Information-seeking and Perceptions of Expertise in an Electronic Network of Practice

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Declaration of own work:

I hereby declare that this thesis, titled:

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and submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Business Studies at The University of Warwick, presents my own work and has not been previously submitted to this or any other institution for any degree, diploma or other qualification. All sources of quoted information are acknowledged by means of references.

Monique Ziebro

Abstract

This study assesses information-seeking and perceptions of expertise in Electronic Networks of Practice (ENoPs). ENoPs are a particular type of online community focused on sharing information related to a specific work-related profession (Wasko and Faraj, 2005). To date, there has been little empirical work on the dynamics of information exchange in ENoPs (Whelan, 2007). The little we do know is based on face-to-face communities, which cannot be generalized to online interactions due to changes in size, purpose, and method of communication. Understanding the type and perceived value of information is an important line of theoretical inquiry because it has the potential to identify the specific informational needs these communities fulfil and the types of people most likely to fulfil them.

This research was conducted in an ENoP focusing on the exchange of information related to the practice of engineering. The community studied, Eng-Tips, is a thriving network focusing on the practice of engineering that has produced over 150,000 posts, and is comprised of engineers from twenty-one different specialties. Interactions take place solely through the use of virtually mediated technology, and focus primarily on practice-related issues. The format of interaction is typically based on a query and a stream of ensuing replies. Data were collected through metrics and a coding procedure that allowed me to identify the most common queries in the ENoP.

My data revealed queries in the ENoP tended to focus on obtaining solutions, meta-knowledge, or validation. The high emphasis on validation was similar to that found in face-to-face friendship networks, and was contrary to Cross et al.'s (2001) anticipated results, most likely due to the presence of anonymity. I also found that experience of interacting with multiple specialties (i.e. interactional expertise) was positively associated with perceived expertise. Finally, I discovered that replies, giving out nominations, and frequently logins were positively associated with the number of expert nominations one received in the community.

This research makes contributions to both theory and practice. I contribute to theory on information-seeking by extending Cross et al.'s (2001) research to the online environment, and articulating the type of informational benefits sought in the ENoP. I contribute to theory on expertise by exploring the characteristics associated with perceived expertise, and exploring the reasons why interactional expertise may be particularly valued in ENoPs. My work in this area reveals that—in the context of the ENoP studied—a 'common practice' is highly fragmented and loosely knit, further distinguishing this entity as a unique organizational form. My findings in this area call into question the validity of a practice-based approach for examining these entities, and for these reasons, I suggest they may be better conceptualized as Electronic Networks of Discourse. Practical ramifications focus on describing the type of information members want to obtain from their involvement in the community, which may benefit members, organizations, and managers of the ENoP.

I. INTRODUCTION

This thesis examines perceptions of expertise and information-seeking behaviour in virtual communities that are devoted to sharing information in a specific type of occupation or practice. These types of communities are known as Electronic Networks of Practice, and are referred to herein for convenience as ENoPs. ENoPs were first defined by Wasko and Faraj (2005, page 35) as "computer-mediated discussion forums focused on problems of practice that enable individuals to exchange advice and ideas with others based on common interests." They are characterized by many of the same features of networks of practice, which include a focus on a shared profession and the presence of weak relationships among members (Brown and Duguid, 2000); however, they are completely reliant on virtually mediated technology to broker exchanges. In this thesis, I use predominantly quantitative measures to assess information-seeking patterns in an ENoP, including cross-specialty information seeking, and the relationship between contributors' usage characteristics, contribution patterns, and perceptions of expertise in the network My objective is to focus greater attention on informational content in ENoPs. Data is based on a rich history of exchanges among members of a virtually-situated engineering community.

The study of ENoPs has emerged from the study of Communities of Practice, herein referred to as CoPs. CoPs are a group of people working toward a common objective who share a profession, craft, or occupation (Lave and Wenger, 1991; Wenger, 1998). ENoPs are distinct from CoPs due to their large, sprawling, virtual form, and because ENoP members pursue individualized (versus jointly-created) objectives (Wasko Faraj and Teigland, 2004; Wasko and Faraj, 2005). Because of these differences, the relatively large body of research on Communities of Practice

cannot fully translate to ENoPs. This study will build theory on ENoPs by exploring in greater detail the types of information sought from the community, and the characteristics of the people most likely to supply that information.

This chapter is divided into eight main parts. The first portion discusses both the aim and importance of this research. The second portion delineates these objectives by describing specific areas of interest. The third part defines several key concepts. The fourth part identifies the research gap this literature seeks to fill and summarizes the intended contributions of this work to theory and practice. The fifth part describes the methodology, the sixth briefly introduces the community, and the seventh portion outlines the structure for the remainder of the thesis, and the final part provides a summary of this chapter

1.1 The Research Aim and its Importance

The research aim, or broader purpose of this research, is to **understand the type of information sought in ENoPs and the factors associated with perceived expertise in these networks.** This is a highly important aim for both theorists and practitioners alike. Due to their ability to facilitate the sharing of information and stimulate innovation, structures such as the ENoPs are of growing importance to both researchers and practitioners (Dhanaraj and Parkhe, 2006; Parkhe et al., 2006; Whelan, 2007). These structures are widespread and can be found in a variety of industries, including: public health (Vaast, 2004), law (Wasko and Faraj, 2005), astronomy (Ferris, 2002), and software development (Shah, 2006; for complete review of industries, see Whelan, 2007). Given the size of the knowledge economy and the related demands for efficient information sharing (Camagni and Capello, 2009), it is likely ENoPs will only increase in popularity. Since we cannot

generalize our knowledge of CoPs to ENoPs, it is not surprising there has been a call for research into "the dynamics of knowledge exchange that occur within these electronic networks" (Whelan, 2007, pg. 5). My objective is to remedy some of this theoretical murkiness by: first, defining and positioning ENoPs in the literature on online communities, and second, exploring some of the dynamics of knowledge exchange that shape patterns of information-sharing and perceptions of expertise. From a practical perspective, practitioners are better situated to capitalize on the benefits of ENoPs when they understand the strengths of these entities, and the information-sharing niche they fill.

Online communities are groups of people who, with the support of technology, interact in a virtual environment; these interactions are guided by norms and policies and may often develop independently of an organizational structure (Preece, 2000; Johnson, 2001). Both the structure and dynamics of these communities vary as a product of the following factors: meeting space (i.e. solely virtual or face-to-face), community purpose, the structure of the virtual interactions (i.e. teleconferencing, bulletin boards, email, etc.), size, duration, life-cycle, culture, and governance structure (Preece, Maloney-Krichmar, and Abras, 2003). The resulting variance in these factors produces a great deal of range and diversity in online communities (Johnson, 2001).

Due to their potential to develop into thriving centres of exchange, there is both a strong organizational and empirical interest in online communities that focus on information-sharing and the exchange of knowledge (see Ardichvili, Page, and Wentling, 2003 for review). However, interest in these communities is not simply a matter of organizational importance. At an individual level, practitioners may see

online communities as a valuable way to increase personal knowledge and professional worth, and reinforce occupational identity (Wasko and Faraj, 2000; Ren, Kraut, and Kiesler, 2007). In addition, these communities represent a potential to access unique information that is not commonly held in one's organization, which may subsequently have a higher degree of perceived value due to its presentation of diverse perspectives (Granovetter, 1973; Reagans and McEvily, 2003). For these reasons, individuals may join practice-based networks that are not situated in any specific organizational context.

1.1.1 Theoretical Basis of ENoPs

What we do know of ENoPs is situated within both a practice-based view and a social network perspective. The former viewpoint emphasizes the production of knowledge as a form of participation that is "continually reproduced and negotiated…it is always dynamic and provisional" (Nicolini et al., 2003, page 3). Since this perspective focuses more on the production of knowledge as an interactive process or joint undertaking, it tends to focus less on the informational diversity present within the group. For this reason, there has not been sufficient attention on understanding centres of expertise in ENoPs. This perspective is affiliated with situated learning theory, which examines how knowledge emerges through shared practice (Lave and Wenger, 1991). Due to its research focus, theory that developed from situated learning—specifically CoPs and ENoPs—have not focused greatly on evaluating differing levels of expertise.

Another way of approaching ENoPs is through a social network lens, which focuses more heavily on understanding the flow of information, goods, and social capital (e.g. Burt, 1992; Granovetter, 1973). This perspective uses a methodology

called social network analysis to determine network structure, which is used as a proxy for understanding the most important people and information flows in a given network (Scott, 1988). However, social network analysis may be difficult to conduct when the network is large, its boundaries are indeterminate, and it contains a disproportionate number of weak relationships (Burt and Ronchi, 1994), all conditions exemplified by the ENoP. Furthermore, since network analysis only assesses the presence and strength of a relationship (i.e. structure), it does not assess the directionality of information flow, meaning a network perspective often assumes informational symmetry in exchanges, which may lead to a distorted view of the most valuable contributors in a network (Haythornthwaite, 1996).

Ultimately, the theoretical positioning of ENoPs has consequently restricted our ability to describe, understand, and position ENoPs within the literature on online communities. By understanding how members of ENoPs use the networks to access and communicate diverse information, researchers will have a greater awareness of the individual as an autonomous agent in the information-seeking process and the way these networks are able to fulfil important member needs.

From a practical perspective, the range of information available in an ENoP can be a powerful tool for both organizations and practitioners. This relevance of this research is evidenced by a continued demand for knowledge-based products, and the ever-increasing prevalence of electronic communities devoted to information-sharing (Ardichvili, Page, and Wentling, 2003; Zhang, Ackerman, and Adamic, 2007). Encouraging membership in ENoPs is one way organizations can ensure employees will have access to a range of information that may help fuel innovation or enhance job performance (e.g. Camagni and Capello, 2009; Sharratt and Usoro,

2003). Understanding the information needs of the participants in these communities may help ENoP developers create better communities while helping members raise their profile in the ENoP.

1.2 Research Objectives

The aim of my research is to understand the type of information sought in a particular kind of online community, referred to here as Electronic Networks of Practice (ENoPs), and to identify the factors associated with community members' perceptions of expertise in these networks. The related objectives are to:

- assess the type of information sought in ENoPs;
- examine how information-seeking behaviour is related to perceptions of expertise;
- understand the characteristics associated with perceptions of expertise in ENoPs;

From a theoretical perspective, I would like to focus attention on the ENoP as a vehicle for both seeking and sharing information among a set of diverse practitioners who are not situated in a shared organizational context, but united by an overarching shared professional identity. I would also like to illuminate the dynamics of exchange in these types of communities, looking specifically at the extent to which the ENoP is used to seek information outside of one's own immediate area of expertise and the type of information seeking that occurs. Finally, I would like to see how certain contribution patterns and characteristics, such as the frequency and type of interaction, influence perceptions of expertise in these communities. These aims will allow me to develop a picture of information exchange and valuation that pushes beyond the structural explanations offered by the social network perspective (e.g. Faraj and Johnson, 2011; Whelan, 2007).

1.3 Key Concepts

1.3.1 Electronic Networks of Practice

I have previously defined ENOPs in the introductory paragraphs on page 9, so the discussion here will be succinct. Distinguishing features of ENoPs included: a reliance on virtually mediated communication, the pursuit of an individually determined—rather than jointly developed—purpose, presence of a common practice, and a focus on sharing information related to that practice (Wasko and Faraj, 2005). The study of Communities of Practice, and thus the theoretical approach to ENoPs, is rooted in situated learning, which evaluates learning as a social process that leads to the co-creation of knowledge and meaning (Lave and Wenger, 1991). This process is context specific, and the acquisition of knowledge is embedded within a distinct context and environment. Figure 1 focuses on a few key differences concepts discussed thus far, according to the specific authors noted.

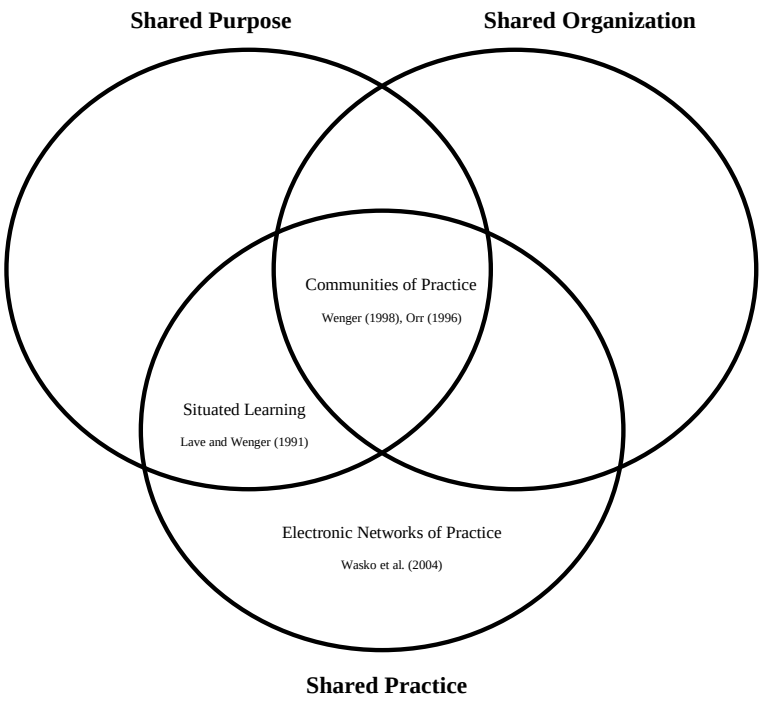


Figure 1: Relationship between situated learning, Communities of Practice, and Shared Practice

1.3.2 Information-Seeking

Information seeking is the process of acquiring knowledge through a systematic—but not necessarily sequential process—which includes engaging in a series of defined stages, involving the identification of a problem, the articulation of information needs, development of a query, and the evaluation of the results of the search (Sutcliffe and Ennis, 1998). The search for information is an imperfect process, with individuals often limited in the amount of cognitive effort they expend to address a query (Simon, 1957). Online communities offer the ability to reduce the effort associated with searching for information by providing rapid access to expert knowledge in a given field (Zhang, Ackerman & Adamic, 2007). There are five types of information-seeking benefits identified in face-to-face communities by Cross et al., (2001), which include: solutions, meta-knowledge—the search for a larger knowledge repository or database, validation—the confirmation of a solution, problem reformulation, and legitimacy. To date, this research on informational benefits has not yet been extended to online communities. My focus here is on information-seeking (as opposed to information giving) because it allows us to understand the type of knowledge people want to obtain from their involvement in the community.

1.3.3. Perceptions of Expertise

Expertise is defined as knowledge or performance that is superior to the performance or knowledge of a number of other people who practice in that same domain (Schvampveldt et al., 1985). In the context of my thesis, perceived expertise is the relative belief that an individual possesses a degree of superior knowledge on a given topic. In essence, if a perceiver has less wisdom than a target, that target could be seen as possessing expertise (Collins and Evans, 2007). Perceptions of expertise

are important because they influence a number of factors, including the development of status, power, and reputation in a community (e.g. Dellarocas, 2003, Lampel and Bhalla, 2007). In my thesis, perceptions of expertise are assessed using expert nominations (see below).

1.3.4 Expert Nominations

In the context of the community studied, expert nominations are a form of feedback that publicly acknowledges helpful or constructive contributions, and can be used to determine the most valued community members. In my thesis, expert nominations are extremely simplistic, taking the form of a two-click vote to acknowledge a particularly helpful piece of advice or information. At the most basic level, expert nominations form part of a feedback or 'reputation' system that facilitates the development of both reputation and status in online communities (Dellarocas, 2003; Lampel and Bhalla, 2007).

1.4 Expected Contributions to Knowledge

This work has strong ramifications for both theory and practice. The main contributions to theory are centred in information-seeking and the evaluation of expertise in ENoPs. Contributions to practice focus on benefits to: coordinators of these communities, those seeking to enhance their reputation in ENoPs, and employees of organizations. To date, much of the research on ENoPs has primarily focused on why people contribute to the community (e.g. Wasko Faraj & Teigland, 2004; Wasko and Faraj, 2005; Ardichivelli, 2008; Ardichivelli Page and Wentling, 2003). However, understanding the reasons people 'give' or contribute to the community is only one half of the equation; by examining the type of information

people want to get from the ENoP we are better positioned to understand how these communities meet information needs.

Our knowledge of ENoPs aligns with a practice-based view; the practice-based view does not tend to focus on evaluating levels of expertise, because the object of inquiry here is on how a practice—as a whole—develops and moves forward (e.g. Nicolini et al., 2003). While additional insights are gleaned from the social network perspective, this perspective does not fully consider asymmetries that occur in exchanges, which may distort the picture of the most important contributors in a group (e.g. Borgatti, 2003).

Due to the positioning of ENoPs in situated learning theory and the social network perspective, I suggest there has been insufficient exploration into expertise and information-seeking in ENoPs. While ENoPs are an increasingly popular topic of scholarly research, the focus of that scientific inquiry has tended to be on the factors underlying the motivations to contribute rather than the actual contributions themselves (e.g. Wasko Faraj & Teigland, 2004; Wasko and Faraj, 2005; Ardichivelli, 2008; Ardichivelli Page and Wentling, 2003). Through my research, I hope to shift some empirical attention from 'who is participating and why', to the 'shape and texture' of that participation. In this way, I hope to illuminate the dynamics of exchange in ENoPs.

This research contributes to practice by assisting community coordinators in understanding the type of information members seek from ENoPs. This will subsequently allow coordinators to structure their communities in more effective ways to meet member needs, while taking proactive measures to ensure the most valuable contributors remain active. Secondly, this research may prove helpful to

those individuals wishing to enhance their professional reputation or perceived worth in the ENoP through an enhanced understanding of the factors related to perceived expertise in ENoPs. Finally, a better understanding of these types of communities allows both employees and management to capitalize on ENoPs to increase the organization's knowledge base; subsequently enhancing creative potential, and speed of innovation (e.g. Woodman, Sawyer and Griffin, 1993; Tsai, 2001). In this way, my research has the potential to make practical contributions to mangers of ENoPs, members of ENoPs, and organizations.

1.5 Research Methodology

This work primarily uses quantitative techniques to address my research questions. To understand information-seeking patterns, I use coding to transform the queries (i.e. qualitative data) into overall frequency counts. To evaluate perceptions of expertise, I used both partial correlations and linear regression to evaluate the relationship between expert nominations and several community-level factors. These statistical analyses were based on data gathered in the form of community usage metrics, which include information such as: frequency of logins, specialist expertise, the number of times an individual starts a thread, the number of times they replied to a thread, number of "frequently asked questions" briefs that are written, the forums in which these comments were made, the number of expert nominations received, and the number of expert nominations given out. In addition, data were gathered on the forums where individuals made contributions, including the number of comments, replies, and the specialty area of those comments.

