectively, dissemination strategies should be grounded in theory so as to minimize the potential for technology to drive changes as opposed to outcomes (Glanz, Rimer, & Viswanath, 2008).

Virtual communities of practice (VCoPs), which leverage ICT to minimize geographic and organizational barriers, offer a convenient way for community members to communicate across locations and organizations, thereby increasing the efficiency of information sharing. Research has demonstrated the effectiveness of

these VCoPs to health care quality improvement, but little is known about how and why users choose to adopt technology to support CoPs (Nembhard et al., 2011).

In Canada, health care lags behind other industries and countries in technology adoption, largely due to user ambivalence towards the technology (C.D. Howe Institute, 2015). Health information technology can be defined as “the knowledge, skills and tools which enable information to be collected, managed, used and shared to support the delivery of health care and promote health” (U.K. National Health Service, 2011). Technology has the potential to enable how those in health care can work together to tackle specific quality of care issues and share information and best practices, yet its adoption in health care is subject to unique factors and influences (C.D. Howe Institute, 2015). To ensure successful implementation of such a technology, a thorough understanding of the factors influencing the decision to use it warrants investigation.

As stated by David Blumenthal, the former head of the United States Health Information Technology strategy, “Creating a robust (information) exchange system isn’t only an IT problem; rather, it’s a problem of social, cultural, legal, institutional, economic, and political proportions. The technical part is actually the least challenging...” (C.D. Howe Institute, 2015).

1.2 RESEARCH OBJECTIVES

This research seeks to understand the drivers of attitude towards using virtual communities of practice among Canadian health care workers. This research objective is examined in partnership with Health Quality Ontario. Health Quality Ontario

(HQQ) is an arms-length agency of the Ontario Ministry of Health and Long-term Care, tasked with public reporting on the province’s health care system, making recommendations about how to improve care using the best evidence, and supporting large scale quality improvements (HQQ, 2016). Public reporting delivers the outcome, whereas the processes to improve such outcomes vary and remain fragmented by organizations and geography. With growing recognition of the importance of both care coordination and prevention to improve health outcomes (Zwarenstein, Goldman, & Reeves, 2009), the emphasis has shifted away from acute care. Communicating across sectors to share best practices and improve knowledge uptake is a need that HQQ aims to tackle through its implementation of an “Online Environment,” or virtual CoP. This virtual community of practice consists of multiple knowledge-sharing modules whereby users can, among other tasks, share lessons learned, post questions and participate in discussion forums. Overall, this virtual CoP’s focus is on improving health care quality, and within the larger community, smaller communities, or groups, exist to focus on specific topics of interest. See Appendix A for mockups of the platform’s interface. This province-wide initiative is a novel concept in Ontario and as such, encouraging adoption of the platform is of paramount importance.

1.3 IMPORTANCE OF THE TOPIC

Given the novelty of virtual CoPs for quality improvement in health care in Ontario, this research will provide needed insight into effective messaging to increase the Online Environment’s uptake and use. This is especially important, as when opinions towards a technology are not long-held, exposure to information determines

attitudes regarding its usage (Angst & Agarwal, 2009). Research shows that when a virtual CoP platform meets user expectations for reciprocating knowledge, the user's intention to continue using the platform increases (Cheung, Lee, & Lee, 2013). It is therefore important to understand the factors that influence user expectations so as to ensure these needs are met.

Improving attitudes towards and subsequent intention to use a virtual CoP, as well as understanding the factors important to user experience after joining the community, provide the opportunity to strengthen positive attitudes towards the platform—so that we can go beyond understanding adoption to fostering their continued use.

This exploratory research approach adds necessary insight into the factors that influence how attitudes towards virtual CoPs are formed for those working in health care—a population that CoPs are known to benefit but whose perspectives on technology to support them have yet to be studied.

Communities of practice have been proven as a means to improve knowledge dissemination towards improved care quality, yet they face barriers to optimal use (location, time, resources). Technology to enable these communities to operate and thrive provides a promising, sustainable solution. However, technology use in health care faces a multitude of barriers, including attitudinal ones. Using theory to guide the study of factors influencing attitudes provides a more robust framework. The elaboration likelihood model (ELM) is a model of persuasion that looks to explain the spectrum of antecedents to attitude formation, such as prior expertise and perceived

personal relevance of the technology, and the ways in which information is subsequently processed. Using ELM as a guiding framework, this research seeks to explore the following question:

For those working in health care, how does motivation and ability affect attitudes towards using virtual communities of practice?

The following paper is structured as follows. In Chapter 2, a review of literature is presented pertaining to the concepts of communities of practice as a means for knowledge utilization in health care and technology to support such communities. Chapter 3 presents theoretical models of adoption and the rationale for the selection of ELM as the guiding theoretical framework. In Chapter 4, the research methodology is discussed. Chapter 5 provides results of the research model, as well as a post-hoc analysis in which further relationships between variables are explored. Chapter 6 discusses final conclusions and contributions to research and practice.

CHAPTER 2: LITERATURE REVIEW

2.1 COMMUNITIES OF PRACTICE

A community of practice (CoP) is “a group of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis” (Wenger, McDermott, & Snyder, 2002). Lave and Wenger’s influential work on communities of practice (1991) is based upon ‘situated learning theory’, whereby learning takes place in its applicable context as opposed through more formal institutions or dyadic methodology to advance knowledge generation.

While the business sector has, for decades, been utilizing CoPs for knowledge management towards improving organizational performance, their increasing use in health care has been fairly recent as a means for health care practitioners to implement practice guidelines and evidence in a context-relevant manner (Li et al., 2009; Ranmuthugala et al., 2011).

Promotion of evidence-based best practice is the primary focus of health care CoPs. A 2011 systematic review found that CoPs assist with a wide range of issues such as removing professional, geographic and organizational barriers, improving knowledge retention and professional competencies, sharing of information, and implementing innovative processes and technology (Ranmuthugala et al., 2011). As such, there is growing recognition of the need for further research into the complex dynamics that influence CoP adoption (Ranmuthugala et al., 2011). Specific examples of positive impact include improvements in mental health quality indicators (Huckson

& Davies, 2007) and reductions in infections (Aveling, Martin, Armstrong, Banerjee, & Dixon-Woods, 2012; Dixon-Woods, Bosk, Aveling, Goeschel, & Pronovost, 2011). Communicating across boundaries to improve knowledge translation and ultimately to improve how care is delivered is indeed the target outcome of health care CoPs.

CoPs are characterized by the presence of a domain of interest shared by the group, a community that shares and learns together, and a shared practice or knowledge base (Wenger & Wenger-Traynor, 2015). Having a clearly defined problem to work on as a community is key to the success of a CoP to improve perceptions of the intervention's usefulness. This concept was identified with the Keystone Intensive Care Unit project, which was able to dramatically reduce central venous catheter bloodstream infections across more than 100 intensive care units in Michigan through a networked community problem-solving structure, including teleconferences and in-person meetings (Dixon-Woods et al., 2011). This initiative benefited from the cost-effective community interactions to standardize practice, including through peer monitoring (Dixon-Woods et al., 2011).

Clinical practice guidelines and other high quality evidence alone are not enough to ensure successful implementation into practice; adaptation to the local context is necessary to ensure uptake (Straus et al., 2009), and which the situated learning theory behind CoPs can potentially address. The interplay between evidence (research, experience, and local information), context (workplace culture, leadership, and organizational approach to evaluation), and facilitation (support to help change attitudes and behaviour) is validated as being key to successful implementation efforts

(Kitson, Harvey, & McCormack, 1998; Rycroft-Malone, 2004). Implementation is the process by which an intervention is disseminated or used within an organization (Damschroder et al., 2009). In implementation research, context refers to the factors surrounding an implementation effort, and is the set of circumstances or unique factors that surround a particular implementation effort (Damschroder et al., 2009).

The contextual factors affecting knowledge utilization in health care indeed warrant research attention, and understanding how evidence is internalized requires a deeper understanding for successful implementation (Gabbay & le May, 2004). The term “mindlines” was developed by Gabbay and le May (2004) to refer to “collectively reinforced, internalized, tacit guidelines.” The authors found that these mindlines are what clinicians rely on instead of direct research sources (i.e., clinical practice guidelines), preferring to use experience from either their own or their colleagues’ practices, previous interactions and other tacit knowledge sources (Gabbay & le May, 2004). Clinician behaviour has been shown to be influenced by a combination of formal evidence and trusted peers, where evidence alone is insufficient to influence behaviour but requires authority or credibility by those supporting it (Dixon-Woods et al., 2011; Dopson, Locoock, Gabbay, Ferlie, & Fitzgerald, 2003). Knowledge from peers and learned through experience has been found to have a greater influence on behaviour change than more hierarchal approaches (Aveling et al., 2012). The importance of external/normative factors was echoed in a 2008 systematic review by Godin, Bélanger-Gravel, Eccles & Grimshaw which found that beliefs about capabilities and consequences, moral norms, professional role/identity and

social influences explained over 50% of behavioural intention amongst healthcare professionals.

Communities of practice, then, in which existing informal interactions result in a practice that is based on “socially constituted knowledge” (Gabbay & le May, 2004), rely on having credible sources capable of relaying knowledge based on research, as traditional forms of evidence are bypassed in the process. Given the constraints from the organization in which people work, internalized, tacit guidelines evolve or iterate often within a CoP, which Gabbay and le May (2004) say results in socially constructed “knowledge in practice.” The workplace’s social and organizational culture within which the CoP takes place influences their success (Denis & Lehoux, 2009). Attention must be paid to disseminating research findings through the sources that clinicians actually use, as opposed to traditional routes (Gabbay & le May, 2004).

CoPs provide a means for integrating tacit and explicit knowledge (Meagher-Stewart et al., 2012). In a public health setting, Meagher-Stewart et al. (2012) found that tacit knowledge was the primary, preferred source for care solutions, especially when facing time constraints in decision making. Using trusted sources that possessed knowledge and experience, as well as their own experiences, were the most commonly used strategies for appraising evidence (Meagher-Stewart et al., 2012). Thompson et al. (2001) further found that nurses value the advice of trusted and clinically credible sources above text or electronic resources when making decisions at the point of care. The decision to use tacit or explicit evidence also was found to vary with the

complexity of the decision (such as in the face of time constraints, diverse goals and conflicting elements) (Thompson et al., 2001).

Making improvements in quality of care, as noted through theory and observation, is dependent on the context the team is operating within, their available time and their motivation to do so (Øvretveit et al., 2002). Community members must perceive the leaders of a community-based quality improvement initiative to be credible and authoritative (Øvretveit et al., 2002), meaning the leaders will likely come from within the community in order for members to trust them (Aveling et al., 2012). Straus et al. (2009) further note that the learning that occurs within a CoP is either constrained or enabled by social norms and governance structures existing within the professional or workplace setting.

Foundational to a CoP is the connection between members so as to have the mutual respect and trust that enables them to work towards their common goals (Cambridge, Kaplan, & Suter, 2005; Hoadley & Kilner, 2005; Wenger et al., 2002).

“The community creates the social fabric of learning. A strong community fosters interactions and relationships based on mutual respect and trust. It encourages a willingness to share ideas, expose one’s ignorance, ask difficult questions, and listen carefully,” (Wenger et al., 2002).

Facilitators to the use of CoPs related to practice-based problem solving include enhanced knowledge systems and professional development as well as

opportunities for networking and communication with peers (Meagher-Stewart et al., 2012). Barriers to knowledge access include insufficient planning time and inadequate computer networks. In addition, management leadership that supported and valued a culture involving evidence-informed decision making and CoPs was important (Meagher-Stewart et al., 2012). Addressing the barriers to implementation of evidence and guidelines require the active engagement of end users, and discussions of changing organizational practices are necessary to create a communicative and collaborative culture between managers, decision makers and health professionals (Straus et al., 2009).