1.6 Research Context

The ideal context for this study is an ENoP that has the capacity to produce information exchanges across a variety of specialities, thus enabling an exploration into the nature of the information sought and its perceived value. Furthermore, the context in question should be focus on an area where knowledge-sharing and the consumption of information is a key characteristic of the profession or practice.

The criteria are fulfilled by the selected context, Eng-Tips, an ENOP, whose members represent a broad range of differing engineering specialities and who work in numerous different organizations. Eng-Tips is a public community that was founded in 1998, and since that time it has accumulated over 154,300 posts, yielding a data-rich environment. It is difficult to determine the actual number of active members because the network is consistently in flux and its loose structure makes it difficult to obtain a reliable measurement. However, there are over several thousand registered members in over 200 countries, with the bulk of members (31.5%) concentrated in the United States, and communicating solely in English. A broad range of engineering specialties are represented (approximately twenty-one), and detailed metrics were available on the frequency of member login, duration of membership, and forum engagement. The community is divided into specialist areas, although members are free to post anywhere on the board.

The Tecumseh Group, Inc., which manages Eng-Tips, suggests the quasi-anonymous nature of the forum creates a "'safe,' non-political place to go to solve technical issues," where members are free from judgment by their peers or superiors. Content on the board is varied; however, the majority focuses on technical issues with a smaller portion dealing with on-the-job issues, career progression, skill building, socialization, and recruitment. Much of the content of the board focuses on

addressing member enquiries on certain problems encountered in their work. These queries were highly varied in regards to both objectives and length. It is evident that several individuals engage with the community solely to seek an answer to a specific problem, while others engage on a more regular basis, both asking and answering questions, and engaging in the dialogue these questions produce. These differing levels of engagement are characteristic of most networks of practice and hint at discrepancies in the underlying motivations of users.

1.6.1 Appropriateness of Context

Naturally, the largest criterion was that the group I studied represented a true ENoP, meaning that it was a group of people who shared a professional identity and communicated through virtual media. While there were a variety of contexts that fulfilled this requirement, I was particularly drawn to the engineering context. My decision to select an engineering group was based on my desire to study information exchanges in a profession in a practice where the consumption and exchange of information is a fundamental part of the job description. The engineering discipline centres on developing solutions to practical problems, and information plays a vital role in performance—engineers consume more information than they produce, making them an ideal group to study (Shuchman, 1981). While engineers have similar core training, they are primarily specialists, with university training focusing on a specific type of engineering (Leckie, Pettigrew, and Sylvain, 1996). Since Eng-Tips is structured around distinct specialties, it permits an exploration of how individuals use the ENoP to access information outside their immediate specialty.

My second main criterion for a context was in keeping with a definition of an ENoP, which was that it was *not* embedded within a specific organization. It was

my objective to assess an ENoP that was not subject to organizational norms or other constraints, because these may unintentionally confound our understanding of community-level interactions and evaluations. My third main criterion was that member exchanges occurred virtually. Not only was this criterion a key defining feature of an ENoP, it allowed me to examine exchanges as they actually occurred.

Eng-Tips not only met the criteria of a robust ENoP, it represented a fairly large profession in which information-sharing was extremely critical to occupational performance. Practical considerations increased the appeal of Eng-Tips, most notably the fact it is a large, thriving community with a long and active history. I had the ability to access a large number of detailed metrics on member engagement (e.g. number of logins, type of post, division posted to, etc.) that allowed me to examine the type of information exchanged, as well as perceived value of that information.

1.7 Dissertation Structure

In this chapter, the research aim, specific objectives, key concepts, and potential contributions of the research have been discussed. The subsequent chapter reviews the academic literature relevant to my thesis, and further highlights the research gap that I will fill. The third chapter discusses the context in greater detail, both that of the engineering industry and Eng-Tips itself. The fourth chapter explains the methodology used to both collect and analyse data. The fifth chapter reports on the specific findings, or results, of my research inquiries, and the sixth chapter analyses these findings in greater detail. The final chapter will offer concluding statements as they relate to my thesis.

1.8 Chapter Summary

This chapter has introduced this work, which aims to understand the type of information sought in ENoPs, and the user-level characteristics (e.g. type of response, number of responses) associated with community members' perceptions of expertise in these networks. The primary justification for this research is that we do not have sufficient knowledge about the dynamics of exchange in these communities, nor do we have an adequate understanding of the individuals who are perceived as the sources of greatest expertise in these communities (e.g. Whelan, 2007). It is anticipated this work will contribute to theory by better defining ENoPs as an object of theoretical inquiry, exploring how information-seeking takes shape in the virtual environment, and push beyond a basic structural understanding of expertise that is favoured by social network perspective (e.g. as criticized by Haythornthwaite, 1996). This work will also add to theory by explicitly discussing and analysing differing levels of expertise; a topic which has not received sufficient attention in the practice-based literatures of situated learning theory and CoPs (Whelan, 2007). Finally, this research hopes to contribute to practice by providing coordinators of ENoPs with valuable data on the types of information that may be sought by members of their community, as well as techniques that individuals can use to increase their profile as a community expert. This chapter concluded with a discussion of the methodology and context of the thesis.

II. LITERATURE REVIEW

2.1 Introduction

There is an extensive body of research devoted to online communities, as well as communities focusing on sharing information and knowledge, which will be discussed in depth in this literature review. In this literature review, I focus selectively in the information that is relevant to my thesis and the development of arguments I make in my paper. Therefore, there are several areas of research that are beyond the scope of this review because they not wholly relevant to the sharing of information in the type of online community studied here—Electronic Networks of Practice (ENoPs). Not included in this review is: work on communities that engage for social purposes (e.g. Galegher, Sproull, Kiesler, 1998; Ellison, Steinfeld & Lampe, 2007; Walther et al., 2008), literature that focuses on the correct identification or methodological assessment of expertise (e.g. Shanteau, Weiss, Thomas, and Pounds, 2002; Weis and Shanteau, 2003), and most literature that focuses on the co-development of a specific communal good (e.g. open-source communities, as seen in Jeppesen and Fredericksen, 2006; Roberts, Hann, and Slaughter, 2006; von Hippel, 1994). The literature reviewed here was carefully selected on the basis of relevance to Electronic Networks of Practice, and the information-sharing and perceptions of expertise in those entities.

The relevant literature can be categorized into three groups: online communities (and a specific subtype, ENoPs), information-seeking, and perceptions of expertise. First I discuss online communities in broad terms, and the factors associated with these communities, specifically: membership structure, communication, community norms and governance, and the reasons for engaging in

these communities. Then, I offer more in-depth discussion on how these factors influence knowledge/information-sharing communities in general. I subsequently both define and situate ENoPs in the existing literature on online information-sharing communities, and discuss the theoretical background that gave rise to the study of these entities. Next, I discuss information-seeking behaviour at a more general level. Finally, I discuss perceptions of expertise, focusing on understanding expertise in general, its subjectivity, how it relates to ENoPs, and the way that it is evaluated. Although I discuss these constructs separately, they are interrelated. Together a query and reply make up the dialogue that occurs in the ENoP, while the evaluation of that reply gives rise to the perceptions of expertise in the community. In essence, this type of interaction represents an online dialogue that leads to the production of knowledge (e.g. Tsoukas, 2009). Below, Figure 2 depicts the relationship between these constructs. Given the large body of research related to replies (in the form of understanding motivations to contribute e.g. Wasko and Faraj, 2005; Ardichivelli, Page, and Wentling, 2003), my research focuses more narrowly on queries and perceived expertise.

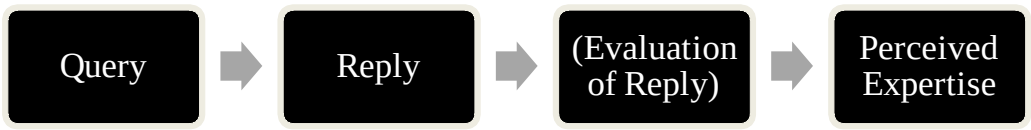


Figure 2: Relationship between the two main constructs of interest, queries and perceived expertise.

In regards to my literature review, I have three primary objectives. The first is to identify and categorize ENoPs as a distinct form of online organizing, one that was worthy of study in its own right. The second objective is to explore the

information-sharing in these networks in greater detail, focusing on understanding how ENoPs might meet information-seeking needs. The final objective is to examine the nature of expertise, specifically the subjectivity of the construct and the ways in which it is evaluated.

2.2 Online Communities: A Broad Overview

Online communities was first defined as "social aggregations that emerge from the [Inter]net…to form webs of personal relations in cyberspace" (Rheingold, 1993, p. 5). This exceedingly broad definition has received criticism for over-inclusivity, which essentially describes a range of activities that occur within the virtual space, consequently diminishing the social complexities associated with this organizational form (Kling and Courtright, 2003). Current conceptualizations of online communities focus more on the cohesiveness of the entity, and describe it as a virtually positioned entity subject to mutual engagement, solidarity, support, and reciprocity (Komito, 1998; Bays and Mowbray, 2001).

Although this definition of online community remains quite broad, encompassing a very diverse range of entities (Preece, Maloney-Krichmar, and Abras, 2003), there are many features shared by online communities that emerge from reliance on virtual technology. These characteristics include: membership structure, method of communication, and the presence of community norms and governance. I describe the impact virtual organizing has on each of these characteristics, and discuss more specifically how these variables might shape online communities that primarily focus on sharing information and knowledge, such as the ENoP.

2.2.1 Membership Structure

One of the striking features of online communities is that—assuming the absence of barriers to entry—patterns of participation tend to be fairly similar. In healthy communities, which are characterized by a steady stream of contributions, community members tend to fall in one of three categories: the core membership, the peripheral member, and the lurker (Efimova and Hendrick, 2005). These three levels of participants give online communities a distinctive structure and shape.

The core membership group is a small and select group of people who contribute to the community on a regular basis. Membership in this group is voluntary, and comprised of individuals who have assumed a degree of responsibility for the functioning of the community and its output (Wenger, McDermott, & Snyder, 2002). Although core members are a relatively small and select portion of the community, they are typically responsible for the majority of content produced in the community (Hansen, Shneiderman & Smith, 2010). For this reason, the core members can be thought of as the mainstay of the community.

Peripheral members are those individuals who contribute on occasion, but whose activity is markedly less than that of the core contributors. This lower-intensity participation might give way to escalating interaction and commitment (Gehl, 2001), or it may simply be a form of low-intensity, yet legitimate, peripheral participation (e.g. Lave and Wenger, 1991).

Finally, there is a category of community members who form a silent audience, reading the output of the community, but neglecting to contribute to it. Although they may login to the community on a frequent basis, and read or consume the information posted by other users, they do not contribute to those resources. This

group forms the vast majority of online membership, comprise the majority of participants, which are estimated up to 80% (Nonneke and Preece, 2000). Although these individuals do not participate directly in the community, in a way the 'silent audience' both validates and reinforces community objectives (e.g. Garton, Haythornthwaite & Wellman, 1997; Hansen, 2009). Furthermore, for those communities who sell advertisement space on their website, this 'silent audience' could represent a substantial opportunity to increase cash flow by boosting readership numbers and pageviews.

Attitudes toward lurkers vary to a degree, which is contingent on both the context and the perceiver. Lurking may be viewed positively, as a legitimate form of participation, because the presence of an audience legitimizes the actions of the core and peripheral members (Antin and Cheshire, 2010). On the other hand, lurking may be perceived negatively, as an act of free-riding (Smith and Kollock, 1999). Generally speaking, lurking behaviour often better situates individuals to contribute to the community should they choose to "de-lurk" by creating familiarity with the group norms and practices that might better situate them to make a meaningful contribution (Rafelia, Ravid & Soroka, 2004).

It is important to note the general prevalence of lurkers arises from the fact that members of online communities, unlike face-to-face communities, do not necessarily incur social costs for failure to contribute, yet they are able to benefit from the information they access in the community (Nonnecke and Preece, 2003). Members are often relatively free to determine their level of participation, increasing or decreasing their involvement as personal circumstances dictate. For this reason, participation can be perceived as a fluid construct, with lurkers 'de-lurking' to

become contributors, and shifting between peripheral and core membership groups (Rafelia, Ravid & Soroka, 2004). As a result of this fluidity in membership, online communities tend to exist in a constant state of flux, with many individuals both engaging and contributing in a sporadic manner. This transient state of membership is exemplified by the fact that the majority of contributors to a user-based community drop out after contributing a single post (Arguello et al., 2006). Thus, in the typical online community, it is often easy to join, but just as easy to leave.

In online communities with forums designed to address user inquiries, there may be a larger proportion of people asking questions than people answering questions; in a Java usenet community approximately 55% of people only asked questions with 30% of people responding to those questions (Zhang, Ackermann, and Adamic, 2007). This structure aligns with the core and peripheral structure, revealing the majority of queries in a group are likely formulated by peripheral members, with core members taking on a greater degree of responsibility in addressing those queries. Core members, peripheral members, and lurkers combine to form the membership of an online community. For communities focusing on knowledge sharing, this means that the majority of produced content will come from a small group, yet the majority of consumers will be a silent audience. This has ramifications for the range of information that is produced by online communities that focus on knowledge sharing.

2.2.2 Communication Medium

Virtual organizing can have a dramatic influence on the structure of a community by influencing its size and cohesiveness, as well as the type and volume of information that can be exchanged between community members. For this reason,

we cannot assume the social processes that underpin face-to-face interactions necessarily apply to online communities. Although there is a significant body of research on the type of interactions that occur in Communities of Practice (e.g. Orr 1996; Wenger 1998; Agterberg et al., 2010; Swan, Scarbrough, and Robertson 2002; Thompson, 2005), the extent to which that research can be translated to ENoPs is—in part—restricted due to changes in the medium of communication. Understanding the different types of virtual communication permits an understanding of the way that communication influences interactions among members of an ENoP.

Broadly speaking, virtual communication is categorized into two different types of interaction, synchronous—a pattern of exchange occurring in real-time, and asynchronous—a pattern of exchanges occurring at different times (Preece, 2000). Examples of synchronous exchanges include virtual 'chats' or instant messaging systems that require users to interface with the technology simultaneously, or even live-twitter feeds. This type of virtual interaction most closely resembles verbal communication (Condon and Cech, 1992). Although these interactions may occur across large geographical distances, they possess a level of immediacy that occurs from the rapidity of response. Perhaps most notably, synchronous interactions—much like verbal interactions—feature turn-taking and repair, which is the phenomenon of co-creating shared meanings during the course of dialogue (Schegloff, Jefferson, and Sacks 1977; Argyle, 1972). To be more specific, turn-taking involves demonstrating active listening by engaging in sentence completions, affirmative responses or pauses to ensure conversational engagement.

Face-to-face communication is typically considered a rich form of communication, because its synchronous nature allows for turn-taking and repair, as

well as providing access to tonal and non-verbal cues (Schegloff, Jefferson, and Sacks 1977; Argyle, 1972). Written conversation, such as those that occur in the typical online community, is a comparatively less rich form of communication because it does not provide access to multiple cues, often occurs asynchronously, and leaves limited ability to build conversational rapport (Cramton 2001; Griffith and Neale, 2001). In addition, there is a limited ability to 'repair' conversations, which involves clarifying meanings that ambiguous or potentially misunderstood (Cherny, 1999).

Asynchronous communication involves conversational dialogues that are not concurrent and often do not occur simultaneously (Blanchard, 2004). Asynchronous communication is evidenced in electronic mail (e-mail), posting to online communities that utilize a bulletin board method of posting, or webpage updates. This type of communication lacks the simultaneous reciprocity that characterizes either face-to-face communication or synchronous exchange. However, this lack of immediacy offers some advantages in the fact they allow the user to focus on the content, by giving sufficient time to reflect on the meaning of the message and respond accordingly (Warkentin et al., 1997). When there is a distinct time lag between the transmission of a piece of information and its reception, communication can be considered asynchronous. Most online communities exchange information using asynchronous technologies (Warkentin, Sayeed, Hightower, 1997). Suler (2004) suggests this type of communication has an element of 'invisibility' meaning that there are no physical cues (e.g. frowning, looking away, nodding) to be able to determine how the interaction is received. This can mean that people are relatively insulated from immediate negative feedback and may feel more secure asking a question. On the other hand, when there is insufficient information and the inability

to clarify that information, people may have the tendency to project their own motives and assumptions to fill in the blanks left by inadequate communication; this may increase the possibility of prescribing an inadequate or incorrect course of action (Suler, 2004).

Generally speaking, written messages—such as those typically found in an online community—have greater potential for ambiguity, with a decreased potential to clarify that ambiguity (Rhoads, 2010). Communication lacks many of the features of rich dialogue, which include: immediate feedback, access to multiple cues (e.g. verbal and non-verbal), and the potential to personalize a message to a given context or communication partner (Cherny, 1999). For this reason, written virtual messages may be ill-suited to certain types of high-complexity or intricate exchanges (Herring, 2001). However, with practice and familiarity, individuals can communicate more effectively while using virtual technologies; much like a blind person's reliance on their other senses, such as smell and hearing, a person familiar with certain medium of exchange will have a greater potential to reap rich rewards from the use of that medium (Carlson and Zmud, 1999). In this way, familiarity with a given medium of exchange can enhance the quality of information transmission by increasing the potential the user will successfully transmit the intended message. Thus, people accustomed to exchanging messages in online communities may acquire the necessary skills to increase the quality of communication.

By understanding how virtual communication shapes information exchange, we have a better understanding how information exchange takes place in online communities. For communities that focus on knowledge-sharing or information exchange, the dynamics of online exchange may influence the quantity or type of

information exchanged. In regards to my own research, this means the dialogue that occurs in online communities such as ENoPs is likely to as complex as face-to-face interactions, such as in the typical Community of Practice. However, the sheer volume of information available in the ENoP context—and the fact that information can be 'revisited' multiple times has strong implications for the way learning and interactions can take place in this context. Specifically, people have the potential to 'learn' from interactions that have taken place months, or even years, in the past. What is apparent is that individuals exchanging information in a virtual context will, to some extent, have to develop their ability to use electronic media if they want to communicate effectively in these environments.

2.2.3 Community Norms and Size

In online communities, communication and behaviour is often guided by norms that are developed through repeated interactions among community members (Johnson, 2001). However, in the event these norms are violated, or individuals engage in negative social interaction such as harassment, spamming, misusing resources, or violating community protocol, community behaviour can be regulated through the use of social and electronic controls (Hiltz and Wellman, 1997). In many online communities, there is a group moderator, who guides, corrects, or controls behaviour that violates community norms (Williams and Cothrel, 2000). Generally speaking, in communities that are self-organizing, moderators often emerge from the core group of contributors, providing a social structure to both support and regulate contributions (Jahnke, 2010).

Online communities often do not rely solely on moderators to acknowledge behaviour. In the typical online community there are self-policing measures in

effect, whereby members can notify moderators of infringements. Wasko et al. (2004) suggest the use of controls is likely to be most effective in situations where members have a strong relational attachment to the network itself. Presumably this is due, in part, to the heightened sense of cohesiveness that emerges when members have a greater sense of shared identity and group norms. For members seeking information in communities focusing on knowledge sharing, it is important to understand both the norms and governance of these communities to ensure successful interactions. For individuals seeking information, it is important to follow community protocol when making requests to ensure a request is 'heard.' An examination into the relationship between the adherence to group norms and the quality/quantity of information received is beyond the scope of this study; however, it does highlight additional dynamics to consider when discussing information-seeking in an online community.

2.2.4. Sense of Anonymity

One of the benefits of online communities is their potential to take place in an anonymous or quasi-anonymous setting (Rhoads, 2010). Anonymity influences the way people interact because people have the capacity to construct or manage an online identity, choose what types of information to reveal and conceal, and allow individuals to disassociate themselves from their offline personality or identity (Suler, 2004). In effect, there is no need to maintain continuity in the online and offline personality, and people can feel free to 'let their guard down' and admit their own limitations should they so desire. When a person seeks information, it requires a degree of acknowledgement they do not have the answer. In a face-to-face context, information-seekers may incur social costs, such as loss of status, for admitting the limitations of one's knowledge (Cross et al., 2001). In the organizational context,

this could have consequences in the form of future employment or promotion. Online queries have the potential to access information while maintaining anonymity, which means individuals will not jeopardize the status their status in their organization or offline community.

In addition, the anonymous nature of these online communities has the effect of minimizing visible status cues of interaction partners, such as dress, age, title, and position (Preece, 2000). As a result, the virtual context can promote a sense of egalitarianism, in which all contributors are perceived as equal and evaluated solely on the merits of their contributions. Furthermore, people may be more likely to say what they are really thinking without fear of censure or reprisal (Burnett, 2000). All of these factors likely influence the type of information that is sought in online communities, the way individuals reply to that information-seeking, and how those replies are perceived. In addition, using online communities to access information may actually increase one's perceived expertise by imbuing them with insights they obtain outside of the organization. For ENoPs, the sense of anonymity is likely to be enhanced by the size of the network, which could have a distinct impact on the way ideas and information are communicated.

2.2.5 Offline Relationships

The relationships formed by individuals in their day-to-day lives are governed by both homophily and proximity (McPherson et al., 2001). This means that individuals tend to share similar perspectives, beliefs, and demographics with close ties both within and outside of the organization. When people work closely together on shared tasks, relationships form giving rise to both friendship and advice networks (Gibbons, 2004). Advice networks are comprised of individuals who

exchange task-related information and wisdom, and these types of networks are often associated with a degree of task interdependence (Podolny and Baron, 1997). For this reason, there is often an overlap in work function among people exchanging advice in the organization. Practically speaking, this means that relationships in organizations tend to form between people doing similar things (e.g. McPherson et al., 2001).

In regards to the type of information contained in one's face-to-face networks, there is both knowledge variety and overlap. Knowledge variety is associated with increasing specialization and with unique information; knowledge overlap is associated with a more general understanding of information and a shared competency (Wong, 2007). Although knowledge variety is associated with enhanced performance, it may be more difficult to access knowledge variety in one's face-to-face network, which tends to be more homophilous (e.g. McPherson et al., 2001). Thus, we might expect a large degree of knowledge overlap to be present in one's face-to-face social network. This brings to light an important issue, namely the fact that knowledge variety is important for performance, yet, in the workplace, individuals are likely to have relationships with people with whom they work together and share similar perspectives (Feld, 1982). For this reason, accessing informational variety may be difficult to accomplish in the organization, particularly when individuals belong to workgroups that have a great deal of knowledge overlap.

Online communities can be an important source of knowledge variety because they have the potential to facilitate connections to a wide range of people with diverse knowledge (Wellman, 2001). In online communities focusing on a shared practice, individuals have the potential to engage in information-seeking behaviour

that might supplement existing advice networks by accessing individuals who are outside of one's own social network; as a result, these individuals are comparatively more likely to possess unique information (McPherson et al., 2001). However, this ability to connect to unique sources of information is counterbalanced by the fact that electronic media is (compared to face-to-face communication) an information-poor source of communication. In online communities, the reduced capacity for turn-taking and repair decreases the potential for shared meaning and context in dialogue (Cherny, 1999). While these potential drawbacks do exist, engagement in online communities can benefit users in a variety of ways.

A sociomaterial perspective of virtual learning illuminates some of the benefits associated with engaging in online communities. A sociomaterial perspective focuses on the interrelationship between material tools—i.e. technology—and social framing (Johannesen et. al, 2012; Latour, 2005). This is a dynamic perspective, which suggests there is an interplay or entanglement between the technological tools one uses, and actual work practices. Orlikowski (2002) explored several forms of technological enactment suggesting technology can create structural transformation, or reinforce existing structures. Incremental gains from the use of technology might generate inertia, guaranteeing the status quo of certain structures and existing work practices. When individuals use technologies in new ways to gain access to additional information or tools, this is characterized as an application of the technology. Finally, a substantive transformation results from the integration of new technologies into practice in a way that fundamentally alters an individuals practice. In this way, engagement in ENoPs may also alter offline behaviour, and lead to differences in the way individuals perform work and engage with the discipline itself. By providing exposure to the work practices and ideas of others with a few

simple clicks, the ENoP can serve as an inspiration, influencing members' offline activities and relationships.

2.2.6 Motives for Engaging in Online Communities focusing Information

Online communities can only sustain themselves when there is a constant flow of information and contribution by its members. For this reason, a number of researchers have focused on understanding member motives for both contributing and engaging in online communities that focus on sharing knowledge or information (e.g. Wasko and Faraj, 2005; Wasko and Faraj, 2000; Ardichivelli, Page, and Wentling, 2003; Zboralski, 2009; Ardichivelli, 2008).

The reasons and motivations for contributing to online communities are often complex and multi-faceted, but are frequently related to several of the following factors: identity and esteem needs, professional development, morality, and reciprocity/turn-taking. I divide these reasons into two broad categories: altruistic and ego-centred.

2.2.6.1 Altruistic Motivations for Contribution

The first category of research I discuss focuses on altruistic behaviour as a motivating source for community contribution; these arguments focus on the morality and assumption of responsibility. The notion of community contribution as a gift-giving action has roots in the study of open-source communities, which tended to frame contributions as gifts (e.g. Bergquist & Ljungber 2001; von Krogh, Spaeth & Lakhani, 2001; Bergquist, 2003). Altruistic contributory motives are particularly relevant to online communities that focus on information sharing, because—unlike other types of exchanges—the gifting of knowledge does deprive the giver of knowledge (Coward and Jonard 2004).

McLure, Wasko and Faraj (2000) suggest contributory behaviour is strongly linked to one's sense of duty or obligation to assist others in need. Contribution is depicted as a moral choice undertaken to help others in need, to advance the community as a whole, and is done with little expectation of direct reciprocity from the individual assisted. Thus, people contribute because 'helping others' is the 'right thing to do.' In a broader context, assisting others can benefit the practice as a whole. Unlike other forms of exchange, the giving of information does not deprive the giver—they are still in possession of the information (Ljunberg, 2000). Furthermore, they are likely to reap intrinsic rewards that come from helping others who need assistance (Kogut and Metiu 2001).

Assuming responsibility for community output may lead individuals to contribute whenever possible, because group members may be aware that the network's long-term viability rests on a continued, steady stream of contributions (e.g. Coleman 1988). By contributing, people assume a degree of responsibility for producing community content, and engage in an action that benefits the community as a whole. In essence, the motivation behind contribution lies in the fact that individuals have a degree of ownership over the community, and this commitment to the ENoP guides their contributions (McLure Wasko and Faraj, 2005).

2.2.6.2 Ego-centred Motivations for Contribution

Models of altruistic information-seeking have increasingly given way to understanding ego-centred reasons for contribution (e.g. Arriaga and Levina 2008). Ego-centred reasons for contribution focus the act of contribution as a means to attain some degree of personal or professional benefit. Thus, engagement in online communities could be conceptualized as a strategic manoeuvre to increase one's self

or organizational worth, while simultaneously meeting identity needs. Ego-centred reasons for engaging in the community include identity and esteem needs, professional development, reciprocity, and status (Wasko and Teigland, 2004).

One reason individuals may contribute to a community is to express one's professional identity (Wellman and Gulia, 1999). Online communities focusing on a specific type of knowledge or practice may reinforce a core identity as a member of a given profession. By contributing to an online community that focuses on a specific practice, one may increase attachment to the profession itself, and/or experience feelings of belongingness to an exclusive group (Tajfel and Turner, 1986). In this way, a participant may feel a greater sense of inclusion in the profession itself.

The ability to further one's professional skills and develop greater knowledge of the profession are additional reasons for participating in online communities focusing on knowledge-sharing in a specific practice. Participation in the form of contribution is a way to become an active member of the learning process by directly engaging with the knowledge and information shared within these communities (Foray, Thoron, and Zimmermann, 2007). By stepping over the barrier from passive learner (i.e. reader and non-contributor) to active learner (i.e. member of the dialogue and contributor), individuals are engaging with material in a new and more complex way. The ability to contribute information requires a level and depth of understanding that goes beyond basic comprehension (Collins and Evans, 2002). Becoming a teacher requires more knowledge than being a student; likewise, the act of contribution might be a way to engage with the boundaries of one's knowledge.

Contributory behaviour may be linked to a sense of reciprocity, which is the expectation that providing assistance to others will ensure a person will receive assistance should they require it (McLure, Wasko, and Faraj, 2000). By contributing to the community, a person is essentially storing up 'credit' that can be redeemed at a later date. Due to the typically widespread structure of online communities, interaction patterns are likely to be transitive, meaning interactions are more generalized to the community and there is little—if any—assumption of direct reciprocity or of equality in exchange (Haythornthwaite**,** Kazmer, Robins, and Shoemaker, 2000). For example, Person A might receive information from Person B, who—in exchange—receives information from Person C. Patterns of interaction assume a messy iterative process involving multiple actors. However, contributing at some point in the value chain may increase the (perceived or real) possibility of receiving a return on that investment. For some knowledge-sharing communities, exchange based on reciprocity might actually be a strategy to obtain information from these communities.

The act of contribution is one way of building a professional reputation by accruing respect from others in a shared practice or discipline. Altruistic models of online exchange stands in peculiar contrast to face-to-face interactions, which tend to rely more heavily on status seeking behaviour (Harbaugh, 1998). Recently, more researchers have started to focus on the reputational and status benefits for contributing to online communities. Lampel & Bhalla (2007) focus on status as a central motivation for engaging in online information exchange, suggesting the recognition of valuable information in these communities is one way people reinforce self-esteem and meet ego needs. Given the strong demand for information, Avery, Resnick and Zekhauser (1999) suggest the supply cannot be met

by a gift-giving or altruistic model alone; therefore, researchers may continue to look to self-interested, status-based models to understand information gift-giving in online communities.

On a final note, contributions may be a way to attain esteem, but only when there is some feedback mechanism that allows individuals to know their contributions are valued (Dellarocas, 2003). These type of feedback mechanisms are extremely important to understand perceptions of expertise, and are discussed later in this literature review in section 2.5.5. This line of research alludes to the importance of understanding perceived expertise in ENoPs. Specifically, if people obtain expert nominations from their engagement with the ENoP, this may lead to a sustained pattern of contribution. For this reason, understanding the characteristics associated with perceived expertise has the potential to speak to the contribution patterns of ENoPs.

In summation, there are many different types of motivations to contribute to online communities, which may be either self-interested or altruistic. Of note, contribution rates in general are influenced by enthusiasm and time spent with the community, presumably because members have both the ability and motivation to develop community resources (Faraj et al., 2011). On the whole, the popularity of understanding motivations for contributing in online communities likely stems from its association with long-term community survival (McLure, Wasko and Faraj 2000). Yet, understanding why people contribute is only part of a bigger equation. The other half of the equation is understanding the type of information individuals seek from their membership in these communities, and the extent to which *quality, expert* information is available. Given the fact there is a robust and well-developed body of

research on motivations to contribute, it makes sense to next turn the theoretical focus on the quality and content of those contributions.

2.2.6 Information Exchanges in Online Communities

Online communities can facilitate the exchange of information via text-based transmissions or dialogue; generally speaking the exchange of information in these communities is either interactive or non-interactive (Burnett, 2000). Interactive behaviour includes direct postings to the community and develops information through dialogue; this type of behaviour may either be collaborative (e.g. offering ideas and advice, etc.) or tangential (e.g. gossip, engaging in social niceties, etc.) (Wellman and Gulia, 1999; Burnett, 2000). Non-interactive behaviours focus on learning from others via lurking (Nonnecke & Preece, 2003).

Although these broad categories of interaction have been identified (i.e. interactive and non-interactive information-sharing), additional research on the type of information exchanged in practice-based online communities is fairly limited. Although online communities, and in particular, the Electronic Network of Practice has the potential to "transcend traditional barriers to knowledge exchange through the creation of knowledge as a public good, available to all members of the collective" (Wasko and Teigland, 2006, p. 211), how people seek information from these communities is not adequately addressed.

2.2.7 Concluding thoughts on Online Communities

The reliance on virtual technology influences several characteristics associated with online communities, which include: membership structure, method of communication, and the presence of community norms. Generally speaking, this is found to influence the type of information that can be effectively transferred in

online communities. On the whole, the virtual technologies that power online communities give rise to several commonalities in the shape, texture and dynamics of these groups. However, online communities vary on multiple different dimensions, which leads to the diversity present among this broad category (Wilson and Peterson, 2002). Dube, Bourhis and Jacob (2006) identified twenty-one characteristics on which online communities might vary. These characteristics include: demographics (orientation, life span, age, level of maturity), organizational context (creation process/path, boundary crossing, environment, organizational slack, degree of institutionalized formalization, leadership) membership characteristics (geographic dispersion, member's selection process, member enrolment, member's prior community experience, membership stability, member's literacy in information technologies, cultural diversity, topic's relevance to members) and technological environment (degree of reliance on information technologies and the availability of those technologies). All of these factors can influence the dynamics of exchange in online communities. One very important source of influence is the underlying purpose of the community.

One of the distinct differences in virtual communities that focus on knowledge sharing is the size of these communities. Generally, these communities may be larger than face-to-face communities due—in part—to the decreased presence of government regulation, barriers to entry, the ability to engage at whim, and their extensive geographical reach (Butler 2001; Dube, Bourhis and Jacob, 2006). For knowledge-sharing communities, this has several ramifications. Firstly, the comparatively large size of these communities mean individuals will have the ability to access a large pool of information, and this information pool may be more likely to contain greater information diversity, which arises from the ability of community

members to access non-redundant sources of information off-line (Fulk et al., 1996, Markus, 1990, Rafaeli and LaRose, 1993 from Butler, 2001). Thus, there are some clear informational benefits to engaging in online knowledge-sharing communities. Finally, the relative anonymity of interactions in these communities decreases the salience of certain power/status items, including factors such as one's age, gender, ethnicity, educational background, qualifications, professional status, tenure in the industry and a given organization, and employer status (Wellman et al., 1996). The anonymity in these communities can potentially influence the type of information sought in these communities as well as the way it is perceived.

2.3 Electronic Networks of Practice: A subset of Online Communities

In general, online information-sharing communities have received a great deal of attention in both theoretical and practical fields due to the fact they can provide easy access to information that can enhance knowledge and work performance (Chiu, Hsu, and Wang, 2006; Ma and Argwal, 2007; Lin and Lee, 2004; Oliver and Kandadi, 2006). By connecting people working in similar fields, these communities can reduce the costs associated with searching for information on the internet, and provide expedient and direct access to occupational knowledge and wisdom (Caschera, D'Ulizia, Ferri, and Grifoni, 2008). One of the defining characteristics of ENoPs is that they use virtual technology to communicate, but this feature characterizes all online communities (e.g. Preece, 2000; Rheingold, 1994).

ENoPs represent a particular form of online community because they focus on the exchange of information related to a specific professional domain (Wasko and Faraj, 2005). Unlike CoPs that tend to be smaller and more close-knit, ENoPs adopt sprawling network structure that tends to lack the cohesiveness of a 'community'

structure (Wasko, Faraj, and Teigland, 2004). Furthermore, ENoPs are distinct from CoPs because they focus on individually-determined (v. shared) objectives. For these reasons, ENoPs are best conceptualized as a specific type of online community that focuses on sharing information related to a specific practice.

2.3.1 A Working Definition of Electronic Networks of Practice

A working definition of Electronic Networks of Practice is not entirely straightforward because multiple authors use a variety of different terminologies used to describe phenomenon that—on the surface—appears fairly similar. I explore these multiple terminologies and identify key differences among them before turning my attention to specifying the term "Electronic Network of Practice" as it is used in this thesis.

The lack of consensus in terminology used to describe these types of entities is evidenced by the fact that several authors (e.g. Fang and Chiu, 2010; Ardichvili, 2008) use the term Virtual Communities of Practice (VCoPs) to describe these professional groups that communicate online, while other researchers (e.g. Brown and Duguid, 2000; van Baalen et al., 2005) use the term "Electronic Networks of Practice." The main point of divergence here centres on the use of the word 'community' as opposed to a 'network.' Both of these terms refer to the actual structure of relationships in the group. The term "networks of practice" was first utilized by Brown and Duguid (2000) to characterize nascent communities of practice, whose members have not yet formed strong relationships. In this way, the term "network" denoted the relatively loose connections among members. Wasko and Faraj (2005) added the term "electronic" to describe similar groups that existed

in the virtual realm, ones that were loosely organized and comprised of individuals who did not have strong relationships.

The definition of Electronic Networks of Practice (ENoPs) I use in this thesis is that of a self-organizing, open and "loosely knit, geographically distributed of individuals engaged in a shared practice" who rely on virtual media to communicate (Wasko and Faraj, 2005, pp. 37). I believe the term 'network' best encapsulates the structure of relationships that exist in the virtual realm. Of note is the fact that members of an ENoP are united by a shared practice rather than a shared organizational identity or specific goals and objectives. This is a very important distinction between ENoPs and CoPs, which tend to focus on jointly-determined goals. Due to the lack of a shared working context in ENoPs, is highly likely that members will pursue individualized objectives.