2.2 VIRTUAL COMMUNITIES OF PRACTICE

Promotion of evidence-based best practice is increasingly done through email and web-based communications to support health care communities of practice (Ranmuthugala et al., 2011). Virtual communities of practice (VCoPs) are those that make use of information and communication technologies (ICTs) to support communities across diverse locations and time barriers (Dubé, Bourhis, & Jacob, 2006). Not only do VCoPs offer a convenient collaboration space, they have been shown to facilitate development of an innovative patient-focused integration of medical, social and supportive services by health care organizations, while allowing health care providers to use their energy and time more efficiently and provide care that is collaborative and cost-effective (Winkleman & Choo, 2003). Those working in health care organizations can access organizational knowledge through the use of virtual CoPs on an as-needed basis, incorporate it into their daily work and convert

their new knowledge to future health care needs at the organization (Winkleman & Choo, 2003). Further studies reveal that virtual CoPs enable healthcare teams to problem solve through active debate and integration of differing perspectives to improve practice and implement evidence-based decision making (Ikioda, Kendall, Brooks, De Liddo, & Buckingham Shum, 2013). Virtual CoPs allow for extension of learning in health care beyond face-to-face opportunities through the promotion of distributed and continued learning (Jarvis-Selinger, Armstrong, Mehta, Campion, & Black, 2012). Virtual CoPs also strengthen intra-professional ties, improve access to information and provide support otherwise unavailable to health care practitioners (Valaitis, Akhtar-Danesh, Brooks, Binks, & Semogas, 2011).

With a virtual CoP, in addition to the shared domain or problem, the presence of connections and relationships are what distinguish the CoP from that of a simple chat room or document repository (Hoadley & Kilner, 2005). Establishing a visible presence with other members is necessary to keep them engaged with their community when unable to rely on physical meetings (Cambridge, Kaplan, & Suter, 2005).

The growing attention on context-specific quality improvement initiatives that target professionals rather than academics is only recently being implemented through quality improvement (QI) repositories, defined as “as searchable web-based tools for documenting and sharing information on QI practices that are intended for practitioner rather than academic audiences” (Bytautas, Gheihman, & Dobrow, 2017). A review of QI repositories found that user-submissions played a central role, and that these core, engaged users hold potential for content generation and ideation

(Bytautas et al., 2017). The authors found that enablers for user engagement include opportunities for networking, virtual communities of practice, personalized accounts or connection to professional development and other resources (including funding) for QI projects. In investigating an adverse event reporting system, Wu, Shen, Lin, Greenes and Bates (2007) found that the subjective norm of a practice is its most significant predictor of system success and behavioural intention, showcasing the importance of the organization for system promotion and to encourage use.

Cheung, Lee and Lee (2013) found that when virtual CoPs met user expectations for reciprocal knowledge, their satisfaction with the platform increased, and when their ability to help others as expected met expectations, knowledge self-efficacy increased. Both constructs subsequently increased intention to continue to use the platform. Having a platform to enable this exchange of knowledge through an interface that demonstrates connectedness is then necessary for sustained usage.

Summary

As noted by Roberts (2006), the resources necessary to cultivate and successfully manage a CoP to reach its knowledge-generating potential limit the practicality of their implementation in small and medium-sized organizations. Virtual platforms to enable CoPs would then provide a cost-effective, geographically neutral method to achieve the shared aim of increased quality of care. The situated learning of a community of practice provides a promising method for those working in health care to implement new knowledge to work together and problem solve. To increase the knowledge base and practicalities of this learning method, a virtual environment offers

a promising solution. However, delving into the factors that contribute to the success or failure of such a collaborative requires looking into the “black box” of usage determinants (Schouten, Hulscher, Everdingen, Huijsman, & Grol, 2008). To do so, an evidence-informed strategy is needed to assess these determining factors.

Developing interventions to support implementation of evidence can be done through theory to understand the factors influencing the desired behaviour change (such as use of a virtual CoP) and associated techniques to facilitate this change. The need to better understand the factors that inform health care professional behaviour change is well recognized, of which theory-based research can be beneficial to design, specifically with prospective studies using theory-informed frameworks (Godin, Bélanger-Gravel, Eccles, & Grimshaw, 2008). Evidence can then be used to guide which barriers to target and the possible effective delivery strategies, while considering the available resources as well as acceptability of the intervention to the group and the setting in which it is operating (French et al., 2012).

CHAPTER 3: THEORETICAL BACKGROUND AND RESEARCH MODEL DEVELOPMENT

The purpose of this chapter is to outline various models and theories that have been used to study technology adoption. The proposed theoretical model was developed after an examination of the extant theories. This model is used as a framework to guide examination of the research objective, which is to explore the determinants of attitudes towards virtual communities of practice among those working in the Canadian health care system. The chapter is organized as follows. Section 3.1 provides an overview of theories relating to technology adoption, including the elaboration likelihood model, which is the overarching framework guiding the current research, and discusses the rationale for selecting this model. Section 3.2 outlines the proposed research model and discusses the research questions to be explored in this study. Finally, Section 3.3 presents the hypotheses in the context of the variables studied and their support from the literature.

3.1 THEORIES AND MODELS OF ADOPTION

Theory is defined as “is a set of interrelated concepts, definitions, and propositions that present a *systematic* view of events or situations by specifying relations among variables, in order to *explain* and *predict* the events or situations” (Glanz, Rimer, & Viswanath, 2008, p. 26). The interplay between theory, research and practice is a re-enforcing one: theory should inform practice, and practice should be grounded in theory. Due to the limited resources in which health care occurs,

grounding implementation in theory is both more efficient and increases the likelihood of success (Glanz et al., 2008).

The Theory of Reasoned Action (TRA), developed by Fishbein (1967) posits that behavioural intention is a function of attitude and subjective norm (Montaño & Kasprzyk, 2008), and that it is this intention that best predicts actual behaviour. The Theory of Planned Behaviour (TPB) builds upon the Theory of Reasoned Action to add the construct of Perceived Behavioural Control (Montaño & Kasprzyk, 2008). A recent systematic review of social cognitive theories of behaviour change identified TPB as the most commonly used model to both explain intention and predict health care professional behaviour (Godin, Bélanger-Gravel, Eccles, & Grimshaw, 2008). The reviewers found TBP explained 31% of behaviour variance but that greater care and attention is needed to understand the context in which behaviour takes place.

Hsieh (2015) applied the TPB to study usage of cloud technology by nurses in Taiwan, and found that “subjective norms” (the social expectations one feels when performing a task or behaviour) was the factor most influential on intention to use, highlighting the importance of a work culture that positively views and encourages usage of this new technology.

The commonly used Technology Acceptance Model (TAM) also posits that usage is a consequence of behavioural intention, and that acceptance-related beliefs are a function of attitudes towards a system (its ease of use) and perceived usefulness (Bhattacharjee & Sanford, 2006; Davis, Bagozzi, & Warshaw, 1989). While the two theories (TRA/TBP) and the subsequent technology acceptance model postulate that

usage is a consequence of behavioural intention, TAM differs in that it assumes that intention is determined jointly by attitude toward a system and the perceived usefulness (Davis et al., 1989). TAM also proposes that perceived usefulness can override (presumably negative) attitude to acceptance intention (Bhattacharjee & Sanford, 2006).

Rogers' (1995) Innovation Diffusion Theory (IDT) highlights the importance of achieving a correct fit between an innovation's attributes, the individual or organization adopting it, and the context in which the adoption is taking place (Montaño & Kasprzyk, 2008). IDT proposes that later adopters of a technology become aware of its existence from early adopters existing in their social network (Bhattacharjee & Sanford, 2006). This model posits that early adopters are influenced by media whereas late adopters are reliant on social channels. While IDT separates mass media and interpersonal channels, it does not distinguish message content/quality nor message source, and does not delineate between causes of early and late adopters (Bhattacharjee & Sanford, 2006).

The above theories exhibit multiple limitations to this research's target population and topic. Of particular importance is that these other models and theories of adoption do not look at the *process* of influence (Sussman & Siegal, 2003), such as how information leading to the attitudes or importance of social norms, are formed. As noted by Bhattacharjee and Sanford (2006), TAM/TRA does not examine temporal effects of attitude changes and IDT only looks at one-time acceptance. Also, as identified by Bhattacharjee and Sanford (2006), when a technology is too new for

there to exist socialized behaviours regarding its use, the social norm construct cannot sufficiently explain user acceptance. Cyr, Head and Ivanov (2009) note that information technology (IT) adoption research, such as TAM, focuses on the cognitive aspects of IT usage (such as perceived usefulness and ease of use, in the case of TAM), but there is growing recognition of the need to include affective design elements such as enjoyment and trust.

TAM looks at perceived usefulness and ease of use as the antecedents to attitude and behavioural intention (Davis et al., 1989; Holden & Karsh, 2010), and TBP considers social norm as the only external influence on behavioural intention (the others being the internal constructs of perceived behavioural control and attitude) (Bhattacharjee & Sanford, 2006; Holden & Karsh, 2010). In attempting to understand the *processes* by which intentions are formed, a more comprehensive model is needed.

The elaboration likelihood model (ELM) (Petty & Cacioppo, 1986a) is a model of persuasion that posits that a user processes given information (or “elaborates”) based on their level of motivation and ability related to the issue at hand, leading to attitude change. When information processing leads to a change in attitude, this is referred to as persuasion (Angst & Agarwal, 2009).

Persuasion strategies can be combined with other behaviour change interventions to improve their likelihood of success. Persuasion theories are based upon the assumption that individuals process the same messages with varying levels of effort (Rudd & Glanz, 1990). Persuasive communication is that in which arguments in favour of a behaviour are presented by a credible source (Michie, Johnston, Francis,

Hardeman, & Eccles, 2008). In the Theoretical Domains Framework (2008), which maps out the most effective behaviour change techniques according to the target behaviour, persuasive communication is listed as useful for changing beliefs about consequences, motivation and goals—outcomes relevant to attitude formation.

Individuals vary in how much energy and effort they expend on a message, depending on the context (Petty & Cacioppo, 1986a). The ELM is a dual-process model used when studying two differing sets of needs within the same relative population and as such posits two different routes of information processing that differ based on extent (more vs. less) of processing (Bhattacharjee & Sanford, 2006). In dual-process theories, attitude changes and the resulting changes in behaviour are driven by external information.

Elaboration is defined by Petty and Wegener (1999) as the tendency for users to “add something of their own” to the information they are provided with, above a verbatim acceptance of information (Bhattacharjee & Sanford, 2006). The extent of elaboration is determined by two routes (Bhattacharjee & Sanford, 2006): (1) the central route, where users are highly motivated/able and are influenced by argument quality; and (2), the peripheral route, where users are not as highly motivated/able and are influenced by more superficial factors such as the likability of the endorser, source credibility, and message medium. Attitudes formed through the latter process tend to be less stable over time (Petty & Cacioppo, 1986b).

Widely validated as a framework in psychology (e.g., Petty & Cacioppo, 1986a) and in marketing (e.g., Bitner & Obermiller, 1985), the ELM is considered a

foremost influential model used to study attitude change and persuasion (Teng, Khong, & Goh, 2015).

The extent of elaboration moderates the impact of the argument's quality and peripheral cues on changes in perception (Bhattacharjee & Sanford, 2006).

“Elaboration likelihood” is high when an individual's motivation and ability to think about a particular issue are fostered (Petty & Cacioppo, 1986b). It is not practical or adaptive to elaborate on every issue an individual is faced with, and so naturally the individual will rely on heuristics to inform such decision making.