I have explained the reasons why I have chosen to use the term ENoP. I would like to reiterate the distinguishing features of the ENoP, which I discussed in the introduction of the thesis. These distinguishing features include: a reliance on virtually mediated communication, the pursuit of an individually determined—rather than jointly developed—purpose, presence of a common practice, and a focus on sharing information related to that practice (Wasko and Faraj, 2005). In sum, ENoPs are defined by their method of communication, structure, and goals. Specifically, ENoPs communicate using virtually-mediated technologies, can be characterized as large and sprawling entities that form outside organizational boundaries, and members pursue individually-determined objectives. The study of ENoPs has theoretical roots in both situated learning and the social network perspective, which as influenced our empirical approach to these entities.

2.3.2 Early Theoretical Roots of ENoPs

The theoretical basis of ENoPs originates—in part—from theories of situated learning. Situated learning is a theoretical framework that focuses on learning as a social process, in which meaning and knowledge is jointly developed in a specific context and environment (Lave and Wenger, 1991). This work emerged from understandings of how newcomers and novices became legitimate members of a technical specialty through legitimate peripheral participation. This focus on situated learning gave rise to the study of CoPs, an early predecessor of ENoPs.

CoPs are groups of people who have come together to focus on shared concerns, problems, or passions relating to a specific area of knowledge or practice (Wenger, McDermott and Snyder, 2002). In general, these communities adopt a form that ensures principle control over problem-solving is not held by an instructor or tutor, but by a community of learners, who are charged with developing solutions to the joint problems they encounter (Johnson, 2001). Wenger (1998) describes three dominant features (or prerequisites) of CoPs: Mutual engagement, joint enterprise, and shared repertoire. Mutual engagement is associated with a high degree of interdependency in community-related interactions, whereby group interactions lead to the construction of norms and culture. Joint enterprise refers to the process of working toward a shared goal or purpose that is cooperatively developed. A shared repertoire emerges from these group interactions, and it is the development of a co-constructed set of ideas and outcomes that are associated with the practice. This notion of a CoP as a cooperative and joint enterprise is further developed by Wick (2000), who extends Wenger's (1998) ideas by suggesting communities of practice

ought to be comprised of individuals who—in daily life—perform similar functions. This is not to suggest that identical practices are an essential prerequisite to CoPs. CoPs can act as a unifying mechanism to bring people with different technical backgrounds—who may have different perspectives on problems—together to focus on a common overarching problem (Swan, Scarbrough, & Robertson, 2002).

Generally speaking, CoPs typically require a shared context and a focus on a joint problem or issue (Wenger, 1998); this conceptualization of CoPs arises from its early foundations in situated learning (Lave and Wenger, 1991). Specifically, more current research on CoPs focuses on the co-creation of meaning and is rooted in both shared practice *and* shared problem sets (Wenger, McDermott and Snyder, 2002). The ENoP stands in contrast to both CoPs and situated learning because it is less likely to involve joint enterprise—or the focus on a shared problem—and more likely to involve ephemeral interactions that focus heavily on the transfer of information (Wasko, Faraj and Teigland, 2004). Since the interactions that occur in ENoPs are likely to involve the transfer of information across environment and context, the individuals consuming this information are required to translate or adapt the information to meet the specific needs of the context in which they are embedded (Vaast, 2004). For logistical reasons, the type of information sharing that takes place in ENoPs is likely to focus on a broad professional domain (e.g. lawyers) rather than a highly specific shared practice (e.g. intellectual property law).

2.3.3 Point of Divergence: ENoP versus Online CoP

Despite the fact that ENoPs often are not typically situated in a shared environment, the *scholarly* treatment of both ENoPs and CoPs are fairly similar. This is perhaps due to the fact they address similar phenomena; both types of

communities focus on building and enhancing a shared practice, and they also require a great deal of shared knowledge to communicate. Unlike online CoPs, exchanges in ENoPs are likely to take place between individuals who may not know each other and are embedded in a different environmental context. Furthermore, ENoPs lack the development of a shared, jointly developed purpose that that is characteristic of CoPs (Wenger, 1998).

Initially, CoPs were depicted as a small face-to-face group of people committed to developing solutions to address a shared or similar problem set (Lave and Wenger, 1991). However, subsequent research by Wenger (2007) identified the virtual/online CoP. Online CoPs are defined as groups of people united by common objectives who use virtually-mediated technology to engage in collective learning. This definition of online CoP did not necessitate a wholly virtual structure; often the virtual interactions in the community were supplemented by face-to-face interactions. Generally speaking, scholarly discussion of online CoPs depicts a form of engagement that maintains an emphasis on the close-knit dynamics that leads to the production of jointly determined objectives (Wenger, 1998). However, these same dynamics are not present in ENoPs, where members often pursue individual agendas and members lack the cohesiveness that is characteristic of both online and face-to-face CoPs (Wasko, Faraj, and Teigland, 2004). Table 1 summarizes several of these key differences between CoPs and ENoPs. Several of these differences were identified by Wasko et al., (2004), while others I identified through my review of the literature.

FEATURES	Community of Practice	Electronic Network of Practice
Community Size	Small	Large
Barriers to Entry	Medium to High: Restricted Access	Low: Open Access
Purpose of Participation	Jointly developed	Individually determined
Medium of Communication	Face to Face and/or virtually mediated	Text-based, virtually-mediated communication
Degree of Joint Enterprise	High: Focus on shared objectives	Low: Focus on idiosyncratic objectives
Interaction Partners	Repeated and Sustained	Unique and Intermittent

Table 1: Key Differences between Communities of Practice and Electronic Networks of Practice

Some of the distinctiveness associated with ENoPs emerges from the that fact they interact solely in a virtual space. The virtual positioning of the community can lead to a larger size, open access, reliance on text-based computer-mediated communication, individually determined levels of participation, and a greater chance of experiencing unique or one-off interactions with exchange partners. In addition, the CoP, unlike the ENoP, focuses heavily on producing knowledge associated with a joint enterprise.

2.3.4 Situating the Electronic Network of Practice

As research on CoPs developed, there was an increasing emphasis on the CoP as a centre of learning situated within the organization (e.g. Wenger McDermott and Snyder, 2002). To a great extent, this has confounded the original ideas of situated learning by leading to a re-conceptualization of 'situatedness' as based on learning exchanges that occur in a shared organizational context, rather than the joint undertaking of a shared problem (Contu and Wilmott, 2003; Roberts, 2006). The appropriateness of redefining situatedness in this way rests beyond the scope of this

thesis; my focus is on identifying the ramifications of situatedness on the way we understand knowledge-sharing communities in general. In the literature on Communities of Practice, 'situatedness' may either refer to a shared physical/environmental context or an organizational context (e.g. Lave and Wenger, 1991; Orr, 1996; e.g. Contu and Wilmott, 2003). In the discussion below, I explore the influence a shared location, organization, and practice has on the different type of online communities devoted to the sharing of information in a specific domain.

Originally, shared location was perceived as a necessary precursor to situated learning, because this term described a pattern of intensive interaction in which people worked together to achieve a collectively desired outcome (Lave and Wenger, 1991). This type of 'joint enterprise' required individuals to be located in the same space while learning exchanges occurred. Gradually, with the introduction of online Communities of Practice, there was an emphasis on harnessing virtual technologies to 'meet' and engage in collective learning (e.g. Williams and Cothrel, 2000). Originally, online CoPs were rarely described as existing solely in a virtual space, rather the online interactions were used to facilitate relationships that would ordinarily be too difficult to maintain in real life (Johnson, 2001; Wenger, 1998).

Reliance on virtually mediated technology influences the volume and quality of information that can be exchanged in ENoPs. Specifically, virtual exchanges are less rich than face-to-face exchanges due to the presence of fewer cues and a decreased potential to clarify ambiguities (Cherny, 1999). Although familiarity with electronic exchanges may reduce some of the problems associated with technologically-mediated interactions (Carlson and Zmud, 1999), it does not eliminate them. Additional considerations of virtually mediated discussions were reviewed extensively in 2.2.2.

Due to the difficulties associated with virtual communication, lack of shared physical environment, and sprawling network structure of ENoPs, there is a diminished capacity for understanding the knowledge and skills of an exchange partner. This may lead to increased difficulties in communication (Brown and Duguid, 2000; Nonaka 1994). Furthermore, when engaging in the exchange of information related to problem-solving, the definition and explanations of a problem must be done entirely through the use of language; the potential to engage in 'hands-on' learning is diminished when individuals do not share the same geographic location and lack the ability to engage in face-to-face interactions. To a great extent, this limits the quality of information exchanged in online communities. For this reason, it is inappropriate to categorize the exchanges that occur in these entities as situated learning using the definition set forth by Lave and Wenger (1991).

As discussed, the term 'situatedness' gradually became appropriated to describe learning interactions that occurred within organizational boundaries (Contu and Willmott 2003). This interpretation is more heavily aligned with practitioner understandings of CPs (e.g. Wenger McDermott and Snyder, 2002; Roberts, 2006). In ENoPs, the lack of situatedness in an organization can influence the quality of exchanges that occur in CoPs. Shared organizational norms can facilitate the exchange of information by creating familiarity with a problem or the language used to describe it (Dewhirst, 1971). Shared organizational context also increases the probability that interactions between members of a group would focus on mutually shared goals and objectives, because the overarching purpose or goal of the collective is one determined by the organization. Ultimately, CoPs embedded in an organization will adopt features that are similar to its host, which will be reflected in language, norms and practice (Wenger McDermott and Snyder, 2002). The ENoP is

not embedded in an organization; as a result, members may have diverse purposes for engaging and different overarching objectives.

It is important to emphasize that situatedness in a shared organization is not a prerequisite for shared purpose. The intra-organizational network of practice bridges several organizations, connecting individuals who share an overarching purpose—and often practice (Faraj, Jarvenpaa and Majchrzak, 2011). These intra-organizational networks of practice are similar to CoPs because they represent a group of individuals who engage in a joint enterprise by focusing on the "sharing, transfer, accumulation, transformation, and co-creation of knowledge" (Faraj et. Al, 2011, p. 1224). However, due to their structure and method of communication, they are more likely to lack stable membership and feelings of shared dependency among members when compared to CoPs (Faraj, Jarvenpaa, and Majchrzak, 2011). Shared practice is not a prerequisite to the successful exchange of information, evidenced by intra-organizational networks that can serve to unite individuals with different training and backgrounds by focusing on shared problems and issues (Swan, Scarbrough & Robertson, 2002).

To better understand the type of exchanges that occur in ENoPs, (i.e. both within and across specialist practices), I review the types of situatedness. Although situatedness was first used to explain learning interactions that were centred in the same physical environment (i.e. Lave and Wengner 1991), it has been appropriated to examine communities in a shared organizational context—and often technical speciality (e.g. Brown and Duguid, 1991; Orr, 1996; Contu and Willmott, 2003). The typical situated community shares a purpose and objective; in contrast, members of ENoPs are likely to have potentially disparate individual agendas, different levels of skill or training backgrounds. For this reason, the type of exchange that occurs in

ENoPs may be more aptly characterized as trans-situated learning (e.g. Vaast and Walsham, 2009).

Trans-situated learning describes the learning that occurs between individuals who share similar work practices, yet are not co-located in a specific work context (Vaast and Walsham, 2009). This type of learning occurs between individuals, "who share occupational practices but do not necessarily work with each other or even know each other because of geographical or organizational distance." (Vaast and Walsham, 2009, p.547). For example, two individuals might share a similar job description—e.g. aeronautical engineering—yet work in different organization, or they may work in the same organization but are separated by geographic distance. Furthermore, this type of learning may also include interactions between people who share a broader practice, yet have distinctly different occupations due to the presence of specialist training (e.g. electrical engineer and aeronautical engineer). This type of trans-situated learning—i.e. interaction among people with different specialist training—is likely to occur in ENoPs due to lack of a shared physical context, low barriers to entry, and the ability to access a broad range of practitioners with different specialist backgrounds. Unlike situated learning, trans-situated learning addresses the process of knowledge development when learners have different frames of references, work contexts, training or background.

Situated learning theory has not traditionally focused on exploring the different levels of knowledge or expertise in community members. This oversight may have emerged because the emphasis of this theory is on the creation of shared as opposed to disparate knowledge. As previously stated, the original focus of Lave and Wenger's (1991) research was on newcomer socialization, and how gradually members of a practice adopted a shared-knowledge model. As a result, the focus of

inquiry was not knowledge differences but similarities, so there was less of an emphasis on expertise. Although different levels of knowledge are part of situated learning theory, the focus is on how this knowledge is integrated to create a shared perspective.

As knowledge-sharing communities moved online, and no longer shared the same physical, work, or organizational contexts, the type of knowledge that emerged in the community was no longer a joint undertaking to quite the same extent (Teigland and Wasko, 2004). Pursuit of knowledge was shaped more by individual as opposed to group factors and motivations. However, theoretical inquiry has not completely adapted to this new context. Due to the early influences of situated learning theory, the focus of research in ENoPs has tended to emphasize the *process* of acquiring knowledge, rather than the *type* of knowledge sought or the *value* of the knowledge acquired by community members. As a result, there is insufficient attention on the quality of information sought and received in these communities.

Since members in ENoPs focus on the pursuit of individualized objectives and agenda, information needs are also more idiosyncratic. To truly understand whether a community is able to deliver the types of information sought by its members, we must first develop an understanding of those idiosyncratic information needs and the characteristics of people who are able to address those needs. Although understanding diversity in information/knowledge is not a traditionally important line of inquiry in Communities of Practice due to its emphasis on shared knowledge, it is a highly important objective in ENoPs. This has the potential to speak to why people 'return' to the ENoP and how the ENoP addresses information needs that may not be met in the offline community. By looking to the social network perspective, we can understand additional factors that have influenced the study of

ENoPs, while simultaneously developing a better understanding of the factors that influence information exchange in networks.

2.3.5 Networks of Practice: Lessons from Social Network Perspective

The social network perspective focuses on understanding how the structure of relationships influences the flow of information, goods, and social capital (Burt, 1992; Granovetter, 1973; Coleman, 1988). This perspective evaluates knowledge and information as properties held by an individual or group and can transfer (with a varying degree of difficulty) from person to person (Burt, 1992). The purpose of the literature review in this area is primarily to explore how the 'network' structure of ENoPs influences its dynamics, and how this emphasis on 'structure' has shaped the trajectory of research on ENoPs. It is not the objective of this thesis to explore the social network perspective in depth, or to focus on analyzing the pattern of interactions in ENoPs through social network analysis. These lines of inquiry are beyond the scope of this thesis, and for this reason, my discussion of social network perspective is fairly succinct.

To fully understand the dynamics of ENoPs, it is essential to understand the ramifications of the 'network' structure these entities adopt. Networks of practice exhibit two distinctive characteristics: enduring patterns of exchanges and the presence of a non-hierarchical form (van Baalen, Bleemhof-Ruwaard, and van Heck, 2005; Podolny and Page, 1998). To state otherwise, communication in virtually mediated network is both ongoing and egalitarian in the fact that people can essentially communicate with whomever they choose. For this reason, ENoPs adopt a more organic format, which is reflected by the fluid membership and the presence of a self-organizing structure (Wasko and Faraj, 2005).

Compared to a community which tends to be comprised of a group of individuals with strong ties, a 'network' is typically comprised of a larger number of individuals who share both strong and weak connections (Brown and Duguid, 2001). From a social network perspective, communities tend to be small and compact, while networks are large and sprawling.

For this reason, attachment, commitment and identification is likely to centre on the network itself, rather than specific individuals in the network, meaning feelings of attachment will centre on the ENoP itself rather than the members of the ENoP (Wasko et al., 2004). Due to a lack of strong ties, relationships in the ENoP are unlikely to have the foundation necessary to allow for the transmission of large volumes of information or the development of mutually-created objectives (Coleman, 1988; Wenger, 1998). The lack of shared objectives, coupled with the size and range of the ENoP, ostensibly means that interaction partners are unlikely to be repeated multiple times.

Social network theory tends to embrace a structural perspective for explaining network phenomenon. For example, expertise is perceived as a product of network structure characteristics; specifically, those people in positions of centrality (i.e. possessing the greatest number of relationships) are likely to possess greater access to novel information and a greater amount of social capital which underlies expertise (Burt, 1995). However, due to the sprawling structure of ENoPs, as well as their dynamic structure, it is difficult to consistently identify the people who possess centrality, and thus social capital.

In the social network perspective, the ontological basis is structure; by understanding structure, researchers can understand group dynamics and behaviour.

However, an emphasis on structure may have the unintended consequence of overlooking the quality of interactions in ENoPs, and the content and dynamics of those interactions (Whelan, 2007). This is problematic because an emphasis on structure does not adequately address the potential for asymmetries in exchanges—the type of interactions likely to occur in ENoPs (Borgatti, 2003). In addition, it does not evaluate the subjective experience of exchange partners. Social network perspective may reveal that Person A had five interaction partners, one of whom included Person B. This perspective would not evaluate the *perceived quality* of information exchanged between Person A and B, nor would it tell us which person benefitted the most from the interaction. To accurately assess the ENoPs as centres of information, we must push beyond structural explanations of exchange and begin to evaluate the quality of information exchanged in the community, and the characteristics of the individuals perceived to possess valuable knowledge.

2.3.6 Consequences of Theoretical Positioning for ENoPs

To summarize, the theoretical background of ENoPs is primarily based in situated learning theory, and to a lesser extent, social network theory. These theoretical bases have shaped the types of research questions we have asked in relation to these communities. Since situated learning theory emphasizes the co-development of knowledge, it focuses more on information that is jointly held, rather than examining different levels of knowledge such as those found in experts. This has influenced scholarship related to expertise for both CoPs and ENoPs. Specifically, expertise in CoPs is linked to membership characteristics and degree of participation (i.e. the process of becoming a legitimate participant), and it tends to be heavily influence by the characteristics of the environment in which it is embedded. In contrast, perceptions of expertise in ENoPs cannot be influenced by visible cues.

Furthermore, much of what we know of expertise in CoPs cannot be applied to ENoPs because of changes in size and communication medium. Table 2 below provides a summary of the different ways expertise is perceived in CoPs and ENoPs.

	Communities of Practice	**Electronic Networks of Practice**
Emerges from	Group Consensus	Individual Assessment
Sources of Percieved Expertise	Position, Title, Organizational status, membership characteristics, and degree of participation	Quality of information provided; other related factors unknown
Salience of Power Cues (e.g. Tenure, title, etc.)	High; very observable	Low; participants tend to have a degree of invisibility
Importance of Past Contributions	High, record forms part of community history	Low to Medium; only record available via feedback system

Table 2: Sources of Expertise in Communities of Practice and Electronic Networks of Practice

A social network perspective or social network analysis does not fully explore the potential for asymmetrical information exchange, and generally fails to adequately address how most valuable contributors in the network might change over time (Borgatti, 2003). This type of approach focuses on those individuals who communicate with the most people at any one given time, rather than the people who communicate the most valuable information. In Table 3 below, I contrast the perspectives of situated learning theory and social networks as they might relate to sharing knowledge in an online community.