If information in support of an attitude is readily available and peripheral routes are targeted, attitudes are more likely to be consistently reported over time (Petty & Cacioppo, 1986b). This same pre-existing attitude is then more likely to be used to defend against contrary stances. Furthermore, the more accessible the attitude is, the more likely it will be indicative of future behaviour (Petty & Cacioppo, 1986b; Fazio, Chen, McDonel, & Sherman, 1982). Higher states of elaboration (central route) are found to have a stronger relationship between attitudes and behaviour (Petty & Cacioppo, 1986b).

Bhattacharjee and Sanford (2006) studied ELM in the context of IT acceptance among office administrators and staff personnel to examine what influences user perceptions regarding a document management system, including how the attitudes differ across populations and how persistent this influence is. They sought to examine what has traditionally been a “black box” of IT acceptance, and to examine the longitudinal/temporal effects of attitude change and the drivers therein.

Bhattacharjee and Sanford (2006) note that the dual process findings confirmed in their research highlight the need to not assume a “one-size-fits-all” approach to IT implementation, given the range of motivation and abilities among the same workforce, and that influence processes need to be targeted correctly to increase adoption success. They found that persuasion can occur – before the user is introduced to the technology if the messaging is found to be personally relevant to them. They suggest managers enhance elaboration, such as through message manipulation, source, context, time given or pre-message conditioning, to tap into the central route.

Angst and Agarwal (2009) sought to examine the impact of concern for information privacy on the decision to adopt electronic health records (EHRs) among patients. The authors found that while concern for information privacy moderates the effect of issue involvement and argument framing on changes in attitude, this effect can be positively influenced through message framing. The authors examined the effects of positively vs. neutrally framed arguments on pre and post attitudes towards EHRs. They also found that persuasion can occur before an individual uses a technology if the arguments resonate sufficiently with them.

Angst and Agarwal (2009) note that persuasion is determined by two factors: the message (its quality, length and source) and/or the recipient of the message (the extent to which they are involved in the given topic, their motivation, relevance and expertise or experience). They operationalized the message factor through argument framing and the recipient factor through issue involvement. Issue involvement was studied as a function of the frequency of the use of the healthcare system, citing past

research that found chronic illness to be a strong predictor of EHR acceptance (Angst & Agarwal, 2006; Lansky, Wald, & Flatley Brennan, 2004). This construct is a state at a point in time reflective of their motivation but not an attitude able to be manipulated.

At the time of their study, EHRs were not widely available to patients and so study participants could not actually adopt the technology but rather only have attitudes towards it, so Angst and Agarwal (2006) looked at the construct of likelihood of adoption to measure future behaviour. Citing Ajzen (1991, p.181), they noted that the motivational factors influencing an individual result in their behavioural intention. EHR adoption was voluntary (intrinsic) for patients, in contrast to other studies that have examined behavioural intention in the context of IT systems whose use was instituted in an organizational capacity (extrinsic), and therefore have limited choice in adoption.

The presence of confirmation bias, whereby one actively adheres to their existing position on an issue, through biased interpretations of messages (Weinstein, Sandman, & Blalock, 2008) infers resistance to persuasion among those with formed opinions. Those yet to form an opinion on an issue therefore are more likely to be subject to persuasion (Weinstein et al., 2008). With respect to technology, strong opinions in favour of or against the technology *can* be moderated through appropriate message framing and education (Angst & Agarwal, 2009). Those for whom attitudes are not formed or without strong opinions are more apt to be influenced through peripheral cues since they lack the motivation/ability to expend additional effort

(Angst & Agarwal, 2009). These differences, then, highlight ELM's value in the face of wide-ranging levels of elaboration likelihood with respect to health care technology.

With respect to behavioural intention, which is less frequently studied than pure attitude change in ELM research, Angst and Agarwal (2009) found a high correlation between attitudes towards EHR use and their opt-in intention. They noted the need for research looking into the antecedents to attitude and persuasion beyond those originally proposed by Petty and Cacioppo (1986a).

Opt-in intention for a virtual CoP is more complicated than system usage; it encompasses using the information within, as CoPs are, by definition, knowledge management tools. Thus the factors contributing to knowledge use and receptivity require more thorough assessment. Organizational context and peer influence extend beyond ease of use for such a platform, and therefore necessitate greater attention.

A systematic review on the factors influencing information and communication technology (ICT) adoption in health care by Gagnon et al. (2010) cited human and organizational factors as a primary reason behind why implementing ICT fails. They found that the factor most affecting adoption of ICT was perception of the system's benefits (sometimes termed *system usefulness*), followed by ease of use. The most cited barrier was design and technical concerns, while lack of compatibility with workflow was also frequently cited as a barrier (Gagnon et al., 2010). As such, persuading potential users of the technology's usefulness by appealing to the relevant enablers and barriers is necessary.

By improving attitudes towards virtual CoPs through peripheral messaging for those with low motivation/ability, and thereby improving their intention to use the platform, the creation of a positive user experience after joining the community will enable continued usage. Peripheral cues by nature (peer opinion and message medium) are tenets of a virtual CoP and, if positive, will presumably entrench the positive attitude change about the virtual platform. For those with higher motivation/ability, ensuring their needs and expectations are met is necessary for sustained use of a virtual CoP. Creating targeted strategies to differing levels of motivation and ability could then influence both the intention to use the system initially and continue to do so.

3.2 PROPOSED RESEARCH MODEL

The main purpose of this research program is to understand the processes by which those working in health care are influenced by information pertaining to virtual communities of practice for health care quality improvement. Specifically, the proposed research aims to:

- (i) Examine how an individual's ability and motivation with respect to virtual communities of practice affect their perception of an argument's quality, the source's credibility, and the design elements in a user interface; and
- (ii) Examine how different messaging types (those that focus on argument quality and design elements) affect attitudes and intention to use a VCoP.

While past research has shown that ELM (central route and peripheral route) influence attitude and ultimately intention to use an information system, the present research seeks insight into the potential antecedents of these two routes amongst health care workers. By understanding what influences these two routes, a better understanding of how to design and position a virtual CoP for health care workers will be achieved.

Antecedents to processing routes for the VCoP-relevant messages have been divided into two broad categories: (1) ability (operationalized through four types of user experience/expertise); and (2) motivation to use the technology (operationalized through the constructs of relevance to job and perceived usefulness) (see Figure 1). The research will examine how these antecedents affect perception of message types and further, how the processing of this information influences attitudes towards and intention to use the system.

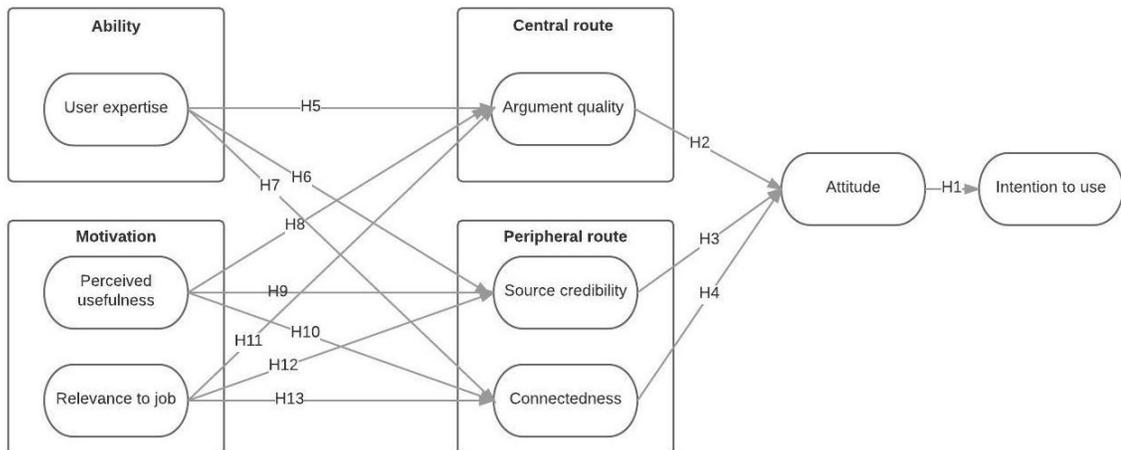


FIGURE 1: RESEARCH MODEL

3.3 HYPOTHESES DEVELOPMENT

It is hypothesized that the strength of expertise (used to represent ability) and perceived usefulness and relevance to job (constructs used to represent motivation) related to virtual CoPs will determine the route through which information is processed, leading to positive attitude and subsequently intention to use the platform. The constructs and their relevant hypotheses are discussed in turn below.

Intention to Use and Attitude: According to the TRA and TPB theories of adoption, beliefs about outcomes of performing the specific behaviour are weighted by how the outcomes or attributes are evaluated to determine attitude (Holden & Karsh, 2010). This direct measure of attitude towards performing the behaviour is used to assess the overall evaluation of the behaviour (Holden & Karsh, 2010). The present research focuses on attitude as opposed to attitude change, as the participants were not exposed to the actual system and only saw a quick mock-up of the prototype system (evaluating changes in attitude would take longer or more in-depth exposure).

As previously validated (Davis et al., 1989; Taylor & Todd, 1995; Venkatesh & Davis, 2000), perceived usefulness and attitude have been shown to positively influence IT intention due to the tendency for beliefs, attitudes and intentions to remain congruent (Bhattacharjee & Sanford, 2006). As cited by Holden and Karsh (2010), in developing the TRA, Fishbein (1967) differentiated between the attitudes towards objects and those towards behaviours relating to the object, because attitude towards behaviour has greater predictive ability than attitude towards an object. Therefore, in the present study the wording of the question relating to attitudes was

made to include the attitudes towards the object for quality improvement. This leads to the first hypothesis:

H1: For VCoP, Attitude is positively correlated with Intention to Use the system among health care workers

Central Route of Persuasion

Argument Quality: Quality arguments are those viewed as informative, helpful, valuable and persuasive (Bhattacharjee & Sanford, 2006; Sussman & Siegal, 2003). As documented in the extant literature (Bhattacharjee & Sanford, 2006; Cyr, Head, Lim, & Stibe, 2015; Sussman & Siegal, 2003), argument quality is used to represent the central route to persuasion. ELM considers argument quality to be the determining factor for whether information is influential when in a state of high elaboration (Sussman & Siegal, 2003), and argument quality has a greater impact on attitudes for those in a state of high elaboration than low (Petty & Cacioppo, 1984a).

The present research presented these high quality arguments as six *positively-framed* arguments (as listed in Table 1 under Section 4.6), which Angst and Agarwal (2009) have defined as those that contain both credible content and beneficial outcomes. A greater number of high quality arguments than neutral arguments were selected, as attitudes can be impacted by the number of messages (Angst & Agarwal, 2009; Petty & Cacioppo, 1984a). Low levels of elaboration result in greater agreement when containing more messages, as the number of messages serves as a peripheral cue signaling worthiness of the message; high states of elaboration do not significantly

increase agreement when the number of messages increases (Petty & Cacioppo, 1984a).

Under conditions in which issues are perceived to be of low relevance, the number of arguments presented has a greater persuasive effect than under high relevance (Petty & Cacioppo, 1986b). However, under conditions of high relevance, if the arguments are strong, increasing their number increases persuasion, but when their quality is weak this reduces the persuasive effect (Petty & Cacioppo, 1986b).

The quality of the argument is found to be more persuasive under conditions of high relevance compared with low relevance (Petty & Cacioppo, 1986b). Angst and Agarwal (2009) pointed out the inconsistency in how the construct of argument quality is often operationalized. They used the concept of argument framing, which is the extent that a message makes the consequences of a behaviour explicit, accounting for causality (Angst & Agarwal, 2009; Iyengar, 1987). Positive framing is credible and showcases beneficial outcomes available to the recipient, whereas negative messages show the unfavorable outcomes. Angst and Agarwal (2009) used neutrally framed arguments (in addition to positively framed ones) that do not make explicit any positive outcomes but rather are presented as weak arguments. This leads to the second hypothesis:

H2: For VCoP, the Central Route of Argument Quality is positively correlated with Attitude towards the system among health care workers

Peripheral Route of Persuasion

Source Credibility: This construct refers to the perceived credibility of the source but does not consider the message itself (Chaiken, 1980; Sussman & Siegal, 2003). Source credibility assesses the source's knowledgeability, expertise, trustworthiness and credibility (Bhattacharjee & Sanford, 2006; Sussman & Siegal, 2003). The construct is used to represent a peripheral cue, as source credibility is expected to be more important for those who are not experts (Sussman & Siegal, 2003). With the rapid rate at which technology changes, users are often forced to rely on expert advice (Bhattacharjee & Sanford, 2006).

Angst and Agarwal (2009) found neutrally framed arguments to have a limited impact on changing attitudes when the participant is highly involved, as they are more interested in the argument's quality. This construct has been found to increase receptivity to recommendations—those made by highly credible sources—among those with low levels of participation (Mak & Lyytinen, 1997; Mak, Schmitt, & Lyytinen, 1997; Sussman & Siegal, 2003). The presence of source credibility could increase the favorability of an argument among those in high states of elaboration likelihood, and could even bias how the quality of the argument is perceived (Chaiken & Maheswaran, 1994; Sussman & Siegal, 2003).

Connectedness: As a design element, connectedness is defined as the extent to which website visitors are able to share their views, benefit from the community of visitors to the website, and share a common bond with website visitors (Cyr et al., 2015). As such, it is considered a peripheral cue for the purposes of the present study.

By definition, CoPs necessitate interaction and as such, a virtual platform to support their existence must meet these needs. As user satisfaction and knowledge self-efficacy (feeling knowledgeable and capable of helping others) determine continued participation (Cheung et al., 2013), it is important that community members feel that their opinions matter and that they have influence on the group. Connectedness was also found to impact issue involvement, regardless of level of prior knowledge (Cyr et al., 2015). Cyr et al. (2009) found the element of connectedness as contributing to e-loyalty, defined as when users are more likely to return to the site or to visit it in the future.

This construct was chosen not only due to its proven utility for web-based platforms but because of its importance to the concept of CoPs, whereby connection to other members and the value derived from them sustain the community's activities (Wenger et al., 2002). This construct has been previously validated by Lee (2005) as a necessary component of interactivity that positively impacts user sense of trust and further behavioural intention in a mobile commerce situation. Consumers are more apt to pay attention to, and be persuaded by, product information provided by fellow consumers in online forums than from the company itself (Bickart & Schindler, 2001; Lee, 2005). Online communities and the sense of connectedness within have been proven effective for reducing purchase risk in the eyes of consumers and building trust (Hoffman, Novak, & Peralta, 1999; Lee, 2005).

Furthermore, previous research has shown the importance of interactivity in e-commerce for conversion of visitors to a site into loyal customers (Berthon, Pitt, &

Watson, 1996; Cyr et al., 2009; Srinivasan, Anderson, & Ponnayolu, 2002) — a necessary consideration for the continued usage for VCoPs.

Together, the research on these peripheral cues leads to the third and fourth hypotheses:

H3: For VCoP, the Peripheral Route of Source Credibility is positively correlated with Attitude towards the system among health care workers

H4: For VCoP, the Peripheral Route of Connectedness is positively correlated with Attitude towards the system among health care workers

Ability

User Expertise: User expertise is the ability of the participant to use the system in general (Bhattacharjee & Sanford, 2006). System experts are capable of more critically appraising messaging, including assessing of bias and inaccuracy, whereas those less familiar with the subject rely on peripheral cues to form their opinions (Bhattacharjee & Sanford, 2006).

User expertise influences the extent of elaboration because it affects an individual's ability to process information: when the user has greater knowledge of the topic at hand, the amount and extent of thoughts about the issue and ability to understand such arguments increases their effortful ability and reduces the extent they will rely on peripheral cues (Ratneshwar & Chaiken, 1991; Sussman & Siegal, 2003).

From this, the following hypotheses were developed:

H5: For VCoP, User Expertise is positively correlated with Argument Quality among health care workers

H6: For VCoP, User Expertise is not correlated with Source Credibility among health care workers

H7: For VCoP, User Expertise is not correlated with Connectedness among health care workers

Motivation

Perceived Usefulness: Perceived usefulness is a function of productivity, performance, effectiveness and overall usefulness of an object (Bhattacharjee & Sanford, 2006; Davis et al., 1989). As identified in the technology acceptance model (Davis et al., 1989), beliefs are a result of consequences of adoption of the behaviour or technology in question. Furthermore, the extent to which one believes a behaviour will be useful is a predictor of intention to adopt, and the perceived relevance of a given topic is ignored or interpreted with effort (Kiesler & Sproull, 1982; Sussman & Siegal, 2003).

When there is a match between the user's needs and what the source offers, the user's motivation to process the message increases, and they will be more likely to elaborate on what the source is saying (DeBono & Harnish, 1988). When the message is perceived to be in line with an individual's values, the situation is motivating and the user internalizes and forms an attitude change. Evidence shows that the perceived usefulness of a health care technology will impact whether clinicians accept and use the technology (Holden & Karsh, 2010).

Highly motivated users may have greater familiarity and knowledge related to the issue, so not only is their motivation higher, their ability to interpret messages will be higher. Therefore, when the subject's initial attitudes towards an issue are reflected in the argument, their ability to elaborate on that issue's strengths is higher than those

in the low relevance group (Petty & Cacioppo, 1986b). Message elaboration may be explained by relevance when assessing the differences between arguments that run in favour or counter to those preexisting beliefs of the participant (Petty & Cacioppo, 1986b).

Petty and Cacioppo (1986b) found that when an individual's relevance increased towards an issue, they were more able to distinguish between strong and weak arguments—when the argument was strong, those in the high-relevance state increased attitudes, but weak arguments resulted in a significant decrease in attitudes. This leads to the next set of hypotheses:

H8: For VCoP, Perceived Usefulness is positively correlated with Argument Quality among health care workers

H9: For VCoP, Perceived Usefulness is not correlated with Source Credibility among health care workers

H10: For VCoP, Perceived Usefulness is not correlated with Connectedness among health care workers

Relevance to Job: Job relevance is defined by Bhattacharjee and Sanford (2006) as the system's relevance to the user's work. To clarify the intended application of this term, the current research will instead use "Relevance to job" to minimize confusion. Systems perceived to be highly relevant to one's work are therefore likely subject to greater elaboration and scrutiny of related messaging, resulting in longer-lasting and informed perceptions of usefulness. Users with high relevance to job are less likely to pay attention to peripheral cues, while those with low relevance to job will not be motivated to dedicate effort to thoughtful processing and will rely on other,

peripheral, cues to shape their attitudes towards and perceived usefulness of the system (Bhattacharjee & Sanford, 2006). The final hypotheses are thus as follows:

H11: For VCoP, Relevance to Job is positively correlated with Argument Quality among health care workers

H12: For VCoP, Relevance to Job is not correlated with Source Credibility among health care workers

H13: For VCoP, Relevance to Job is not correlated with Connectedness among health care workers

CHAPTER 4: RESEARCH METHODOLOGY

4.1 SAMPLE COLLECTION AND STATISTICAL ANALYSIS

Sample size was calculated based on attendance at the two conferences at which the survey was conducted, for a combined 3,000 attendees working in health care. The first conference, Quality Improvement and Patient Safety Forum, focused on patient safety and was jointly organized by the Centre for Quality Improvement for Patient Safety (C-QuIPS) and Improving & Driving Excellence Across Sectors (IDEAS) and Health Quality Ontario. Its approximately 700 attendees were predominantly health care providers, administrators and academics. The second conference, Health Quality Transformation, which occurred the following day, is the largest annual health care quality conference in Canada and is organized by Health Quality Ontario. Conference attendance is approximately 2,200 (not including HQO employees), composed of a wide range of participants, including providers, administrators, academics and patients. Given the exploratory nature of this work, a confidence interval of 90% with a 10% margin of error was used to calculate a minimum sample size of 67.

As the size of the population of health care workers was difficult to estimate, for the sake of this study the population was based on those at the conference due to knowledge of this number, and so the sample size was then based on this. The researcher acknowledges basing the population on this group as a limitation.

4.2 TARGET POPULATION AND RATIONALE

Participants in this study were adults above the age of 18 and working in the health care system (either as clinician, administrator, researcher, patient/caregiver or non-clinical staff). This study aimed to determine how motivation and ability affect an individual's attitudes towards health care technology adoption; therefore, it was necessary that the participants were working in health care.

4.3 DATA COLLECTION

Surveys were administered at the Quality Improvement and Patient Safety Forum (October 19) and Health Quality Transformation (October 20) conferences held in Toronto in 2016, with the option of completing the survey online following the conferences.

Data was collected using online surveys, conducted on laptops at the conferences. The laptops were located at the Quality Improvement Department's booth, located in the venue behind the main information booth. Participants walking by were verbally recruited. Postcards (providing a link to the survey) also were handed out at the conferences for those who wished to complete the survey following the conference. There was no compensation for participation.

4.4 ETHICS APPROVAL

The McMaster Research Ethics Board (MREB) approved the study procedure and questionnaire prior to data collection on September 19, 2016; the study was assigned MREB number 2016 162.

4.5 PROCEDURE

After an initial screening question to ensure that the participant worked in health care, each participant's consent was obtained via a detailed consent form. They were then asked a series of questions regarding their knowledge of communities of practice and related technologies, as well as to evaluate a mock website interface (Appendix A). Participants did not interact with the site, but rather just saw an image of the home page and two subpages of what the proposed virtual CoP would look like. This protocol was necessary due to the site still being under development, with scheduled completion set for February 2017. The images shown to survey participants were those provided by the vendor contracted to build the website. Participants were then asked about different concepts of interest to probe into their attitude and what would drive it. These concepts included argument quality (the strength of an informational message's arguments), source credibility (the expertise of people providing endorsements), and connectedness. The survey contained 25 closed-ended questions and 9 open-ended questions. The survey took approximately 15 minutes to complete.

The online survey was conducted with LimeSurvey, which uses McMaster University's ethics-compliant templates and guarantees in its terms and conditions the privacy of data collected: they do not share or use in any way the information collected in surveys. LimeSurvey servers are protected with available security technologies, including firewalls and data encryption.

From the researcher's post data-collection reflection, approximately one-third of those approached to participate in the study agreed.

4.6 OPERATIONALIZATION OF CONSTRUCTS

Based on the above descriptions and validation from previous research, the construct of ability is operationalized as user expertise across four areas (social networks, electronic medical records, communities of practice and virtual communities of practice). Motivation is represented through the variables of relevance to job and perceived usefulness. The two routes to persuasion are represented through argument quality (central route) and source credibility and connectedness (peripheral route). Attitudes were assessed both at the beginning and end of the study, and finally the intention to use the platform was examined. All constructs were measured using pre-validated scales, as indicated in Table 1.

The antecedents (relevance to job, perceived usefulness and user expertise) were each assessed using 7-point Likert scales (Strongly disagree to Strongly agree, unless mentioned otherwise) for their respective questions. For perceived usefulness and relevance to job constructs, the items used to make up each respective scale were averaged for purposes of analysis.