	Situated Learning Theory	Social Networks
Focus of Research Effort	Creation of knowledge (Lave and Wenger, 1991)	Discovering network structure and tie strength (e.g. Burt, 1992)
Sources of Knowledge	Knowledge emerges from the community, created through joint enterprise (e.g. Wenger, 1998)	Range of Network Ties (e.g. Granovetter, 1973)
Approach to identifying knowledge or expertise	Complete progression through the apprenticeship model (Lave and Wenger, 1991)	Identifying the people who are in central positions in the network (e.g. Ibarra, 1993)

Table 3: Focus of inquiry in Situated Learning Theory and Online Networks as relevant to knowledge-sharing communities

I suggest it is due to the theoretical positioning of ENoPs that certain topics have been overlooked as lines of legitimate inquiry, specifically information-seeking behaviour and perceptions of expertise. This is problematic because it limits our ability to understand the information niche ENoPs fulfil, and the position of ENoPs in the literature on communities focusing on a shared practice.

2.4 Information-Seeking Behaviour in ENoPs

At the most basic level, Electronic Networks of Practice exist to meet the information needs of its members. These networks provide a platform from which to access the knowledge of others and exchange ideas related to the discipline in general. To date, there has been a great deal of emphasis on maintaining community participation and ensuring a steady stream of quality content (e.g. Wasko and Faraj 2005; Wasko and , 2000; Ardichivelli, Page, and Wentling, 2003; Zboralski, 2009; Ardichivelli, 2008). However, there is comparatively less attention on understanding the type of information individuals seek from these networks. By focusing on information-seeking, we are better equipped to understand how these communities

meet specific user needs. The following discussion reviews general and online models of information seeking to understand the role ENoPs play in the information-seeking process.

2.4.1 Information-Seeking Strategies

Research on information-seeking reveals the search process involves a number of interactions between personal and environmental factors, shaping specific search processes (Marchionini, 1995). People tend to progress through a series of defined stages during the search for knowledge; these stages involve recognizing a problem, interpreting the parameters of that problem, establishing a plan to seek or acquire information, performing that search, evaluating the search results, and—in the event the search does not yield appropriate information—repeating the search for a second time (Marchionini, 1989). Sutcliffe and Ennis (1998) focus more specifically on four main components of the information search process: problem identification, articulation of information needs, query formulation, and results evaluation. Although this depiction of the information-seeking process seems to suggest an orderly search progression, more cognitive-based viewpoints suggest the information search is prone to bias and optimization, because individuals tend to form preconceived notions about the type of solution they would like to find (Norman, 1988). As a result, information searches focus on adopting a solution that closely matches the original, ideal solution.

Theoretically, these more cognitive-based viewpoints are rooted in Simon's (1957) theory of bounded rationality, which suggests an imperfect model of information assessment that arises from restrictions on the both the quantity and quality of information available, limits on the reasoning abilities of one's mind, and

the time one has to make a decision. In essence, people are not searching for the perfect solution, but one that will satisfy a given set of requirements. In general, the information search can be depicted as a trade-off between optimizing one's returns and minimizing the effort expended to reap those returns (Pirolli and Card, 1999; Simon, 1957). Searching for information using the internet presents a unique set of challenges that stem from the enormous volume of information that is available on the internet, which—theoretically—could lengthen the search process (Nelson, 2003). However, research on internet-based information searches reveal that consumers of information will reach a tipping point where the perceived benefits of a search outweigh the effort of the search itself (Pirolli and Card, 1999). Essentially a saturation point is reached, whereby new sources of information are redundant, and so the search is concluded. This does not necessarily mean that the information acquired is the *best* information, rather it is the most *common* information.

When information needs (and the enquiries used to express those needs) are relatively basic, a general search strategy may be a productive means of acquiring solutions; however, as information needs become increasingly more complex, developing more specific search strategies—and perhaps multiple strategies—becomes more essential (Bates, 1989). Given the amount of effort associated with searching for information, it would be highly advantageous to gain access to experts who could reduce the 'work' associated with searching for information while simultaneously providing access to quality knowledge. For practitioners, the ability to connect with other experts in the field quickly and easily has distinct advantages, which are embodied by the ENoP. ENoPs act as information domains, or bodies of knowledge that are comprised of entities and relationships (Marichonini, 1995). The ENoP has the potential to access a particularly large domain of information, one that

is comprised of many people and is likely to contain unique viewpoints. Furthermore, the ENoP ought to have high appeal as a source of information due to the fact that many professionals have a distinct preference for seeking information directly from people, such as colleagues or peers, versus acquiring information via codified, written sources (Leckie, Pettigrew, & Sylvain, 1996).

In addition, the ENoP forms the setting in which the information is sought, influencing the shape of the information query. Seeking information in the ENoP effectively limits the range of the information search, while simultaneously allowing more complex queries than what would be allowed by a typical 'search engine' request (Sproull and Faraj, 1995; Menczer, 2003). When informational needs are no longer basic, the ability to develop tailored queries becomes increasingly important. Simply stated, people can use the ENoP to ask complex, specific and contextual questions. Given the complex information needs of certain professional occupations (e.g. Shuchman, 1981), this ability to develop robust queries is particularly important.

More specifically, there are five benefits associated with asking people for information: solutions, meta-knowledge—which is the identification of references capable of addressing informational needs, problem reformulation, validations of plans or solutions, and legitimization from contact with respected individuals (Cross, Rice and Parker, 2001). Solutions focus on the acquisition of specific information or answers to address set questions or problems, information may be declarative (know what) or procedural (know how). Meta-knowledge is the ability to obtain solutions by locating relevant information sources, such as databases or subject matter experts. Problem reformulation can be the outcome of engaging in an interaction that leads to

thinking of a problem in a new way. Validation is typically a confidence based interaction, a query to ensure a preconceived idea or plan is accurate. Legitimization confers validity on a solution by virtue of allowing an individual to tell others an esteemed expert has been consulted; due to the quasi-anonymous nature of ENoPs, it is unlikely legitimization would play a role in information-seeking in these communities. Table 4 gives an example of the types of questions that are related to these different information-seeking strategies:

TYPE OF QUERY	OUTCOME	NATURE OF QUERY
Solution	Answers	How should I solve this problem?
Meta-Knowledge	Resources	I need the name of a book/website/database.
Problem Reformulation	Parameters	I think this might be an issue, but I'm not sure.
Validation	Consensus	This is how you solve the problem, correct?
Legitimacy	Authority	I've heard you were the person to ask about this.

Table 4: Summary of the Five Types of Information-Seeking Benefits

ENoPs are a type of social network that allows access to information outside one's immediate peer network (Wasko, Faraj, & Teigland, 2004). Not only do ENoPs have the potential to address complex questions, they also can provide unique perspectives on a given topic. People can use the network to search within their own specialty, or they can engage with the ENoP to search outside of their immediate domain of expertise. In this way, ENoPs have the potential to provide benefits to people seeking information that complements their own body of knowledge or supplements their existing knowledge.

2.4.2 Information-Seeking Preferences

ENoPs have high utility for information-seeking by connecting individuals to a broad domain of knowledge while simultaneously offering the ability to customize queries, but the type and direction of the queries are relatively unknown. By looking

at the type of queries in these communities, we may be able to understand the information needs ENoPs fulfil. The specific type of information-seeking (e.g. solutions, meta-knowledge, etc.), and the extent to which ENoPs are used to access information from within one's own area of speciality versus across specialities has—to date—not yet been a topic of research.

In certain professions, practitioners are more likely to establish face-to-face relationships with individuals who share specialist backgrounds through repeated face-to-face interactions with colleagues in that same speciality (Anderson and Jay 1985). Individuals are more likely to build networks of information centred on shared characteristics, including work background and specialization (McPherson et al., 2001). For this reason, the ability to connect with people outside of a shared speciality may be limited when relying on face-to-face communication. Therefore, people turn to ENoPs to form connections with individuals with expert knowledge in different specialties; people who are typically reside outside their immediate social network. Conversely, ENoPs might be used as a resource for individuals who are in the early stages of a career, or in career transition, and have not yet developed strong ties and resources capable of addressing information needs (Morrison, 2002). Generally speaking, we need to know more about the type of information people seek from ENoPs if we are to understand how their content supplements the information available offline.

Dewhirst (1971) found a distinct preference for using interpersonal relationships as opposed to documents to acquire information in professions such as engineering and science. In the organization, the extent to which individuals are willing to exploit interpersonal relationships likely contends upon the availability of

those relationships and organizational norms associated with information-seeking. If conditions are not conducive to information-seeking in the organization, we might expect individuals to rely more heavily on ENoPs to meet information needs. Generally speaking, it seems evident the type of queries developed in ENoPs is likely to be influenced to some extent by the type of information that is perceived to be available in 'real life'. Understanding the informational purpose these entities fulfil is the first step toward understanding the dynamics of exchange in ENoPs, a meaningful line of inquiry for both theory and practice. In my research, I attempt to understand the type of information-seeking that occurs in ENoPs, and examine how these entities may supplement the type of information-seeking that occurs in the face-to-face environment.

2.5 Expertise

Information-seeking and the acquisition of expertise form part of a dialogue that leads to the exchange of knowledge (Tsoukas, 2009). In essence, a query and the ensuing replies create a chain of discussion that leads to the production of knowledge or insights. Information-seeking involves a search for information from a person who possesses more knowledge on a given topic. Electronic Networks of Practice allow information-seekers to connect with individuals who have more expertise in a given area. Expertise is the development of a skill that surpasses basic competency. Specialist expertise—the type of expertise discussed in this paper—refers to the acquisition of domain-specific knowledge that represents a narrow subdivision of a broader speciality (e.g. Schvampveldt et al., 1985). Collins (2007) identifies three categories of individuals in regards to expertise: those who do not understand the practice and do not contribute (novices), those who comprehend the practice but do not contribute to the advancement of the practice (interactional

experts), and those who contribute to the practice (contributory experts). When there are varying levels of knowledge and mastery in a practice, the potential for subjectivity in assessments of expertise is high. This subjective assessment—the perception of expertise—depends upon an observer's own level of competency. Perceived expertise influences both trust and decision-making (Peters, Covello, and McCallum, 2006; Salas and Klein, 2001). In regards to my research, this means perceptions of expertise can influence the type of information a person emphasizes in the decision-making process. In addition, if a person shares the knowledge gained in an ENoP with others in their organization, it can enhance her perceived expertise or status in the organization. The following discussion briefly discusses how expertise is acquired before exploring the exclusivity and subjectivity of expertise, and the use of feedback systems to evaluate the worth of contributions in online communities.

2.5.1 Expertise as knowledge

Expertise is developed by acquiring an extensive amount of knowledge on a topic and putting that knowledge into practice. Collins, Brown, and Holum (1991) focus on the acquisition of expertise as a social process, one that is facilitated by watching and learning from others. This type of approach is in keeping with situated learning theory, and gave rise to what the authors term "an apprenticeship model" of expertise. Although this model primarily focuses on the acquisition of a skill, it does speak to the development of expertise.

In the apprenticeship model, the individual progresses through a series of stages, acquiring greater and greater competency (Collins, Brown and Holum, 1991). As a beginner, knowledge is extremely limited and task performance requires a great deal of effort and instruction. At the next stage, that of advanced beginner, the

individual begins to become comfortable with the basics of the practice, and begins to attenuate to more complex stimulus. After an individual develops competence, they are increasingly comfortable relying on their own judgement and can adapt their behaviour to meet the demands of different contexts. Proficiency marks the fourth stage, in which the individual no longer contextualizes the practice to a certain area or domain, the practice is embedded in a holistic scenario that transcends a specific practice or behaviour. The final stage is expertise, in which practice is *unconsciously* adapted to context, and the individual has the capacity to fluidly move back and forth, adapting practice across contexts. The skill set has become internalized and can be applied to a various number of scenarios.

This model depicts an orderly progression of ever-increasing knowledge and comfort and familiarity with using that knowledge. This speaks to the potential for discrepant levels of expertise among practitioners, and the fact that persons performing similar tasks will have different levels of comprehension. However, developing standards of 'expertise' may be difficult due to the fact that knowledge is rather heterogeneous in nature, and is often embedded in potentially diverse institutional contexts (Robertson, Scarbrough, & Swan, 2003). Even within a theoretically homogenous community, the information possessed by individuals within those communities is likely to have some heterogeneity (Bunderson, 2003). The presence of this heterogeneity might influence perceptions of expertise by fostering the belief that some individuals have unique insights. Thus, it stands to reason that individuals who have reached the highest stages of competency and mastery (i.e. expertise) might not always be perceived as the most wise, because they could lack the ability to explain that knowledge effectively to people who are not as knowledgeable (e.g. Collins and Evans, 2007). To a great extent, knowledge is only

perceived as expert when people have the ability to communicate it, and it has a degree of exclusivity. The potential to connect with individuals who possess exclusive knowledge is one of benefits provided by ENoPs.

2.5.2 Exclusivity and Subjectivity of Expertise

Expertise involves a degree of mastery; one's skill or knowledge must be exceptional in some way and cannot be considered commonplace or held by the majority (Schvampveldt et al., 1985). It cannot be easily appropriated or acquired, and should be difficult to imitate; however, the extent to which a skill set is considered expert is dependent upon the context in which the skill is evaluated. Collins and Evans (2007) offer the following example: the ability to speak French is not considered an expert skill in French-speaking countries, rather it is considered a very basic and fundamental skill. The ability to speak French in English-speaking countries, however, is considered a unique asset. Thus, Collins and Evans illustrate the importance of relativity in understanding expertise, which—to a great extent—is a socially-constructed concept. Thus, the ability to be "expert" relies on the presence of a larger majority grouping of non-experts. For this reason, one of the main characteristics of expertise is the fact that it is an exclusive property, held by the minority rather than the majority in a given comparison group. The conceptualization of expertise as both unique and distinctive from the mainstream alludes to the reasons why certain types of wisdom are more likely to be perceived as expert.

2.5.3 Types of Expertise and its Properties

Collins, Brown, and Holum (1991) focus on the acquisition of expertise as a social process, one that is facilitated by watching and learning from others. This

emphasis on expertise as a social process emerged from Collins (1990) work on distinguishing human intelligence from that of artificial intelligence, a line of inquiry developed by Turing (1950). Collins suggests the ability to respond to open-ended queries and contextualize arguments is a key characteristic of fully socialized human intelligence. Artificial intelligence is unable to respond in the same way, making the use of language a distinctive characteristic of human intelligence. This highlights the critical role both language and discussion plays in the demonstration of expertise.

Building on this socialization approach to expertise, Collins and Evans (2002) developed a three-fold categorization of expertise, which includes: no expertise, interactional expertise, and contributory expertise. No expertise means an individual does not have sufficient knowledge to understand a practice, engage in its rhetoric, or further its development. Interactional expertise focuses on the socialization of a practice, or the ability to 'talk the talk' associated with a certain profession. This essentially means that a person may understand the language associated with the practice, and employ that language effectively; however, their knowledge is limited because they are unable to make significant contributions to the practice itself. For example, a person may have no experience with the practice of haircutting, but may be able to speak like a stylist (e.g. 'feathering,' 'deconstructed crown,' 'graduated a-line,' etc.) Contributory expertise is the ability to speak competently in the language of the practice and further the practice by doing. For example, they can speak—and cut hair—like a professional hair stylist. As a person learns more and more about a specific practice, they will begin to move from a position of no expertise, to interactional expertise when they begin to develop the ability to talk in an interesting way about a given practice. At some point, a person may even develop sufficient competency to answer questions about a specific

practice as though they actually performed that practice themselves. The difference that exists between 'talking' and 'doing' is the difference between interactional expertise and contributory expertise. Collins and Evans (2002) provide a contextual example of this based off Collins' experiences researching physicists. Collins moved from knowing nothing about the practice, to knowing the language sufficiently to engage in dialogue with gravitational wave physicists; however, he was unable to further the discipline itself by conducting experimentation.

Expertise is both exclusive and subjective; although similar, these two constructs are unique. *Exclusivity is derived from the context; subjectivity arises from observer characteristics.* Subjectivity emerges from the fact that persons with lesser skill are more likely to perceive people with more skill as possessing a degree of expertise (Collins and Evans, 2007). To follow the previous example, within the category of non-native French speakers, a person knowing the most basic phrases might be unable to distinguish between expert and intermediate speakers. To the beginner, the advanced and intermediate might appear to have equivalent levels of skill. In relationship to the apprenticeship model of learning, people in the introductory stages are less able to accurately discern the wisdom of those at the more advanced stages (Collins and Evans, 2007). Generally, if an individual possesses lesser skill or knowledge than the target, the target is more likely to be evaluated as possessing some degree of expertise. Thus, the target may not necessarily be an 'expert' in the strictest sense of the word, rather than will be *more* expert than the individual who is evaluating them. An observer's evaluation of expertise has a degree of subjectivity that is contingent upon the observer's own skill set.

Given the subjectivity that exists in the study of expertise, it is perhaps more logical to study the *perceptions of expertise* in certain cases. However biased or subjective, our perceptions of expertise influence the people we listen to in a community, and the advice we might be most likely to follow. It can influence power and prestige within a community by influencing what individuals are likely to be consulted in certain circumstances (e.g. Finkelstein, 1992). Perceptions of expertise shape confidence in one's contributions, determine divisions of labour, and the type of individuals we defer to on a given topic (e.g. Brandon and Hollingshead, 2004). In certain cases, individuals who are perceived to have greater expertise in a certain area are believed to provide more valuable feedback (Stone, Gueutal, and McIntosh, 1984). In this way, perceptions of expertise are an important outcome variable, because it has a strong influence on a multitude of group factors. This is one reason that research on perceived expertise in ENoPs is so important.

2.5.4 Perceptions of Expertise: Feedback/Reputation systems

There has been a great deal of recent attention on the development of reputation in online communities with user-produced content. This research focuses on examining communities with "reputation systems," mechanisms that allow members of a community to give feedback or rate the activity and contributions of others (Arriaga and Levina, 2008; Lampel and Bhalla, 2007; Dellarocas, 2003). In online communities, perceptions of expertise can be determined through the use of feedback or reputation systems that allow nomination or evaluation of a contribution. Feedback systems are a way of indicating quality and verifying the accuracy of information received in online communities (Resnick et al., 2000). These systems can vary in their structure as well as the amount of information they provide. Evaluation might take the form of a written review, Likert-scale items, or some

combination of the two. In other cases, feedback may be as simple as a "thumbs-up" or a "like this" button.