TABLE 1: OPERATIONALIZATION OF CONSTRUCTS

Construct	Source	Items
User expertise ¹	Bhattacharjee & Sanford (2006)	How knowledgeable are you on using the following technologies/ concepts? 1. Online social networks 2. Electronic medical records 3. Communities of Practice (in-person or offline) 4. Virtual Communities of Practice (VCoPs)
Relevance to job	Bhattacharjee & Sanford (2006), citing Venkatesh & Davis (2000)	1. Using a virtual CoP is important for my job. 2. Using a virtual CoP is relevant (appropriate) for my job.
Perceived usefulness	Bhattacharjee & Sanford (2006), citing Davis, Bagozzi, & Warshaw (1989)	1. Participating in a virtual CoP in my job will increase my productivity. 2. Participating in a virtual CoP in my job will improve my performance. 3. Participating in a virtual CoP will make me more effective (e.g. help me make better decisions). 4. I find virtual CoPs to be useful in my job
Connectedness	Cyr, Head, Lim, & Stibe (2015)	1. The prototype interface demonstrates connectedness (defined as enabling visitors to share opinions, benefit from others from other visitors and share common interests with others). 2. Visitors to this website share their views about quality improvement with other visitors of this website. 3. Visitors to this website benefit from the community visiting the website. 4. Visitors to this website share a common bond with other members of the community visiting the website.

<p>Argument quality</p>	<p>Presented as six positively-framed arguments, which Angst & Agarwal (2009) define as those that contain both credible content and beneficial outcomes. (Bhattacharjee & Sanford (2006), referencing the Sussman & Siegal (2003) evaluation of argument quality as informative, helpful, valuable, and persuasive).</p>	<p>Please read the following statements:</p> <ol style="list-style-type: none"> 1. “CoPs can have a role in achieving a diverse range of outcomes including, but not limited to, gaining competencies following completion of basic training; breaking down professional, geographical and organizational barriers; sharing information; reducing professional isolation; and facilitating the implementation of new processes and technology.” – BMC Health Services Research, 2011. 2. Virtual communities of practice (VCoPs) have been shown to facilitate development of an innovative patient-focused integration of medical, social and supportive services by health-care organizations, while allowing health-care providers to use their energy and time more efficiently and provide care that is collaborative and cost-effective. – Health Expectations, 2003. 3. Those working in healthcare organizations are able to access organizational knowledge through the use of virtual CoPs on an as-needed basis, incorporate it into their daily work and convert their new knowledge to future health care needs at the organization. – Health Expectations, 2003. 4. Studies reveal that virtual CoPs enable healthcare teams to “collaborate in order to share, debate, resolve, integrate and implement different perspectives on practice to improve and inform evidence-based decision making.” – Social Networking, 2016. 5. Virtual CoPs allow for extension of learning in health care beyond face-to-face opportunities through the promotion of distributed and continued learning. – Technology Enabled Knowledge Translation for eHealth, 2012.
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		<p>6. Virtual CoPs strengthen intra-professional ties, improve access to information and provide support otherwise unavailable to healthcare practitioners. –Journal of Advanced Nursing, 2011</p> <p>I confirm that I have read the above messages.</p> <ul style="list-style-type: none"> · Yes · No (if No, please re-read the messages). <p>The information provided about VCoPs was informative.</p> <p>The information provided about VCoPs was helpful.</p> <p>The information provided about VCoPs was valuable.</p> <p>The information provided about VCoPs was persuasive.</p>
<p>Neutral argument framing / source credibility</p>	<p>Bhattacharjee & Sanford (2006), referencing Sussman & Siegal (2003). Assess the source’s knowledgeability, expertise, trustworthiness and credibility. Source: (For the arguments themselves, using four neutrally-framed arguments as done by Angst & Agarwal, 2009)</p>	<p>Please read the following statements:</p> <ol style="list-style-type: none"> 1. Health Quality Ontario is launching a VCoP 2. “Quality improvement professionals recognize the value of virtual communities of practice.” – Lee Fairclough, VP of Quality Improvement at Health Quality Ontario 3. “[C]ommunities of practice (CoPs) have become increasingly popular within the health sector.” – Implementation Science, 2009. 4. “My CoP influences the care I deliver.” — Dr. Noah Ivers (MD, PhD, CCFP), Family Physician and Scientist at Women’s College Hospital. <p>I confirm that I have read the above messages.</p> <ul style="list-style-type: none"> · Yes · No (if No, please re-read the messages).

		<p>The sources of information demonstrate knowledge.</p> <p>The sources of information are trustworthy.</p> <p>The sources of information are credible.</p> <p>The sources of information appear to be experts on the topic.</p>
Pre/post attitudes ^{2,3}	<p>Angst & Agarwal (2009) and Bhattacharjee & Sanford (2006); the latter used the Taylor & Todd (1995) semantic differential scale of adjective pairs</p>	<p>With what you (now)³ know about virtual CoPs, please answer the following question. What are your feelings about virtual CoPs for health care quality improvement?</p> <ol style="list-style-type: none"> 1. Bad to Good 2. Foolish to Wise 3. Unimportant to Important
Intention to use	<p>Bhattacharjee & Sanford (2006), referencing the Taylor & Todd (1995) Likert scale.</p>	<p>I intend to use the Online Environment or other virtual community of practice in the next 3-6 months.</p>

¹ Rated on a 7-point scale of novice to expert.

² Rated on a 7-point scale for each of Bad to Good, Foolish to Wise, and Unimportant to Important.

³ The word “now” was only assessed when measuring post attitudes.

4.7 ANALYSIS STRATEGY

Spearman’s rho correlations were used to test relationships between variables in the research model. The decision to use a non-parametric test was made as the outcomes of interest were found to violate assumption of normality when using Shapiro-Wilk normality. As this research model introduced new constructs other than those typically examined in ELM research, as well as a new study population, correlation was deemed an appropriate test for examining what,

if any, potential interactions existed between the antecedents, persuasion routes and outcomes.

In the post-hoc analysis, the antecedents were divided into both higher (answers 5 and above) and lower (answers of 3 and below) usage groups, to perform one-way ANOVAs. Answers of 4 were not included in this analysis to create distinct separation of user groups for the analysis. While it is acknowledged that data removal was necessary for this portion of the analysis, further review of the responses highlighted that those respondents indicating answers of 4 did so across the survey, indicative of minimal response effort. The decision by the researcher to therefore not include these results was made to increase rigor of the analysis.

CHAPTER 5: RESULTS AND DISCUSSION

5.1 STATISTICAL ANALYSIS

Data was analyzed using JGR version 1.7-16 statistical software, which is an open source graphical user interface for R. The total number of participants for the online survey was 88, from which two respondents were removed for insufficient responses to questions. The online survey collected data between October 19 and November 9, 2016.

5.2 DEMOGRAPHICS

Full demographic information is provided in Table 2. The mean age of participants was 40, reflective of the average age (i.e., 43) of the health care workforce in 2011 (Canadian Institute for Health Information [CIHI], 2013a). Females made up 70% of the sample; according to CIHI, 80% of Canadian health care workers are female (CIHI, 2013b).

“Other” job title was listed most frequently, with open-ended responses provided in Appendix 2. The most frequently cited job title was “other,” the majority of which further identified as working in quality improvement. Following “other,” the most common job title was administrator. These types of positions are reflected in the educational status: 39 (42%) with Master’s degrees, followed by 27 (29 %) undergraduate, 10 (11%) beyond Master’s, and of the remaining five “other,” there were two with PhDs, one MD, one current Master’s student and one post-Master’s certificate. Fitting with the environment in which

the surveys took place, the most frequently cited workplace sectors were hospital (25%) and government (22%).

TABLE 2: DEMOGRAPHIC INFORMATION

Age	Mean (SD): 39.98 (10.84) years	
	Valid N: 76	
	Missing: 12	
Sex	Valid N: 83	Male N (%): 25 (30.1)
	Missing: 3	Female N (%): 58 (69.9)
Primary job title	Count	Percentage (%)
Physician	5	5.43
Nurse	8	8.70
Allied health professional	3	3.26
Administrator	27	29.35
Non-clinical staff	9	9.78
Researcher	3	3.26
Student	3	3.26
Other	28	30.43
(No answer)	6	6.52
	86	
Primary sector		
Academia	3	3.26
Association	1	1.09
Community mental health and addictions	2	2.17
Government	20	21.74
Home and community care	6	6.52
Hospital	23	25.00
Industry	3	3.26
Long-term care	9	9.78
Primary care	7	7.61
Other	11	11.96
(No answer)	7	7.61
Education		
Some high school or less	0	0
Completed high school or GED	0	0
Some college	0	0
College diploma	3	3.26
Undergrad/Bachelor's degree	27	29.35
Master's degree	39	42.39
Beyond Master's	10	10.87
Other*	5	5.43
(No answer)	8	8.7

* Other: Ph.D. (2); Current Master's student; Post Graduate Master's Certificate; MD CCFP, FCFP

5.3 SCALE VALIDATION

To measure the internal consistency of the survey instrument, Cronbach’s alpha measurement was used, which calculates the correlations between individual survey items. Values above 0.70 are considered acceptable, with those above 0.80 considered excellent. If the values are lower than the acceptable threshold, this may indicate other characteristics are instead being measured (Hulley, Cummings, Browner, Grady, & Newman, 2007). As shown in Table 3, all survey items had Cronbach’s alpha values above 0.70.

TABLE 3: CRONBACH'S ALPHA RESULTS

Construct	Cronbach’s alpha	Mean	SD
Argument quality	0.91	5.6	0.92
Source credibility	0.87	5.6	0.9
Connectedness	0.77	5.7	0.79
Relevance to job	0.89	5.5	1
Perceived usefulness	0.92	5.3	1
Attitude	0.9	6.2	0.72

5.4 HYPOTHESIS TESTING

Following scale validation, each of the 13 hypotheses were tested using the methods described in Section 4.7. Results of the analysis are discussed below and shown in Figure 2.

5.4.1 INFLUENCE OF PERSUASION ROUTES ON ATTITUDES AND INTENTION TO USE

The results (Figure 2) confirm that attitude is correlated with intention to use ($r=0.452$, $p < 0.001$). Therefore, *H1: For VCoP, Attitude is positively*

correlated with Intention to Use the system among health care workers is confirmed.

The central route of persuasion, represented with argument quality, is significantly correlated with attitudes ($r=0.404$, $p < 0.001$), so *H2: For VCoP, the Central Route of Argument Quality is positively correlated with Attitude towards the system among health care workers* is also supported.

The peripheral route was operationalized with source credibility and connectedness. Source credibility was correlated with attitude ($r=0.293$, $p < 0.01$). Therefore, *H3: For VCoP, the Peripheral Route of Source Credibility is positively correlated with Attitude towards the system among health care workers* is supported. Connectedness also was significantly correlated with attitude ($r=0.327$, $p < 0.01$), making *H4: For VCoP, the Peripheral Route of Connectedness is positively correlated with Attitude towards the system among health care workers* also supported.

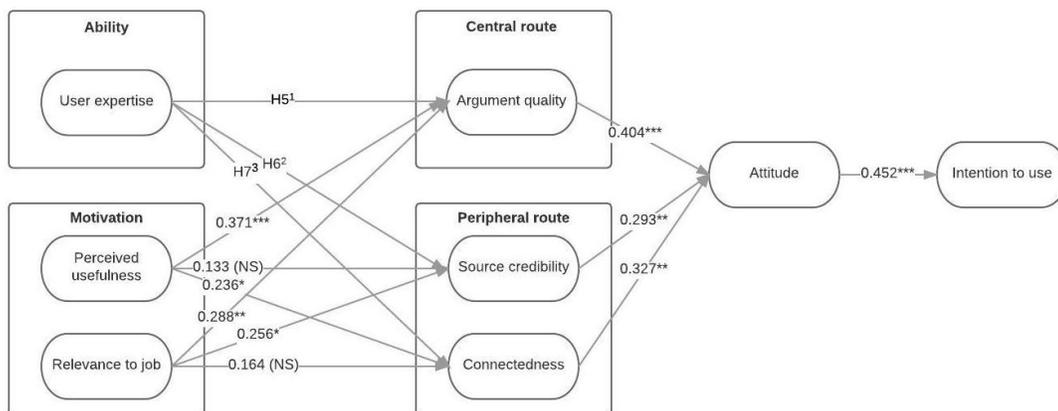


FIGURE 2: RESEARCH MODEL WITH SIGNIFICANCE

Results reported as Spearman's rho

*** = $p < .001$; ** = $p < .01$; * = $p < .05$; † = $p < .10$

^{1, 2, 3} As the user expertise construct was made up of four items, the correlations corresponding to each of these is reported in Table 4.

5.4.2 INFLUENCE OF ABILITY ON PERSUASION ROUTES

The construct of ability was operationalized with user expertise. User expertise consisted of four areas, asking the participants their level of familiarity with each of the following technologies or concepts: 1) online social networks, 2) electronic medical records, 3) communities of practice (in-person or offline), and 4) virtual communities of practice.

In looking at the influence of ability on central and peripheral routes to persuasion, as shown in Table 4, only experience with electronic medical records demonstrated a positive correlation with one of the routes: connectedness ($r=0.240$, $p < 0.05$). Therefore, *H5: For VCoP, User Expertise is positively correlated with Argument Quality among health care workers* is not supported. Both *H6: For VCoP, User Expertise is not correlated with Source Credibility among health care workers* is supported and *H7: For VCoP, User Expertise is not correlated with Connectedness among health care workers* is partially supported.

TABLE 4: INFLUENCE OF ABILITY ON PERSUASION ROUTES

User expertise item	Argument quality ¹	Source credibility ²	Connectedness ³
Online social networks	0.0423	-0.00259	0.0343
Electronic medical records	0.186 [†]	0.182 [†]	0.240*
CoPs	0.179 [†]	0.114	-0.00275
VCoPs	0.104	0.0132	-0.0150

Results reported as Spearman's rho

*** = $p < .001$; ** = $p < .01$; * = $p < .05$; [†] = $p < .10$

5.4.3 INFLUENCE OF MOTIVATION ON PERSUASION ROUTES

In terms of the constructs used to represent motivation (perceived usefulness and relevance to job) correlating with central and peripheral routes, perceived usefulness was correlated with argument quality ($r=0.371$, $p < 0.001$), so *H8: For VCoP, Perceived Usefulness is positively correlated with Argument Quality among health care workers* is supported. This construct was not significantly correlated with source credibility, so *H9: For VCoP, Perceived Usefulness is not correlated with Source Credibility among health care workers* is supported. Perceived usefulness was significantly correlated with connectedness ($r=0.236$, $p < 0.05$), not supporting *H10: For VCoP, Perceived Usefulness is not correlated with Connectedness among health care workers*. However, relative to the correlation with argument quality, this correlation is lower.

Relevance to job was correlated with argument quality ($r=0.288$, $p < 0.01$), so *H11: For VCoP, Relevance to Job is positively correlated with Argument Quality among health care workers* is supported. Relevance to job was also correlated with source credibility ($r=0.256$, $p < 0.05$), so *H12: For VCoP, Relevance to Job is not correlated with Source Credibility among health care workers* is not supported. However, as with the relationship with perceived usefulness and connectedness, this was a weaker correlation relative to that with argument quality. It was not significantly correlated with connectedness, so *H13: For VCoP, Relevance to Job is not correlated with Connectedness among health care workers* is supported.

5.5 QUALITATIVE RESPONSES

Qualitative analysis was performed on open-ended questions by examining each response individually to identify themes in accordance with the central and peripheral route constructs and coded accordingly. Although only one coder performed this analysis and thus the process carries the potential for bias, this strategy was utilized as the coder was most familiar with the research and meaning of the constructs of interest.

Without including those who did not answer the question, when elements that contributed most to attitude towards VCoPs were ranked, 35% indicated connectedness, followed by 24% for the strength of quotes/opinions, 21% for argument quality and 20% for credibility of the source.

Of the 70 responses to the question “What would encourage you to use a VCoP?”, 48 gave an answer pertaining to connectedness and source (specifically peer) credibility, such as:

- *“The ability to liaise with peers to discuss challenges and plan improvement initiatives across the sector”*
- *“The ability to connect with peers and share lessons learned”*
- *“If my peers were using it; leaders in the field encouraged use; demonstration of INCLUSIVENESS and usefulness to my practices”*
- *“If you could highlight how this can be useful to nursing I think it would draw a lot of enthusiasm from that profession. During these financial hard times,*

nurses in-unit education has been cut and we are desperate for somewhere we can gain (and share) new knowledge and experiences.”

- *“Ease of accessibility, engaged other users (peers and expert/advice givers) to provide robust, rapid and fruitful conversations and/or support”*

Another key theme was relative content, and high quality arguments

demonstrating evidence of the system’s impact, such as:

- *“A demonstrated connectedness and evidence to prove that participation in VCoPs truly improves a person's or organization's performance.”*
- *“evidence of change related directly to VCoP”*
- *“information about what the VCoP is related to, how it can be used to assist in development and strategies for improving care in my practice setting (relevant).”*
- *“If I knew it would improve my practice.”*

With respect to relative content, this is confirmed in the CoP literature, which states that a shared interest or domain is critical to the functioning of a community (Wenger & Wenger-Trayner, 2015).

The importance of ease of use demonstrated in the qualitative responses is consistent with the Technology Acceptance Model as a determinant of technology adoption. Paré et al. (2015) examined electronic health record use by physicians, dividing them into basic and advanced users. For those who considered themselves

highly impacted (motivated) by EHRs, they also rated system ease of use to be higher, indicating a symbiotic relationship between ease of use as an enabler to continued usage. The most frequent barrier listed in the qualitative responses was navigation/usage barriers (39%), followed by time (21%).

Cenfetelli (2004) found that technology usage is best predicted by enabling factors, whereas rejection is best predicted by inhibiting factors. The presence of enabling factors does not prevent resistance, and the absence of inhibitors does not always increase acceptance. Therefore, the author notes, acceptance and resistance constructs should be examined separately and addressed accordingly in design.

Venkatesh and Davis (2000) note that introducing new systems via compliance is not as effective for temporal persistence as compared to social influence and their effect on perceived usefulness. Instead, they argue, using social influence to encourage usage, such as through source credibility or communication tactics, increases the stability of positive associations with the system.

5.6 POST-HOC ANALYSIS

The following post-hoc analysis was conducted to investigate further relationships between the antecedents (user expertise, relevance to job and perceived usefulness) and outcome variables (attitudes and intention to use), as well as if there were differences between those with higher and lower levels of the antecedent constructs. As mentioned previously, the present study focused on overall attitudes as opposed to attitude changes, given the limited exposure to the

system in question. However, pre and post attitudes were included in the survey and as such, changes between these pre and post measures were also examined as a post-hoc analysis.

First, it was explored whether the antecedent of ability had a direct impact on attitude and/or intention, without being mediated by the central or peripheral routes, as shown in Table 5. Familiarity with communities of practice (in-person or online) was significantly correlated with intention to use ($r=0.362$, $p < 0.001$), but not with overall attitudes. Similarly, familiarity with virtual communities of practice was significantly correlated with intention to use ($r=0.279$, $p < 0.01$).

The direct impact of expertise on intention to use could be indicative of persuasion not being necessary to have a strong intention to use. Although there were no significant correlations with attitudes for both familiarity with CoPs and VCoPs, both user expertise items had significantly negative correlations with attitude change, meaning that the higher the experience level, the smaller the change in attitude and as a result, a greater intention to use the system. As will be explored below, the differences in levels of user expertise resulted in greater changes in attitudes. How to change attitudes, and therefore improve intention to use, for those with lower levels of experience is an important research opportunity, as will be explored further in the next section.

TABLE 5: INFLUENCE OF ABILITY ON OUTCOMES

User expertise item	Attitude change	Attitude	Intention to use
Online social networks	-0.0601	0.112	0.164
Electronic medical records	-0.0601	-0.00372	0.0755
CoPs	-0.215*	0.165	0.362***
VCoPs	-0.222*	0.0683	0.279**

Results reported as Spearman's rho

*** = $p < .001$; ** = $p < .01$; * = $p < .05$; † = $p < .10$

One-way ANOVAs were also conducted for each of the user expertise dimensions, dividing into higher (answers above 4 on the 7-point Likert scale) and lower (answers below 4) expertise groups to test differences between persuasion routes and outcome variables of attitude and intention to use. Table 6 shows those areas of expertise that demonstrated significant values.

For familiarity with online social networks, 11 responses were removed for having answers of 4. Only 8 responses were in the lower user expertise group (67 in the high user expertise group), and differences between all outcome variables were not significant when comparing users with lower and higher levels of expertise.

For familiarity with electronic medical records, twelve responses were removed for having answers of 4, and 22 respondents were in the lower user

expertise group (52 in the high user expertise group). Again, differences between higher and lower users for all outcome variables were not significant.

For familiarity with communities of practice, in person or offline, 11 responses were removed for having answers of 4, and 30 respondents fell into the lower user expertise group (45 in the high user expertise group). Those with higher expertise exhibited stronger intention to use than those with lower expertise levels ($F=7.800, p < .01$). There was also a significant difference in attitude changes between those with lower and higher experience with CoPs ($F= 5.006, p < .05$).

For familiarity with virtual communities of practice, 15 responses were removed, with 39 respondents being in the lower expertise group (32 in the higher user expertise group). When comparing lower and higher users, there were significant differences for intention to use ($F=6.199, p < .05$), with higher expertise users exhibiting greater intention to use.

TABLE 6: DIFFERENCES IN USER EXPERTISE LEVELS

Construct	Familiarity with CoPs	Familiarity with VCoPs
Argument quality	3.273	2.276
Source credibility	0.414	0.599
Connectedness	0.0245	0.0408
Attitudes	1.293	2.296
Attitude change	5.00595*	1.283
Intention to use	7.800**	6.199*

Results reported as F values

*** = $p < .001$; ** = $p < .01$; * = $p < .05$; † = $p < .10$

Differences between lower and higher levels of expertise are to be expected. Prior knowledge with respect to an issue is known to significantly influence information processing, as the greater the amount of knowledge an individual has with respect to an issue, the more likely they are to be capable of discerning communication that runs counter to their existing beliefs or to strengthen arguments consistent with their current stance (Petty & Cacioppo, 1986b). The ability of a user will influence their knowledge of the topic and will determine their ability to scrutinize an argument. For both CoPs and VCoPs, intention to use was significantly higher for those with higher expertise than with lower expertise.

Attitude change was only significantly different between those of higher and lower user expertise at $p < 0.05$ for familiarity with CoPs—the user's expertise with communities of practice. As expected, those with higher ability, operationalized in this study as user expertise, being more knowledgeable on the subject (specifically, on communities of practice) were less likely to exhibit changes in attitude.

To further explore the differences between participants with lower and higher levels of expertise, experience with communities of practice was examined further to derive greater insights into how these users differ in their information processing routes. Responses were divided into lower and higher expertise levels as per the strategy used when doing ANOVA analysis. As shown below in Table 7 for both lower and higher levels of expertise, argument quality was correlated with

attitude and intention to use. For those with higher levels of expertise, source credibility ($r=0.412$, $p < 0.01$) and connectedness ($r=0.314$, $p < 0.05$) were correlated with attitudes, and attitudes were significantly correlated with intention to use ($r=0.554$, $p < 0.001$). For those with lower levels of expertise, the peripheral cues did not influence attitudes, and attitudes were not correlated with intention to use.