Much of this research adopts a marketing-based perspective in the fact that it examines how reputation systems in communities that focus primarily on either purchasing or consumption (e.g. eBay, Amazon.com; from Resnick and Zeckhauser, 2002; Dellarocas, Gao, and Narayan, 2010). When an assessment or decision is not routine, and the costs associated with making the decision is high, the feedback will assume an increasing amount of importance (Dellarocas, 2003; Lee et al., 2000). Thus, for communities focusing on the exchange of goods that are both intangible and free (e.g. knowledge and information), the provision of feedback may be less likely to dictate consumption patterns than interests and individual taste. In addition, there is typically a limit to the type of feedback that can be generated for intangible goods, unlike tangible goods which have many observable features. For example, one can assess tangible items using multiple factors, including: shape, cost, quality, texture, weight, size, colour, performance, and dimensions of an item. Due to the lack of observable features, it may be more difficult to assess tangible items, with individuals focusing more heavily on the extent to which the intangible item provided some benefit. In these communities, feedback might be used as a reward or appreciation mechanism to let a person know their contribution was valued. They are also a way to gain access to perceptions of expertise in a community. In ENoPs, a large number of expert nominations may increase one's status or prestige in the community; however, the impact of nomination may be limited due to lessened visibility and anonymity.

In face-to-face communities, both power and status enhance one's perception of expertise (Bunderson, 2003). In online communities, power and status are not as evident due to the relatively anonymous nature of exchange. Although anonymity may temper the value and effect of status, it does not diminish it (Lampel and Bhalla, 2007). As in face-to-face communities, individuals can accrue status and reputation in the community by making relevant and frequent contributions to community dialogue.

Status can influence consumption patterns in online communities, although the majority of research on this topic was conducted in either social communities (e.g. Facebook, Flickr, Digg; from Arriaga and Levina, 2008; Dellarocas, 2003) rather than professional communities with similar knowledge demands. Thus, feedback (which the authors measured using nominations) may not represent perceptions of expertise or wisdom, but ephemeral reactions to the novelty of a stimulus. Furthermore, in social communities, consumption patterns are directly related to the salience of user ratings, and the extent to which feedback systems are used in algorithms to suggest addition content. In social communities, feedback systems can determine the prominence of an item on a webpage, which may increase the possibility others will look at it and rate it as well. Although the feedback systems examined by Dellarocas (2003), Arriaga and Levina (2008) and Lampel and Bhalla (2007) share similarities to the feedback system used to measure perceived expertise in ENoPs, they do not influence the display or consumption of material in quite the same way.

Generally speaking, we may expect the feedback system to influence consumption patterns the least when decisions are routine, there are few invested

costs, decisions are easily reversible, and when the feedback does not influence the salience of an item (Dellarocas, 2003). Thus, the information provided by feedback systems should influence the consumption of information far less than the consumption of goods. Furthermore, when feedback influences the salience of an item, feedback systems will matter more. In communities such as Digg (e.g. Arriaga and Levina, 2008), where feedback determines the ranking of items on a page, feedback will be particularly important. In sum, feedback systems ought to matter less in ENoPs due to the low costs associated with the consumption of information and the fact they have little influence on the salience of an item. However, these systems can influence community status to an extent. In addition, they can reveal subjective evaluations of members as well as the type of information most valued in it.

To clarify, my research interests in expertise do *not* focus on examining community status/prestige or understanding whether a community of practitioners can accurately identify the most expert individuals. An understanding of status in the ENoP is beyond the empirical scope of this thesis. My objective is to understand how contribution patterns are related to perceived expertise in ENoPs, which are measured by a very basic feedback system. This feedback system is used as my measurement source, because it allows me to directly access the thoughts/perceptions of ENoP participants. Although using feedback mechanisms in this way is a different approach to the traditional approaches in marketing or information systems (e.g. Dellarocas, 2003; Arrianga and Levina, 2008), this line of research may reveal the possibility for the practical application of reputation/feedback systems in more management-based studies.

2.6 Research Gap and Theoretical Positioning

Electronic Networks of Practice provide clear benefits to its users. As discussed, they can serve as a means of reinforcing one's professional identity while gaining access to knowledge or solutions outside one's immediate peer group and meeting esteem needs (Wasko and Faraj, 2005; Wasko, Faraj, and Teigland 2004; Allan and Lewis, 2006). The size, focus and reliance on virtually mediated technology make ENoPs a particular type of online communities. They are distinct from other types of online organizing (e.g. online CoPs) due to the fact that interactions in these types of communities do not focus on joint enterprise, rather they primarily focus on the transfer of information from person to person.

The theoretical basis for the study of ENoPs lies somewhere between the realms of situated learning and social networks. For this reason, research has tended to travel down one of two paths, that of understanding learning dynamics among peers in these communities (e.g. Vaast and Walsham, 2009;Sharratt and Usoro, 2003; Johnson, 2001; Wasko, Faraj, & Teigland, 2004; Wasko and Faraj, 2005; Faraj Jarvenpaa, & Majchrzak, 2011) or looking at how network structure influences exchange patterns (e.g. Agterberg, van den Hooff, Huysman and Soekijad, 2010; Whelan, 2007; Wasko and Teigland, 2004; Thompson, 2005). While this has resulted in a rich body of research, it has led to the marginalization of certain legitimate lines of inquiry, most notably the type of information people want to receive from the community, and the people who are perceived to have the most information to contribute.

In general, this has produced a lack of empirical work on the dynamics of exchange in ENoPs. Situated learning theory focuses more heavily on the process of

joint knowledge development, which occurs when people work together on a shared task (Lave and Wenger, 1991). It has since—some argue inappropriately (Contu and Willmott, 2003)—been extended to study knowledge communities embedded in shared organizational contexts. Regardless of the appropriateness of this application, it has led to the re-conceptualization of CoPs as situated in a shared organizational context (e.g. Wenger, 2007). ENoPs do not share many of the key features of the CoPs, as I have detailed in Table 1 in section 2.3. Specifically, ENoPs exist entirely online and often adopt a sprawling network structure spanning numerous organizations; in addition, members do not share a joint purpose and are likely to possess differing skill levels. As a result, the ENoP cannot be considered an appropriate context for evaluating situated learning, yet their historical roots have influenced the way we have approached these entities (Contu and Willmott, 2003). In situated learning theory, the emphasis on knowledge content is secondary to a greater emphasis on knowledge process, with research attenuating to the joint production of knowledge that emerges from working on a shared problem. As a result, this has shaped our understanding of ENoPs, and the way we approach them as an object of study.

Our understanding of the most valued individuals in these communities is also influenced by the social network perspective. Generally speaking, this perspective tends to focus on identifying the relational structures that are responsible for determining social capital and the flow of information and who is important in the network and why (Burt, 1992). Ultimately, this may lead to a narrow picture of inner workings of the network (Borgatti, 2003). Instead of relying on a structural approach to understand which people are most likely to be perceived as experts in the community, I simply rely on perceptions of expertise. My objective is not to

understand the pattern of relationships in the ENoP, given its sprawl and size, this line of inquiry may have little utility. My objective is to understand what types of people are perceived as expert, and the characteristics associated with perceptions of expertise. This will allow me to focus on the *true* centre of wisdom in the community, rather than relying on structural explanations to identify the supposed centre of wisdom. Since the study of ENoPs has a relationship to social network theory through the form adopted by the community, it has led to a heightened emphasis on understanding the structure of these communities rather than the content of these communities. This has led to a lack of important and necessary research on the actual information-sharing dynamics of these networks (Whelan, 2007); a deficit I hope to address in this thesis.

Finally, there is a growing body of research influenced by practical considerations that focus on understanding contribution rates and motivations for contributions with an eye to developing sustainable communities (Kimble, 2006; Borzillo, 2009; Wenger, McDermott, & Snyder 2002; Ardichivelli, Page, & Wentling, 2003). As a result, researchers have, perhaps inadvertently, focused on the *quantity* of contributions rather than the *quality* of those contributions. This focus represents only one half of the equation. The next, most sensible step is to understand the quality of contributions, as well as the type of information individuals want to obtain from the community. This will allow us to understand what members want from the community, and what might cause them to remain active in the community. Given the practical importance of understanding the factors that influence the survival of online CoPs and ENoPs (Wenger, McDermott, & Snyder, 2002), this is a highly important objective from a practical perspective. Understanding the information needs of these communities will allow moderators (or

hosts of these networks) to develop a better structure for the community to more effectively meet member needs. Furthermore, understanding what types of characteristics are associated with perceptions of expertise in ENoPs will allow members to understand what types of information-sharing behaviours will enhance their status in ENoPs, if this is a desired objective. Lastly, understanding the type of information that is sought in ENoPs will allow a greater awareness of how ENoPs can be used to supplement existing organizational knowledge, and how knowledge workers can capitalize on these communities to benefit their career and the organization as a whole.

In sum, the objective of the preceding literature review was to articulate the different types of practice-based communities, as well as online communities, and situate ENoPs in the literature in those areas. In the ensuing analyses, one contribution of this thesis focuses on understanding the type of information-seeking that occurs in these communities. I plan to do this by examining the type of informational benefits sought in ENoPs (e.g. solutions, meta-knowledge, validation, problem reformulation, and legitimacy). In addition, I will explore the extent to which people seek information within or outside of their own specialty. Ultimately my objective here is to speak to the role ENoPs play in information-seeking. The final contribution of my analysis is to understand the characteristics associated with those people who are perceived as experts in the ENoP.

My theoretical positioning and contributions are centred in online communities, and more specifically, the growing field of ENoPs, a particular type of online community. It is my objective to discover how ENoPs meet specific information needs and to discover the factors associated with perceptions of

expertise in a network that is characterised by diversity. Due to the properties of virtually mediated communication, there is substantial reason to believe that information-seeking will proceed differently in online communities versus face-to-face communities. It is my objective to see how these patterns of information seeking vary in relation to ENoPs. In addition, the lack of context cues in ENoPs and the presence of greater diversity may influence the types of people who are perceived as most expert in the community. It is important to understand the factors associated with perceived expertise if we are to understand the types of people most valued in the group. In this way, I hope to illuminate some of the dynamics of ENoPs, which Whelan (2007) notes are particularly critical to advancing our understanding of these entities. On a more general note, this research touches on two up-and-coming trends: an increased scholarly interest in the practical application of feedback systems, and the presence of a strong interest in harnessing virtually mediated technologies to increase information sharing (e.g. Arriaga and Levina, 2008; Lampel and Bhalla, 2007; Vaast and Walsham, 2009; Wenger, 1998).

2.7 Development of my research questions

My research questions are primarily exploratory in nature, as I am seeking to discover general patterns of information-sharing, information-valuation, and expertise in these communities. At present, there is an insufficient amount of literature on the topic of expertise in ENoPs to validate the formation and testing of specific hypotheses. For that reason, I focus on discovering the broader information-sharing trends in these communities. Although I use some fairly technical statistical analyses that correspond to my research questions, my analysis is primarily aimed at discovering the dynamics associated with the following questions. For this reason, my research questions could be categorized as quasi-experimental in nature.

1. **What types of information do members seek in Electronic Networks of Practice?**
2. **How is information seeking perceived in ENoPs?**
3. **Are the contributions of perceived experts valued only in a specific/narrow domain?**
4. **What characteristics are associated with perceived experts?**

I believe these four questions are sufficiently narrow to give my research and analyses structure, yet they are sufficiently broad to allow me to explore the dynamics of the network and the way information is valued within these networks. Ultimately, it is my ambition to explain the general patterns and trends of information-sharing and valuation in these networks, rather than develop a confirmatory model. Given the fact that these networks are idiosyncratic in nature, and constructs such as expertise can be influenced by multitude of factors, it is more important to focus my efforts on developing a general understanding of expertise in electronic networks of practice, rather than attempting to develop a model, which may have a strong potential to be overly fitted to a specific context.

These research questions are rooted in the literature I have reviewed here. As seen in Table 5 on the following page, my motivations for assessing these questions are based in my understanding of the properties of virtual communication, as well as the patterns of information-seeking, and perceived expertise in face-to-face communities. As I work though my subsequent analyses, I will continue to develop this table which will ultimately give an overview of the literature, my research questions, analyses, results, and theoretical findings. In this way, this table will act as a roadmap of my contributions.

MOTIVATING FACTORS	RESEARCH QUESTIONS
Body of research on informational benefits offline (i.e. Cross et al., 2001) but not online. Generally know little about the dyamics of exchange in ENoPs (Whelan, 2007).	**What types of information do members seek in ENoPs?** (Within specialty or outside of speciality? What types of informational benefits?)
Information-seeking part of the dialogical process of knowledge creation (Tsoukas, 2009), so may also be perceived as form of expertise	**How is information-seeking perceived in ENoPs?** (Is it a source of expertise?)
Expertise tends to be associated with highly specific skills (e.g. Collins and Evans, 2007), but exchange may be impeded by virtual communication (e.g. Cherny, 1999). More investigation needed to ascertain whether expertise is also highly specified in an online environment.	**Are the contributions of perceived experts valued in only a specific/narrow domain?** (Does commenting in multiple areas reduce number of nominations?)
Knowledge the product of a joint enterprise in CoP (Wenger, 1998). When it is not a joint enterprise, we do not know the types of people most likely to produce 'knowledge.'	**What characteristics are associated with perceived experts?**

Table 5: Relationship between literature and research questions

2.8 Chapter Summary

This chapter has examined the literature relevant to the study of information-seeking and perceived expertise in Electronic Networks of Practice. The literature was divided into four categories. Firstly, the literature on online communities was examined, which provided insights into the structure, type of communication, norms and size, sense of anonymity, motives for engaging, and types of information exchanged. Generally speaking, this has produced a tendency for online

communities to become fairly large in size, with a greater potential for unrepeated interactions. Secondly, I worked toward identifying ENoPs as a particular type of online community that focused on sharing information related to a given profession or practice; in this section, I also highlighted several of the differences between ENoPs and CoPs. Next, I explored the nature of information-seeking as it relates to virtual exchanges in the ENoP. In this section, I highlighted the types of informational benefits identified by Cross et al. (2001) and discussed the preferences for acquiring information from people (as opposed to resources). Lastly, this chapter discussed the nature of expertise, highlighting its exclusivity and subjectivity, and exploring how expertise might be assessed through the use of feedback systems.

After exploring the relevant literature, I identified the research gap I wished to fill. Most research on ENoPs (and online communities focusing on shared practice) is grounded in situated learning theory with insights from the social network perspective. This is problematic because it has led to the marginalization of certain lines of inquiry, specifically the dynamics of exchange and the valuation of those exchanges. My objective is to contribute to the literature on online communities and ENoPs by examining the type of informational needs these networks provide, and the characteristics of those people best able to provide it. An empirical examination of information-seeking and expertise will allow us to understand how ENoPs meet specific knowledge needs. This chapter concluded with the four broad research questions that will guide my work.

III. CONTEXT

This chapter describes Eng-Tips, the Electronic Network of Practice that I study in my thesis. This chapter is divided into five main parts. The first portion discusses engineering as a discipline in general, and why this discipline is a relevant area of study. The second portion discusses the structure of Eng-Tips, with specific attention to the way users navigate the site and connect with other users. The third area discusses the general policies of Eng-Tips, the fourth discusses in greater detail the process of expert nomination, and the last part discusses the community level haracteristics of the ENoP more specifically.

3.1 Engineering as a Discipline

Engineering has played an important role in both building and developing society from the beginning of ancient civilization. In modern society, the texture of the discipline has changed, becoming increasingly complex to meet the demand for design in a wide variety of sectors. Its presence is felt in a wide variety of products, from mobile phones to airplanes to plastics to the oil and gas used to power the (engineered) vehicles that transport these goods from one location to the next. Given the prevalence of engineered products that power modern society, it is perhaps unsurprising that the number of engineers is again on the rise after an initial peak in the mid-80s (Mukherjee, 2010). In America, the percentage of engineering graduates has remained constant at approximately an average of 5.5% in the last ten years, an average very similar to that of most Western European economies (Digest of Educational Statistics, 2010). While this figure is not immodest, there is some concern these numbers are too small to keep pace with the large number of technological developments required of a strong market leader (Galbinski, 2011). Figure 3 represents the number of bachelor's degrees in engineering awarded from

1998-2009. Although engineers do not comprise a majority of university graduates, they do represent a sizable faction of awarded degrees.

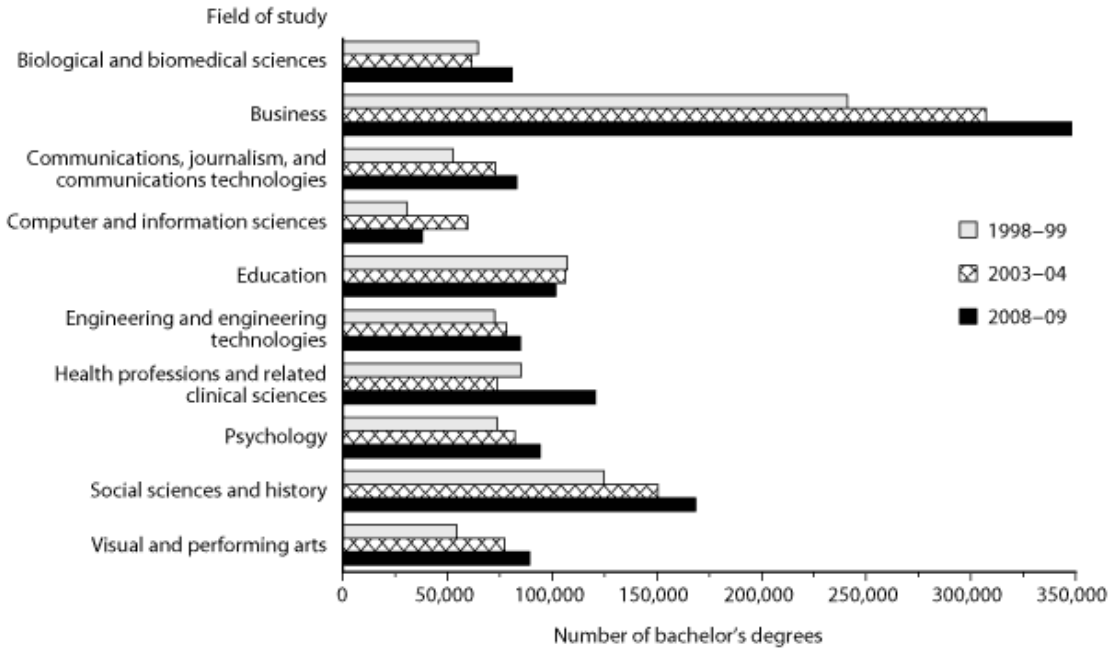


Figure 3: Bachelor's degrees conferred by degree-granting institutions in selected fields of study: 1998–99, 2003–04, and 2008–09; (Reprinted from US Department of Education, 2009)

Both the number of graduates, as well as the concern regarding these numbers, highlights the importance the discipline plays in everyday life and the business environment in general. Perhaps more importantly is the fact that the engineering discipline focuses on the innovative products, and production of effective and expedient solutions is critical to group success (Kemper, 1990). Engineers might work individually on single projects, or as members of a large team. Whatever the size of the group, the work typically takes place in an organization.