TABLE 7: IMPACT OF PERSUASION ROUTES ON OUTCOMES BY EXPERTISE LEVEL

	Lower user expertise		Higher user expertise	
	Attitude	Intention to use	Attitude	Intention to use
Argument quality	0.377*	0.413*	0.433*	0.440**
Source credibility	0.109	0.118	0.412**	0.416**
Connectedness	0.189	0.203	0.314*	0.392**
Attitude		0.187		0.554***

Results reported as Spearman's rho

N=30; *** = $p < .001$; ** = $p < .01$; * = $p < .05$; † = $p < .10$

The positive correlations with source credibility and attitudes and subsequent intention to use for those with high user expertise runs counter to the ELM theory that source credibility serves as a peripheral cue more likely to be relied on by those with low levels of ability. However, the presence of source credibility could increase favorability of an argument among those in high states of elaboration and even bias how the quality of the argument is perceived (Chaiken & Maheswaran, 1994; Sussman & Siegal, 2003). When in a state of high

elaboration likelihood, individuals do not use the source alone to infer acceptance or rejection but rather will consider it along with all other information when evaluating it (Petty & Cacioppo, 1984b).

Connectedness and source credibility, traditionally seen as peripheral cues, were in fact only significantly correlated with attitude for those with high levels of user expertise. These findings are supported by previous research on the importance of peer opinion and tacit knowledge in health care, but the existence of correlations only for those with higher levels of expertise could potentially be explained by a greater receptivity to arguments, regardless of the type, by those with higher levels of ability.

Although correlations between ability and central and peripheral routes were not significant in the original hypothesis testing (aside from familiarity with electronic medical records and connectedness), when lower and higher expertise users were isolated, argument quality (central route) was significantly correlated with attitude for those with high expertise.

Also explored was whether the motivation antecedents had a direct impact on attitude and/or intention, without being mediated through central and peripheral routes. Shown in Table 8, relevance to job was significantly correlated with attitudes ($r=0.385$, $p < 0.001$), as was perceived usefulness ($r=0.349$, $p < 0.001$). Relevance to job was also correlated with intention to use ($r=0.428$, $p < 0.001$), and so was perceived usefulness ($r=0.512$, $p < 0.001$). Unlike the user expertise construct, there were not significant correlations with relevance to job or perceived usefulness and attitude changes. However, as will be discussed below, this could

be explained by the overall high ratings of these two constructs and therefore changes in attitudes were not significant between pre-and post- measures. High motivation, then, can be associated with strong attitudes and intention to use. Increasing these motivational constructs through leadership and organizational support to socialize and normalize the value of CoPs and VCoPs will improve their likelihood of adoption.

TABLE 8: INFLUENCE OF MOTIVATION ON OUTCOMES

	Attitude change	Attitude	Intention to use
Relevance to job	-7.121e-05	0.385***	0.428***
Perceived usefulness	0.0224	0.349***	0.512***

Results reported as Spearman's rho

*** = $p < .001$; ** = $p < .01$; * = $p < .05$; † = $p < .10$

As was done with ability, attempts were made to analyze both constructs used to represent motivation by using one-way ANOVAs, dividing the constructs into higher (answers above 4 on the 7-point Likert scale) and lower (answers below 4 on the 7-point Likert scale) motivation; answers of 4 were not considered in the analysis. Meaningful results were not able to be obtained, as described below. It could therefore not be determined whether routes of persuasion or correlations with outcome variables differed by level of motivation.

The relevance to job construct had four responses with answers of 4 that were thus removed. When divided into high and low users, only 6 would have

been considered as low users as compared to 76 with high relevance to job, unfairly biasing the sample. When high and low users were compared using ANOVAs, all outcome values were not significant.

For the perceived usefulness construct three responses with an answer of 4 were removed. When divided into higher and lower groups, only 6 fell into the lower category as compared to 77 with higher perceived usefulness. As with relevance to job, this was found to unfairly bias the sample. Testing between higher and lower perceived usefulness showed that all outcome variables were not significant.

From the ELM literature, those with strong motivation/ability were expected to be more receptive to argument quality and as such would exhibit minimal change in attitude towards virtual CoPs by both central and peripheral route messaging types. Those with lower levels of motivation/ability were expected to be influenced by the peripheral cues and exhibit a positive attitude change when presented with such cues. Those with low motivation/ability were expected to exhibit minimal attitude change as a result of exposure to high quality arguments, processed through the central route. Indeed those with lower levels of ability exhibited larger changes in attitudes towards virtual communities of practice. Interestingly, those with higher levels of experience with CoPs were influenced by both central and peripheral route processing—perhaps indicative of the highly motivated participants and a greater ability to process issue-relevant arguments due to experience.

CHAPTER 6: CONCLUSIONS

6.1 CONTRIBUTIONS

6.1.1 ACADEMIC

Bhattacharjee and Sanford (2006) were the first to apply the elaboration likelihood model (ELM) to an information technology acceptance context, and the application of this model to the field of electronic health remains limited. Furthermore, where this application has existed, it has been from the patient perspective and not the provider (Angst & Agarwal, 2009). Thus, to the best of the author's knowledge this research was the first to apply ELM to the study of those working in health care and quality improvement.

This exploratory work contributed not only in its unique study population, but also in the exploration of antecedents to the validated concepts of central and peripheral routes to persuasion. The findings highlight the importance of tacit knowledge in the form of source credibility and the design element of connectedness to influencing attitudes towards virtual communities of practice. Argument quality, traditionally found effective in persuading those in states of high elaboration, was an effective influencer on attitudes for both those with higher and lower levels of expertise, reflective of the highly motivated, academic study setting.

Studying the construct of connectedness—defined as enabling visitors to share opinions, benefit from other visitors to the website, and share common interests with others—for virtual communities of practice in health care is a unique contribution to the research body in this field. The origins of this construct are from the e-commerce

world, as a proven contributor to trust and therefore purchase intention and loyalty. Applied to a community of practice setting, being able to demonstrate this through a user interface can then translate to feelings of trust—a known critical success factor for knowledge sharing and generation in communities of practice. Encouraging use and “loyalty” or return visits for this particular setting is necessary to enable a thriving community, and therefore the importance of this as a design element cannot be underestimated.

This exploratory research examined antecedents to attitude formation, the introduction of connectedness as a peripheral cue not yet studied in the communities of practice research, and a new sample (those working in health care). Insights derived from the study warrant further investigation, and it is hoped that future research can use a larger sample size and from there, a more rigorous investigation of causation.

6.1.2 PRACTICE

Given the novelty of virtual communities of practice (CoPs) for quality improvement in health care in Ontario, this research will provide needed insight into effective messaging to increase the technology’s uptake and use. The relative newness of technology for health care means opinions are not long-held, and therefore exposure to related information determines attitudes regarding its usage. To derive maximum benefit from existing government expenditure and investment in electronic health, it is crucial to capitalize on this period when attitudes are being formed to create positive attitude changes. Increasing the capacity for evidence-informed decision making requires changes to structure and processes, which CoPs have been shown to

effectively address (Meagher-Stewart et al., 2012). Improving the usage and adoption of CoPs in a virtual environment therefore warrants investigation of the factors influencing attitudes towards such platforms. The present study has provided insight into the antecedents to attitude formation, and the differences in influential factors between those with higher and lower levels of expertise.

Petty and Cacioppo (1984a, 1986b) note that the benefits of central-route processing (greater persistence, predictive ability of behaviour and resistance to change) make it indeed favourable but acknowledge that there is a difficulty in persuading through this route.

By improving attitudes towards virtual CoPs for those with low motivation/ability, and therefore their intention to use the platform, creating a positive user experience upon joining the community will enable continued usage. Peripheral cues by nature (peer opinion and message medium) are tenets of a virtual CoP and, if positive, will presumably entrench the positive attitude change about the virtual platform. Øvretveit et al. (2002) recommend giving potential CoP members the opportunity to self-assess their expected benefits from participation, in addition to providing guidance about the benefits and requirements to achieve such benefits.

Petty and Cacioppo (1984a) note that one prominent cue or inference (such as the number of arguments being indicative of argument quality) can leave the individual more apt to forget the new information, and so in order to create enduring attitudes requires repetitive exposure to the persuasive message.

The strong correlations found between ability and motivation with intention to use highlight the importance of increasing individual exposure to the system and motivation through leadership and organizational support to socialize and normalize the value of CoPs and VCoPs to improve their likelihood of adoption.

It is hoped the theory behind the research model will enable generalizability of the study beyond virtual communities of practice to health care technology at large.

6.2 LIMITATIONS

It is acknowledged that the conferences at which the present study's surveys were administered may have biased the sample, given that the conference participants were already actively involved in health care quality improvement by nature of their attendance, and may already have been "converted" to such concepts as communities of practice. That being said, as this represents the target audience for such a technology, the present research findings have greater generalizability to others. The sample size was based on the number of conference attendees as opposed to the wider population of health care workers in general, and is acknowledged to be smaller than if it was based on the broader group.

Another potential limitation is the environment in which the surveys took place, combined with the length of the survey. As survey booths were located in high-traffic areas and the majority of participants completed the survey during break periods, the potential for distraction as an external influence is recognized. As identified by Petty and Cacioppo (1984a), distraction can play a role in

influencing the importance of peripheral cues in message persuasion. In the presence of high distraction, elaboration likelihood goes down so these peripheral cues are more influential (Petty & Cacioppo, 1984b). Those with high levels of motivation and/or ability are affected more by distraction than those operating under the peripheral route (Petty & Cacioppo, 1986b). Petty and Cacioppo (1984b) cite work by Kiesler and Mathog (1968), who found that the presence of high levels of distraction increased the effect of source credibility, and when distraction levels were low, this effect was not significant. As such, they note, increasing the ability for an individual to elaborate on an issue will reduce their reliance on using peripheral cues (Petty & Cacioppo, 1984b). Furthermore, when participants had low levels of motivation, increasing the source expertise increased attitudes, regardless of quality of the arguments. In the case of moderate elaboration likelihood, Petty and Cacioppo (1984b) found that source-related cues will increase attitude changes if messages are strong but decrease attitude changes if messages are weak. By the same logic, then, those with low levels of expertise are less likely to have been affected by the presence of distraction, and therefore their resulting attitude changes after message exposure are still valid.

A further limitation is the use of a single-item construct to measure opt-in intention, which can have lower predictive validity than multi-item measures (Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012). The decision to use a single-item construct was made given that the virtual community of practice in question was not yet available at the time of the study, and therefore it did not make

sense to include other time frames (within the next month, in the near future, and for more job responsibilities, as done by Bhattacharjee and Sanford (2006)). User expertise was measured using four single-item constructs for each of four areas (online social networks, electronic medical records, CoPs and VCoPs) and as such may result in lower predictive validity. The user expertise construct had been previously validated (Bhattacharjee & Sanford, 2006) and each item was isolated in the present research to derive greater insights from the different areas.

6.3 FINAL CONCLUSIONS

Virtual communities of practice have been shown to be an effective means for knowledge and research uptake, but researchers have not examined them from a health care practitioner point of view. While ELM's framing of the central and peripheral routes to persuasion has been shown to influence attitude and ultimately intention to use, the present research gathered insights into potential antecedents of these two routes. By understanding what influences these two routes, we can better understand how to design and position a virtual CoP for health care practitioners.

The current study was initiated to investigate the factors that determine attitudes towards technology adoption in health care. Previous research shows that those working in health care value peer opinion and tacit knowledge above other, traditional evidence-based resources, such as clinical practice guidelines, so it is a logical step to leverage this finding to increase technology adoption, which historically has seen limited success in this industry. The research conducted chose to examine this relationship through the ELM framework to examine the role that expertise (ability)

and motivation (perceived usefulness and relevance to job) play in determining how issue-relevant arguments shape attitudes. The constructs used to represent motivation (relevance to job and perceived usefulness) were indeed more strongly (positively) correlated with argument quality than they were with the peripheral cues of source credibility and connectedness. While relevance to job and perceived usefulness were rated highly with respect to virtual CoPs, and therefore these constructs were not able to be separated into lower and higher levels for further analysis, this research showcases that users are highly motivated to use such a technology should it be available. However, it is recognized that these high ratings may be a result of the population the sample was selected from, as voluntary attendees of the conferences where recruitment took place are likely to be highly motivated individuals. The wide range of user expertise with respect to the concept of communities of practice allowed for further analysis in line with the ELM. Surprisingly, the most important factor contributing to positive attitudes for those with low levels of user expertise relating to communities of practice was the central route, operationalized as argument quality. Neither peripheral nor central route constructs were correlated with changes in attitude for the lower levels of expertise. For those with higher levels of expertise, both central and peripheral routes to persuasion were positively correlated to attitudes.

The direct effect of antecedents (for user expertise with CoPs and VCoPs) on both attitude and intention to use (for relevance to job and perceived usefulness) strengthen the importance of these factors in determining the likelihood of the technology's success—manipulation of these factors, perhaps through opportunities to

familiarize oneself with the platform (to increase experience) or leadership support (for relevance to job and perceived usefulness), may in fact offer a promising method to increase success.

Although the findings about the processing routes by level of expertise run counter to ELM theory, the highly educated participants and the nature of their work are reflective of an evidence-minded study population. Through the insights about the unique antecedents to attitude formation in health care, the design and messaging can be improved to appeal to those experienced with CoPs in their traditional offline form to translate this experience to usage of an online environment. For both those with higher and lower levels of expertise, evidence-based arguments are indeed an effective messaging tactic to improving attitudes towards virtual CoPs.

Acknowledging the challenges of bringing evidence into practice in health care (Grimshaw, Eccles, Lavis, Hill, & Squires, 2012), the present research highlights an exciting opportunity to translate research findings through peer knowledge-sharing in a trusting, online environment. Showcasing the value to members through the interface and eventual impacts on practice will be a necessary future endeavour to ensure continued usage, and warrants further investigation. As health care resources are increasingly stretched, enabling effective collaboration through virtual CoPs will contribute positively to fostering a culture of health care quality improvement.

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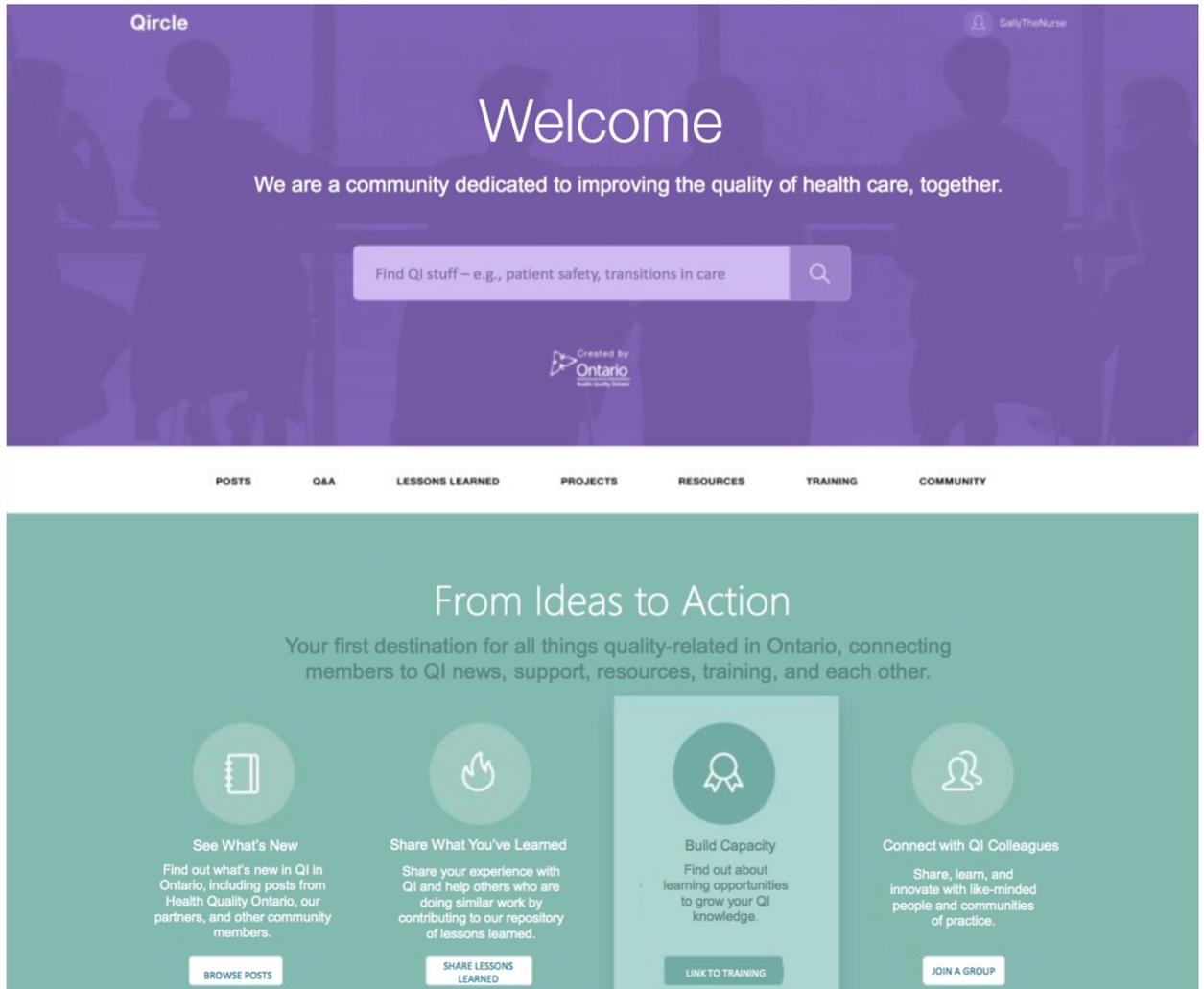
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APPENDIX A

User interface



The screenshot displays the Qircle forum interface. At the top, there is a purple navigation bar with the logo 'Qircle', a search bar containing the text 'Find QI stuff – e.g., patient safety, transitions in care', and a user profile icon for 'SallyTheNurse'. Below the navigation bar is a white menu bar with categories: POSTS, Q & A, LESSONS LEARNED, PROJECTS, RESOURCES, TRAINING, and COMMUNITY. The main content area is titled 'HOME > Q & A' and 'Q & A'. A large heading reads: 'Looking for support? Got a question about QI? This forum is where you can seek help and share your own knowledge with the community.' Below this is a search section with the text 'Find a question...', a text input field with the placeholder 'Enter a keyword', and a green button labeled 'SEARCH QUESTIONS'. A red link 'Ask a question' is positioned below the search field. There are three filter buttons: 'All Qs', 'My Qs', and 'Popular'. The main content area lists three questions with their respective answer counts and authors. The first question is 'How are you measuring falls?' with 9 answers, authored by Aimee Smith, and tagged with 'Falls, long-term care, education'. The second question is 'What kind of person-centred communication strategies have you tried to invite and engage patients in coordinating their care with the Health Link team?' with 7 answers, authored by Michael Taylor, and tagged with 'Health Links, coordinated care, person-centred'. The third question is 'What definition do you use for the PCP indicator in QI RAP?' with 5 answers, authored by Sara McNeil, and tagged with 'Health Links, primary care'. On the right side, there is a section titled 'SHARE EXPERIENCES WITH QI' with a green button 'GO TO LESSONS LEARNED'. Below that is a section titled 'FIND RELATED PROJECTS' with a list of four project titles: 'Falls Prevention in Primary Care', 'The Balance Between Resident Safety and Quality of Life in LTC', 'Preventing Functional Decline', and 'Operation Safe Harbour: Woman Abuse Screening and Early Intervention'.

Qircle Find QI stuff – e.g., patient safety, transitions in care SallyTheNurse

POSTS Q & A LESSONS LEARNED PROJECTS RESOURCES TRAINING COMMUNITY

HOME > Q & A

Q & A

Looking for support? Got a question about QI? This forum is where you can seek help and share your own knowledge with the community.

Find a question...

Enter a keyword SEARCH QUESTIONS

Ask a question

All Qs My Qs Popular

9 Answers How are you measuring falls?
We're a medium-sized home in Central East LHIN and are looking for some advice.
Author: **Aimee Smith**
Tags: Falls, long-term care, education

7 Answers What kind of person-centred communication strategies have you tried to invite and engage patients in coordinating their care with the Health Link team?
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed
Author: **Michael Taylor**
Tags: Health Links, coordinated care, person-centred

5 Answers What definition do you use for the PCP indicator in QI RAP?
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
Author: **Sara McNeil**
Tags: Health Links, primary care

SHARE EXPERIENCES WITH QI

GO TO LESSONS LEARNED

FIND RELATED PROJECTS

- Falls Prevention in Primary Care
- The Balance Between Resident Safety and Quality of Life in LTC
- Preventing Functional Decline
- Operation Safe Harbour: Woman Abuse Screening and Early Intervention

The image shows a screenshot of a web application interface for sharing lessons learned. At the top, there is a navigation bar with the logo 'Circle' and a search bar containing the text 'Find QI stuff – e.g., patient safety, transitions in care'. Below the navigation bar are tabs for 'POSTS', 'Q & A', 'LESSONS LEARNED', 'PROJECTS', 'RESOURCES', 'TRAINING', and 'COMMUNITY'. The main content area is titled 'Lessons Learned' and includes a sub-header 'HOME > Lessons Learned'. A large heading 'Lessons Learned' is followed by a paragraph: 'Have some advice about a QI initiative you've worked on? Let the community know what went well and what you would do differently next time.' Below this is a form titled 'Share a Lesson Learned' with the subtitle 'Inspire the QI community by sharing your experience implementing change ideas and innovative practices.' The form has two main input fields: 'Change Idea implemented:' and 'Lesson Learned:'. The 'Lesson Learned' field includes a prompt: '(e.g., What was your experience with an indicator? What were your key learnings? Did the change idea make an impact? What advice would you give to others?)'. Below these fields is a 'Submit' button. The background of the screenshot shows a list of posts with titles like 'Implement Interdisciplinary Continence Quality Team...' and 'The Interdisciplinary Continence Quality Team began meeting...'. The user's profile 'SallyTheNurse' is visible in the top right corner.

Circle Find QI stuff – e.g., patient safety, transitions in care SallyTheNurse

POSTS Q & A LESSONS LEARNED PROJECTS RESOURCES TRAINING COMMUNITY

HOME > Lessons Learned

Lessons Learned

Have some advice about a QI initiative you've worked on? Let the community know what went well and what you would do differently next time.

Share a Lesson Learned

Inspire the QI community by sharing your experience implementing change ideas and innovative practices.

Change Idea implemented: Implement Interdisciplinary Continence Quality Team to review current trends and analyze continence in the home.

Lesson Learned: (e.g., What was your experience with an indicator? What were your key learnings? Did the change idea make an impact? What advice would you give to others?) The Interdisciplinary Continence Quality Team began meeting on a monthly basis and reviewed every resident that triggered worsening bladder on their MDS assessment. While reviewing for accuracy, the team indicated that there was some confusion around coding. Once the education was provided, the team noticed less residents triggering the indicator. The team learned that it is important to monitor the MDS assessments and share the results with the front line staff.

Submit

APPENDIX B

Other job titles

Planner/Facilitator
Educator
RN and Advisory Council Member
Patient Advisor
Government
Policy Advisor
program coordinator
System Planner
Policy and Planner
Professional Services
Epidemiologist
Knowledge Translation Professional
Business Development
Operational Improvement & Organizational Change consultant
Data analyst
coordinator
QI
Quality Manager
quality
Quality Improvement