Generally speaking, there are four primary branches in engineering: Chemical, Civil, Electrical and Mechanical. There are several other specialities that stem from these primary branches. These specialities include mining and military, nuclear,

aerospace, petroleum, systems, audio engineering, architectural, biosystems, biomedical, and industrial (Kemper, 1990). The practice of engineering draws from several disciplines, including physics, mathematics, and chemistry. Often new disciplines will emerge from the nexus of two branches of engineering, producing new specialties and subspecialties. Collectively, engineers share a professional status and general training, but tend to assume a distinct specialty; however, during the course of their career, it is likely individuals will assume a variety of functions (Kemper, 1990).

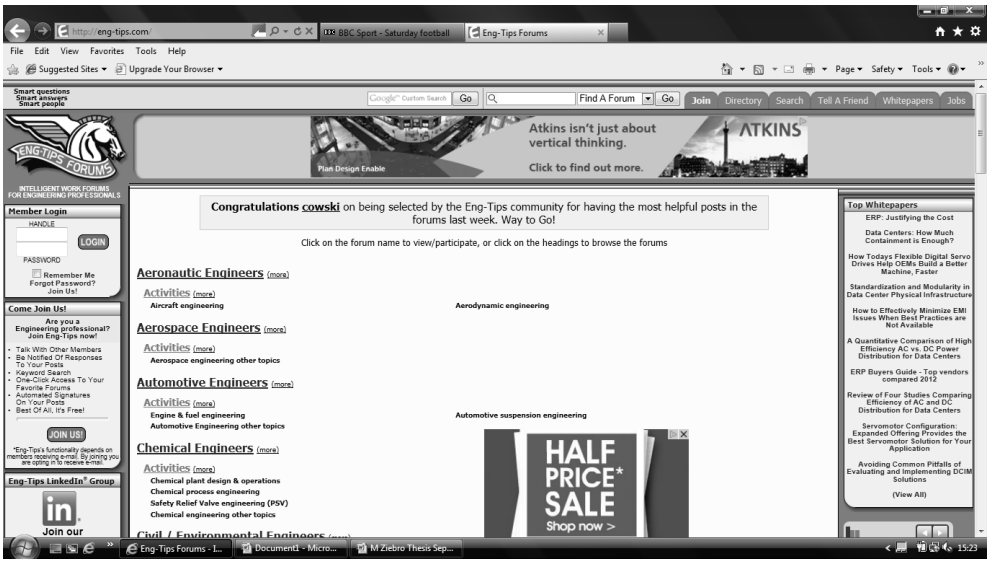
Ultimately, the objective of engineers is to create or develop a solution to fit the parameters of a specified problem set. They are often embedded in an environment that demands creativity and innovation, and often collaborate with multiple numbers of individuals in a team-setting. Knowledge is extremely critical to performance; perhaps it is not surprising that engineers consume much more information than they generate (Shuchman, 1981). An engineers' reliance on information to facilitate job performance is representative of many professionals, which include persons in health care, lawyers, and scientists (Leckie, Pettigrew, and Sylvain, 1996). For this reason, engineers might be considered an ideal sample because their pattern of information consumption can be considered representative of many knowledge-intensive professions.

3.2 Structure of Eng-Tips

The structure of Eng-Tips can be considered fairly uncomplicated. In the discussion below, I briefly discuss the site navigation, member connectivity, message type, and additional site content.

3.2.1 Site Navigation

Navigation of the site is fairly straightforward; at the home page, individuals are invited to login to the community with a small sidebar on the left. In the centre of the page, there is a list of the twenty main specialty areas of Eng-Tips in red, with specific forum names in blue underneath. Individuals can scroll down the page to click on a forum or specialty area of interest. To the top of the page, and immediately under an advertising bar, there is a small banner recognizing the most helpful contributor of the previous week. The right side of the page is predominantly advertisements.



When individuals are navigating a specific forum, they have the potential to sort threads by type, date, most helpful, or last read. Users must be logged into the system to activate this feature.

3.2.2. Member Connectivity

Members have the option of engaging with each other by discussion in the online forums or private message, which is then forwarded to one's email account. Members are generally discouraged from sharing personal information in their online

profile (e.g. email address) to reduce the potential for any problems (e.g. spam or trolling) to occur. In addition, members have the option of joining the Eng-Tips LinkedIn group, which provides further career-based benefits.

3.2.3 Types of Messages

There are five methods of beginning a dialogue forum. The first is to start a thread or query, which is a question or a request for information. The second is to post a FAQ, which is a series of frequently asked questions about a given topic. The third is to post a general tip, which may be a resource or helpful suggestion. The fourth is to post a link to a news article that is related to a given practice. The fifth is to post a review of a book or news article. Individuals have the potential to reply to all of these types of posts. The most common type of interaction is starting a thread or query, which accounts for approximately 92% of all dialogues started in the forum. Replies occur in response to these invitations to dialogue.

3.2.4 Other Areas of the Forum

Although the twenty specialty areas are emphasized in the forum, there are other areas in Eng-Tips that cover additional elements of the profession. The remaining areas include forums on: career development, professional certification, computer programs, engineering methods, and project management. In my study, I focus on those forums which involve the sharing of information related to the performance of a specific practice.

3.3 Policies of Eng-Tips

Eng-Tips has several policies and norms that guide member behaviour and influence the dynamics of the community. These factors include the source of community funding, as well as the rules and guidelines of the community.

3.3.1 Source of Income for Community

Membership and participation in Eng-Tips is completely free of charge, and there appears to be a strong commitment to ensuring the community maintains this status. The finance model is predominantly based on the presence of banner advertising. Organizations have the potential to contact site moderators to secure advertisements for a fee. Income from advertisements is supplemented with donations and the sale of merchandise, which is a range of several shirts and glasses that have been branded with the Eng-Tips logo. This merchandise is advertised by a sidebar in the left-hand column of the log in page.

3.3.2 Community Rules and Guidelines

Eng-Tips has strict guidelines regulating behaviour in their community. Prior to posting to the community, members are asked to peruse the “Eng-Tips Posting Policies” page. On this page, the moderators set forth guidelines on how members are expected to behave in the community, and the types of interactions that are acceptable.

Students are not allowed to post homework problems in the Eng-Tips forums for the purpose of getting answers to their homework. This is considered cheating. Offending posts will be removed from the site and offending members will lose their membership privileges.

The following activities can result in deletion of posts, deletion of threads and/or restriction of further site usage. Members who engage in any of the following activities may be red flagged by the membership. Management of this site does not read any post unless it has been red flagged by a member. In no particular order, here are some common offenses:

- Selling
- Recruiting
- Student Posting
- Profanity
- Cross Posting
- Tack-On Posting. If you have a new question, start a new thread.
- Arguing in an Unprofessional Manner
- Posting of Personal Information
- Posting Anything Illegal (including hacking, cracking, passwords, etc.)
- Defamatory Posting
- Shill Posting, or posting made at the behest of a company
- Leeching (members posting only questions, and never helping others)
- Irritating Other Members

On the other hand, members are expected to:

- Search Google, Previous Posts, and FAQs Prior to Posting.
- Write Intelligent Questions And Use Descriptive Subject Lines
- Thank Other Members For Help Received & Click the "Thank (member) For This Valuable Post!" Link
- Help Other Members
- Red Flag Offensive Posts
- Be Professional

3.4 Expert Nominations

Expert nominations are a measure of how frequently other members of the network of practice perceive a contribution to have extraordinary value. An objective assessment of expertise is beyond the reach of this thesis because it does not rely on traditional measures of expertise, such as the systematic examination of

community members by a panel of experts or rigorous examinations (e.g. Epstein and Hundert, 2002; Epstein and Petrovic, 2010). Furthermore, my interest is in understanding the perceptions of community members themselves. This interest led me to collect data on the expert nominations one received.

In the forum, members are encouraged to "Thank [this contributor] and star this post." Members are then further urged to "Click here to mark this post as valuable and give [the contributor] a star." Once an individual has clicked through to nominate the post, a pop-up occurs stating, "You have chosen to recognize [this contributor] for a helpful or expert post! Thanks for letting [the contributor] know their post was helpful." In this small pop-up, a hyperlink appears stating "Click Here to Confirm This Action and Give [the contributor's] post a star". Computer programming inserts the username or handle of the contributor in lieu of the brackets. Thus, the process of nominating a post as expert requires two clicks. This means it is relatively unlikely nominations are the product of an accidental stray click, rather it represents a true valuation of that person's perceived added value or contribution. Occasionally posters will request that an individual give them a 'star' or expert valuation in the actual text of the response itself. While the language of the posting itself combines the language of 'helpfulness' with 'expertise,' in this community, the notion of helpfulness is entwined with expertise. That is to say, it seems evident that the helpful behaviour alluded to emerges from a place of knowledge or wisdom.

Give XXXXX
a Star!

You have chosen to recognize XXXX for a helpful or expert post! Thanks for letting XXXX know their post was helpful.

Click Here To Confirm This Action
And Give XXXX's Post A Star

To use 'expert nomination' as a true source of expert knowledge, it must be representative of the opinions and perspectives of the community. The expert group cannot represent a small faction of self-nominating individuals who engage in reciprocal nominations. I first checked to ensure that the number of nominations received was greater than the number given out. Since the number of nominations received by the expert group far outweighed the number of nominations they gave out, I felt comfortable proceeding in my analyses. I further discuss the issue of representativeness in 4.3.3.

As previously stated, there is a degree of group recognition and prestige associated with expert nominations that stems from the fact that there is a potential to be 'recognized' as a 'resident expert' or contributor. Every week, the moderators of Eng-Tips calculate which individual received the most nominations for 'expert' or 'helpful' answers. At the top of the main thread page, there is a byline to recognize this individual on a week-by-week basis.

Congratulations XXXX on being selected by the Eng-Tips community for having the most helpful posts in the forums last week. Way to Go!

3.5 Community Characteristics

Eng-Tips is a public community, founded in 1998 with over 154,300 posts related to the specific performance of a practice. This has provided a data-rich context that allows me to examine specific member contributions and patterns of interaction. Due to fluctuations in member activity, it is difficult to obtain an accurate total of the number of members in the community, but there are over several

thousand registered members in over 200 countries. The bulk of membership comes from the United States (i.e. 31.5%), and members communicate solely in English. A broad range of engineering specialties are represented (i.e. approximately 21), and detailed metrics are available through member profiles, which detail the frequency of login, length of membership, and commenting patterns.

3.6 Chapter Summary

This chapter has explained the context of my study on two levels. First, I discussed the justification for selecting engineering as a topic of study, which is due to the fact it is an occupation that requires a disproportionate amount of information; a phenomenon that is quite typical of professional industries. Second, I described the context of Eng-Tips, the community I studied, in greater detail, with specific attention on the structure of the community, its policies and procedures, the actual processes associated with receiving an expert nomination, and the characteristics of the community itself.

IV. METHODOLOGY

4.1 Introduction

The methodology that forms the basis for this research will be discussed in this chapter. This first portion of this work relies on the transformation of qualitative data into quantitative methodology (via coding) to determine the type of information that is sought in the ENoP. The second portion of this work uses quantitative measures in the form of metrics to determine the factors associated with perceptions of expertise.

This chapter is divided into four parts. In the first part, I discuss the reasons for selecting Eng-Tips as my research context. In the second part, I describe the data collection in greater detail (with specific attention to the types of data collection I engaged in) and the preparation required to transform the data prior to the analysis phase. The final portion of this chapter describes the limitations of my methodology, and tentatively explores the consequences this might have on the results of my study.

4.2 Research Community Identification and Access

The search for electronic networks of practice was guided by the following criteria. The ENoP must:

- be situated entirely online, or "virtual" in nature, so as to give me the opportunity to examine both the totality of interactions and the way that virtuality influenced the perceptions of expertise in the community;
- focus on a knowledge-intensive practice that contains multiple specialties, allowing me to examine how ideas and information are perceived across specialist boundaries;
- not be situated in an organizational context, as not to conflate my findings with particular organizational norms;
- allow access to a large archive of electronic exchanges, which should be the product of a thriving community; and

- employ a peer-based evaluation system to determine the worth of contributions, allowing an examination of the characteristics associated with the people who are perceived as expert in the community.

There were several ENoPs that met some of these criteria to an extent, including the following communities: thelawforum.co.uk, lawyers.com, traineesolicitor.co.uk, medscape.com/connect, docsboard.com and studentdoctor.net. However, given the sheer volume of information, the transparency and ease of accessing information in Eng-Tips, its clear and easy-to-understand peer-based evaluation system, and the fact this community focused more on information than social support, I considered Eng-Tips to be the most outstanding context for my study.

Given the nature of my data collection, which was extremely unobtrusive, and focused predominantly on gathering metrics, it was extremely easy to secure access. Most of the information I sought was quasi-public, in that it was available to community members, who could register free of charge. Individual members were not contacted about this project for several reasons. Firstly, given the sheer volume of the members involved with the community, contacting them on an individual level would prove an insurmountable task. Secondly, the data collected was—as stated—not sensitive in nature and publicly available. Thirdly, the data gathered on participants were largely anonymous due to the fact they were identified in the study solely by a username. Furthermore, the results presented in this thesis are aggregated and do not reveal any information about the individual members of the community. While they did not assist in the data collection process, the coordinators of Eng-Tips indicated they were willing to have their community involved in the project. This was confirmed in an email exchange in June of 2009.

4.3 Data Collection

Discussion of data collection is divided into five sections, the first details the informal observation process I went through to develop a familiarity with the Electronic Network of Practice, and the second details data collection on information seeking, and the third explains how metrics were gathered and prepared to be analysed in SPSS. The fourth section discusses the issues of generalization, while the fifth section provides a summary.

Although it was possible to collect the metrics in the community without reading through community exchanges or 'observing' past record of exchanges directly, it could be considered inappropriate to do so, because the resulting analyses might not reflect the spirit or nature of the community. Familiarity with the community, and the dynamics and norms of the community, was essential to know whether my analysis was in keeping with the way the ENoP actually 'worked.' Given the fact that many of my analyses were based on metrics, my observations were not systematic or designed for analytical purposes, rather they represent my attempts to contextualize the data I gathered and form a 'big picture' of my research findings.

4.3.1 Informal Observation

My initial contact with Eng-Tips occurred in May of 2009, when I began looking for ENoPs that might be appropriate for my research study. At this point, I joined the ENoP to gain access to the posts generated by members in the forum. Over the course of one month, I spent a couple of hours each day looking through the forum and reading past posts. This behaviour was instrumental in determining whether the ENoP was appropriate for my study, while generating sufficient

'background' information for me to feel comfortable interpreting my information. During this time, I also looked at several other similar forums in other professions, including an electronic network of physicians, and one focusing on the practice of law.

This early involvement in the network consisted of perusing the forums and gaining familiarity with the types of interactions in the community, as well as the way the community was structured. Given the fact that I had limited technical experience—my exposure to engineering comes predominantly through several close family members and friends working in the field—reading through these posts helped me build a basic understanding of engineering principles and typical problems and issues encountered in the profession.

My later involvement focused more on understanding what types of posts generated the most responses and mass interest, and what types of posts went unanswered or had a small trickle of responses. My observations were not particularly systematic; as I read through the forums I adopted a "random sampling" approach. However, I did spend a disproportionate amount of time reading the most popular and least popular posts. Items which garnered the most interest tended to focus on basic tenants of the discipline, whereas less popular items tended to adopt a blatant request for help, particularly a request for assistance in calculations. In this way, I was able to enhance my understanding of the engineering practice itself through the use of several resources, such as additional online communities specializing in engineering, and speaking with several subject matter experts in engineering (e.g. Mechanical, Chemical, and Computer engineers). Overall, this

behaviour helped me form a context that allowed me more comfort and freedom and increased confidence in assessing the content.

4.3.2 Coding Qualitative Data: Information Seeking

One of my research questions focused on understanding what types of queries were directed at ENoPs. To do so, I relied on the types of information-seeking queries identified by Cross et al., (2001). The decision to use Cross et al. (2001) resulted from an initial attempt at grounded theory coding that was not particularly fruitful. After familiarizing myself extensively with the data, I began to coding the data on the basis of several properties that emerged from the data set. These properties included the type of question asked (closed or open), the number of queries embedded in the question, the amount of expertise that might be required to answer the question, whether the query focused on answering a real (v. hypothetical) situation, whether a calculation was necessary, and the amount of background context provided in the question. The objective was to understand how properties of a question might relate to the number of replies one received, with an eye to understanding how certain types of information-seeking influenced the emergence of dialogue in the ENoP. While information-seeking that was more open-ended did produce more extensive conversations, this type of relationship could be anticipated, and did not speak extensively to the type of information needs that were fulfilled. Thus, my focus turned more intensively toward information-seeking and its accompanying literature. The Cross et al. (2001) article aligned with some of my initial categorization, but was effectively a 'neater' taxonomy, and I believed my initial foray into grounded theory would not significantly improve upon these pre-existing categories.

Cross et al. (2001) identified five types of information-seeking queries: solution, meta-knowledge, problem reformulation, validation, and legitimacy. My objective in this area was to extend this framework of information-seeking benefits from face-to-face communities to the virtual environment. I gathered data on the types of queries in ENoPs by collecting a random sample of queries and then coding the random sample for each of the five types. To ensure that my sample accurately represented the ENoP practice, I employed a quota-based sampling technique. This means that if a certain forum represented 1% of the total posts on Eng-Tips, I drew 1% of my sample from within this forum. My total sample size was 1,543 and the stratification of my sample is depicted in Table 6 below:

ENGINEERING SPECIALTY	TOTAL QUERIES	SAMPLE SIZE
Aeronautical/Aerospace	3357	34
Agricultural	134	1
Automotive	5677	57
Bioengineering	295	3
Chemical	8428	84
Civil/Environmental	5678	57
Coastal	167	2
Computer	1325	13
Electrical Engineering	31276	313
Geotechnical	5609	56
Industrial/Manufacturing	4861	49
Marine Ocean	1206	12
Materials	15091	151
Mechanical	39071	391
Military	291	3
Mining	247	2
Nuclear	2019	20
Petroleum	2130	21
Structural	27463	275

Table 6: Calculation of Quota-based Sample Size

In each category (e.g. Agricultural, Nuclear), I randomly sampled the number of queries as set forth by my quota. For example, in Agricultural engineering, my sample size was 1, in Nuclear engineering, my sample size was 20, as you can see in Table 6. In this way, my sampling technique was representative of the community as a whole. The next step was determining the items to sample, which I did using a random number generator for each forum. After I identified the items in my sample, I then coded the data. I did so by reading the prompt, and determining what type of information-seeking benefit was sought. In the event that the item posted was not a query (e.g. news item, social, or career-based request), I coded the following item. Occasionally, there was ambiguity in an item. For example, one individual asked, "I've heard dimpling aircraft skin is bad practice in a pressurised aircraft. (A) Can somebody confirm this? (B) Direct me to a proper reference?" This query would be coded as both validating and meta-knowledge. Other examples of coding are provided in Table 7 on the following page.

Given logistic difficulties associated with cutting and pasting the data, all coding was performed directly in the forum. This also gave me the opportunity to examine replies in the event of a particularly unusual question. I prepared a blank sheet of paper with ten boxes in a 5x2 format. Across the top of the page were headings of "solutions" "meta-knowledge" "validating" "problem-reformulation" and "legitimacy." To the side of the page were two boxes labelled "within" and "outside." For each query I read and coded, I put a tick mark in the appropriate box.

Solution	Hi, does anyone know how i might calculate the sound power from a night club?
	I recently encountered a situation where an MS20007 bolt was used in conjunction with an MS21043 fiberlock nut. Going off an SS9300 torque chart the bolt was in the 160,000 psi column and the nut in the 125,000 psi column and therefore had very different torques - approx a 200 inlb difference. In this situation, which torque value is used?
	I am having a problem with discoloration on the machined surfaces of aluminum die castings. These parts are cast from A383 aluminum alloy. The discoloration is a brownish tint, maybe a tarnished look. If I scratch it with a knife blade, it is shiny underneath, so it is on surface only. It shows up randomly on different parts from different cnc machines. Maybe only 1 or 2 parts at a time. What could this be?
Meta-Knowledge	Does any-one have tabular format for approximate engineering solution for the coefficient of lift and the coefficient of drag forces at multiple attack angles?
	Anyone knows good web sites about thermography?
	I was just curious if anyone out there has one or knows where to download a spreadsheet that computes lateral stresses from earth pressure and surcharge loadings?
	I am looking for cost estimation of eqiupment for modified starch plant. (cost index 2001)
Validation	I think I know the answer to this, but it is worth a try...Is it acceptable to lower the set point to solve an inlet dP problem? Consider the following: MAWP = set = 75, oper pressure = 45, inlet dP = 5% (3.75 psi). Can I lower the set pressure to say 71 psig and meet the 3% code value?
	Is it correct to perform a proofrolling test while it is raining and the top soil is all loose and flooded?
	In the AASHTO Clasification what kind of truck is an 18 wheeler? Is it a WB-50?
Problem-Reformulation	I would like to design an Embankment Dam, but I am not going anywhere. Can you help?
	Has anyone here ever worked with the GK subsidiary known as Active Shock in a heavy vehicle application? If so, what can you tell me about them?
Legitimacy	Is it standard practice in your area (where are you?) to conduct periodic "backup" tests using sand cone (ASTM D1556), drive cylinder (ASTM D2937), or other methods to check the accuracy of tests conducted using a nuclear density device (ASTM D2922)? Do you know of any authoritative published sources that recommend or specify that such "backup" tests be conducted?
	So the manager spoke to the MD to say that Solidworks is no good for our type of work (heavy engineering) and they should stick to Autocad. So next week I have been summoned to a meeting where I have to justify the continued use of Solidworks....Who else [i.e. other firms] uses it?

Table 7: Examples of queries coded for the five information-seeking types

4.3.3 Gathering Metrics

One of my initial decisions when examining an ENoP was how to appropriately gather data to address my research questions. Given the fact that I was interested in observing *actual* behaviour of network members, it made the most sense to gather metric-based information. I had initially considered supplementing this information with interviews or questionnaires, but refrained from doing so for two main reasons: Firstly, interview protocol would require me to ask about

underlying motivations for past events, which is particularly susceptible to bias. Secondly, as stated, my research questions focused more on what network me`1mbers actually did, which was observable. For these reasons, I focused my data collection on gathering metrics.

One of the key metrics I used in my research was the number of expert nominations received, which is used as a proxy for perceived expertise. This decision is open to criticism because is a potential that a nomination may not reflect true "expertise" so much as a quid-pro-quo pattern of nomination, or a highly evolved ability to answer questions. I address the first issue that of reciprocity or quid-pro-quo pattern of nomination, from a methodological stance. I do this by also gathering data on the number of nominations one has given out in the ENoP. I then correlate this to the number of nominations one received to determine whether I should use it as a control variable in 5.2.2.

The second issue, a highly evolved ability to answer questions, cannot be addressed in my methods. For this reason, I explore the nature of the community itself and previous research in this area. Firstly, the individuals engaging in the ENoP had to possess some degree of expertise to engage in the community, because conversation exists at a highly technical level. Therefore, nominations were not coming from laypersons; they were coming from people who had to possess some degree of familiarity with the topic at hand to effectively engage in the community. Given the jargon and training required to engage with the profession, it would be much more difficult to present a deceptive façade of wisdom or knowledge, because a false representation of knowledge would presumably be more easily noticed in a group of experts. Kostakos' (2009) work supports this notion by revealing that

nominations by experts are fundamentally different from that of a layperson. I suggest electronic communities with higher barriers to entry, like the one studied, are more likely to attract a larger number of expert members. Essentially, this means the content of the answers produced in this type of community will be scrutinized to a greater degree.

Kostakos' (2009) also reveals these expert members are more likely to nominate or recommend materials (i.e. movies and books) that were more obscure, creating a distinct schism between nominating patterns of the general public and experts. This indicates there is something fundamentally different about the nominating patterns of people with expertise. Thus, expert nominees may be more likely to nominate replies that are truly expert. On the whole, I suggest expert nominations are a valid proxy for perceptions of expertise in the community because these nominations represent the collective opinion of a group of people who have—for the most part—extensive experience and training in a certain domain. In effect, this is a group of experts evaluating other experts.

4.3.3.1 Quota-Based Sampling

In the ENoP I assessed, I opted to use a form of quota sampling to gather my sample size, similar to that discussed in 4.3.2. Quota sampling is typically used when a probability sample cannot be obtained, yet the researcher wishes to create a sample that is as representative as possible of a given group. Quota sampling has several advantages in the fact that it is relatively easy to carry out, and can allow for direct comparison between groups. In my context, the strata are the different forums in which I collected my data. Specifically, my technique gathered data on the top-rated 50 contributors in each of forums in Eng-Tips. This decision was influenced

by the fact that a tab in the far right portion of the page identified these people as the MVPs of the forum. Although my sample did not collect data on everyone who received an expert nomination, it did collect a broad sample that was representative of the people perceived as experts in the community.

Approximately 60% of the forums had fewer than 50 top-rated contributors. In these forums, the sample size I generated from the community was also fewer than 50. Given the fact that it was my objective to specifically assess the perceived experts in the forums (i.e. the top-rated contributors), the use of a quota sample was essential because it allowed me to separate the people who received expert nominations from the people who did not receive expert nominations. Quota sampling is subject to some controversy due to the fact that it is a non-probability technique, and might be considered unreliable since the resulting sample might not be representative of the characteristics of the population itself. For this reason, it is highly likely that certain types of people were overrepresented in my study, and care must be taken when interpreting characteristics of the sample size itself.

I collected metrics on network activity and usage over a four month period from January to April 2011. Supplemental information was collected in June and July of 2011. During the initial wave of data collection, I identified the top-rated contributors to each of the specialist forums. This identification process happened in the following way: firstly I identified each of the specialist areas in which I would collect data, which was a total of 21. Each specialist area contained several topical areas, which ranged from two to nine. In each of these topical areas, it was possible to identify the most expert contributors by clicking on a “MVP” button. This would reveal the top fifty contributors for that specific topic. So for example, the specialist

area aeronautical engineering had four main topics. Within those four main topics, I collected metrics on the top fifty experts, which—theoretically—would yield 200 subject-matter experts for the specialist area of Aeronautical engineering. Practically speaking, some topical areas were more popular than others, and the slight majority of forums had fewer than 50 experts. On the whole, there were 149 topical areas in which I collected data.

After identifying the topical areas in which I would gather my data, I collected metrics and information in the following areas:

- Date joined
- Date of last login
- Total number of logins
- Self-described speciality or area of expertise (e.g. "Electrical," "Computer," "Civil," etc.)
- Personal information or details filled in an online profile
- Total number of threads/posts started
- Total number of replies
- Total FAQ (Frequently Asked Questions) written
- Total posts written

During the second wave of data collection, I gathered more specific information on these individuals, collecting information on the name of all of the forums those individuals have participated in (either by commenting or nominating). Collecting information in this way allowed me to 'break down' total activity into specific areas, allowing me to develop a sharper picture of the range of individual behaviour. For each forum, I took detailed information on:

- The number of threads/posts started
- The total number of replies
- The number of FAQ written
- Expert nominations received
- Expert nominations given in one's own area of expertise/specialty
- Expert nominations given outside of one's own area of expertise/specialty

Data collection for these two waves was performed manually and with the use of the copy and paste function. After transferring the data to an excel document, it was formatted into a separate table, which allowed me to manage the data more effectively. In total, I collected information on approximately 2558 individuals who received the most number of expert votes in their respective communities.

4.3.3.2 Preparing data for analysis in SPSS

During the course of my data collection I knew the titles of the forums, which were strings (i.e. words) and often lengthy (e.g. "Automotive tire/wheel engineering" "Cost analysis engineering economics"), might be problematic when I moved into the data analysis phase. Furthermore, I wished to make more complex analyses that were only possible using numerical (as opposed to strings or alphanumeric characters). For this reason, my last wave of data collection from the network focused on creating a list matching forum names to forum numbers, as assigned by community coordinators. Thus, "Automotive tire/wheel engineering" became forum number "68" and "Cost analysis engineering economics" became "278". I then categorized each of the communities according to their respective specialties. To maintain the continuity of the example above, "Automotive tire/wheel engineering" or forum number "68" was part of the "Automotive" specialist area. "Cost analysis engineering economics" or forum "278" was part of the "Industrial/Manufacturing" specialist area.

I then gave each of the major specialist areas specific identifying numbers. Automotive became specialist area number "4" and "Industrial/Manufacturing" became specialist area number "12." This maintained continuity with the type of

labeling used for the forums themselves, while also converting these "strings" into numerical data that could be used more easily in SPSS.

Several topical areas were more general in nature, or focused more heavily on career-based topics. These included forums such as "Professional Ethics in Engineering" and "Where engineering is going in the next 5 years" which were part of a broader topical area called "Trends and Strategies." Other topics such as "How to improve myself and get ahead at work" and "Overcoming obstacles to get my work done" formed part of a broader topical area called "Corporate Survival." I also identified these areas by a number, as I did for specialist areas. However, I added an additional two digits (i.e. a '10') in front of these topical areas to denote they did not represent specific specialties.

This formatting was aided with several tools in excel, most notably the "find" and "lookup" functions. In all, I identified 20 specialty areas on the forums, and 20 topical areas that related to the general practice of the discipline as a whole. It is important to note that I omitted from the data set forums that were social, about career advancement, and standardized professional examinations. Thus, this sample only examined participation in these twenty professional areas.

I converted these alphanumeric strings (i.e. name of specialty) to numbers that would allow me to work with the data in SPSS. I did so by creating a key that assigned a number to each specialty. I used the "vlookup" function to find the specialty in the key sheet and return the number to the next column. After converting the strings to numbers, I next performed a series of extensive calculations in excel to give me the following data on the total number of *unique:*

- forums individuals commented in

- specialties individuals commented in

4.3.4 Generalizing some of my results to the community as a whole

In my last wave of data collection, I sought to determine whether data I had gathered on query and reply patters were reflective of the network as a whole. Specifically, I wanted to see whether my findings on the extent of cross-specialty information-seeking could be applied to the community as a whole. To gather data on this topic, I used quota-based sample (similar to the type used to gather query type as detailed above in 4.3.2), and I counted the number of queries that were cross specialty. I then repeated the same procedure for replies. The data I gathered here allowed me to generalize my findings on experts to the population as a whole.

4.3.5 Data Collection Summary

Data were gathered on the ENoP through the use of informal observation, transforming qualitative data to quantitative data through the use of coding, and by collecting metrics. This resulted in a comprehensive picture of the types of exchanges likely to occur in these communities, which allows me to sufficiently address my research questions. The decision to use metrics mined from the community reduces the potential for distortion to occur in the data collection process, but it does necessitate careful management of the data to ensure they are interpreted properly. On the whole, I believe the diversity in my data collection permitted me to examine all of my research questions exhaustively while simultaneously producing a set of analyses that were more robust.

4.4 Data Analysis

In general, the analysis in this thesis can be characterized as inductive, as opposed to deductive, because it was begun "with a rough definition of a research question, proceeds to a hypothetical explanation of that question, and then continues on to the collection of data…" (Bryman and Bell, 2007, pg. 583 from Winsor, 2010). The analysis that emerged from the inductive questions was somewhat exploratory in nature, because its purpose was not to establish firm relationships between constructs. Given the paucity of research on the topics of information-seeking and experts in ENoPs, one of the purposes of the research was to explore these variables. Data analysis proceeded in two main steps. In the first step, I looked specifically at the type of queries one made, and in the second step, I conducted several partial correlations and a linear regression. I also collected additional data when necessary to supplement my findings, which is described in the discussion and analysis portion of my thesis.

4.4.1 Identifying Information-Seeking

This portion of my analysis was fairly straightforward because I primarily wanted to see the breakdown of the different types of queries so I could understand which types were the most popular in the ENoP. After coding the queries as discussed in 4.32, I calculated the percentage of queries that fell into each of the five categories. I did this by dividing the number of queries that fell into that category by the total number of queries, I then multiplied this number by 100. For example, in validation category, I would take the number of validating queries (i.e. 343) and divide this number by the total queries (i.e. 1543). I then multiplied this number by 100. (I used percentages because it was helpful in additional analyses, allowing me to compare the types of queries that occurred within specialties and across specialties.) The calculation described above represent how I determined the type of

information-seeking that occurred in the ENoP as a whole. To find the type of information-seeking that occurred within (and outside) a shared specialty, I followed the same steps, using the total number of queries within a shared specialty (or outside that shared specialty) as my divisor. This allowed me to compare between the types of queries asked within one's own specialty, and the types of queries asked outside that specialty.

4.4.2 Partial Correlations and Linear Regression

The second portion of my methodology focused on preparing the metrics I gathered for analysis. This process occurred in four main phases: cleaning the data, understanding and normalizing the data, and analysing the data using SPSS.

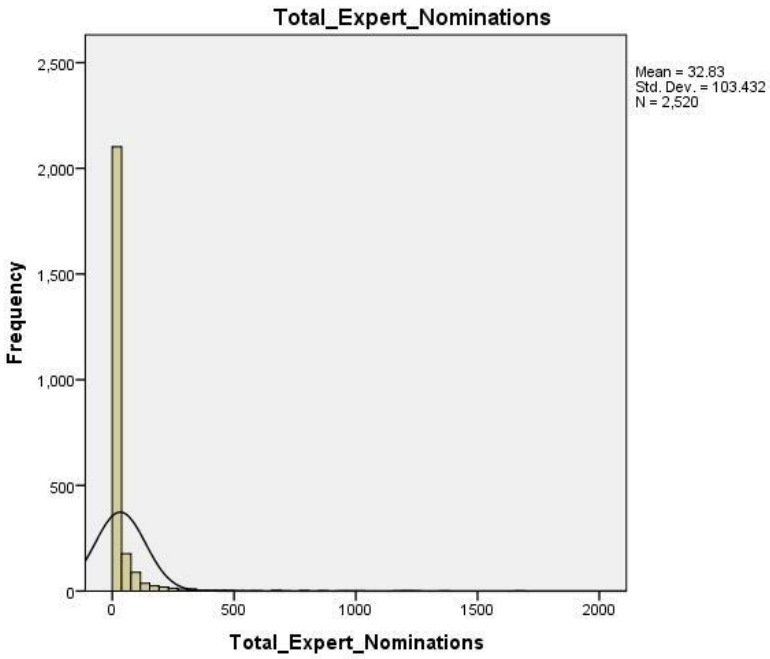
In the first phase of my data analysis, I focused on cleaning the dataset, which I accomplished by eliminating redundancies (i.e. usernames that I accidentally entered twice), searching for any omissions during the collection, and formatting the data for use in SPSS. This included removing additional spaces at the end of usernames, replacing missing data with a period, and forming a new variable that measured the total duration of community membership in days (subtracting the first login from the most recent login).

In the second phase of data analysis, I developed an overall 'picture' of the average expert in the community, looking at general commenting trends and practices. Specifically, I used SPSS to compute variables such as mean, mode, and standard deviation to develop a better understanding of the "expert group" identified in the course of my research. In this phase of my analysis, I developed a greater appreciation and understanding of the range of the data, and gathered information on the behaviour of the "average" expert member in the ENoP. I have discussed the

issue of using expert nominations as a proxy for perceived expertise in 4.3.3. In essence, this was a small, yet important step that allowed me to develop a general understanding of my data and the contributory patterns of expert members.

In addition, it was during this stage of analysis that I checked my data for normality and homoscedasticity by looking at the median, mode, skew and kurtosis of my data using Frequencies and Descriptives in SPSS. At this time, I confirmed most of my data were positively skewed. Given the fact my data were highly susceptible to skew due to natural process limits, this is very unsurprising. These natural process limits are in place because a contributor cannot contribute less than zero times, nor can they receive fewer than one expert nomination to be part of my sample.

Following standard procedure to address the issue of skew, I first examined the data for extreme outliers, of which I found only one which was erroneous, and corrected it. This outlier had no effect on the skew of my data. I then looked at the residuals as further confirmatory evidence that my data were not normally distributed. In a normal distribution, one expects the residuals to be roughly normal, with a mean of zero and a constant variance around that mean. I checked my residuals by first looking at Q-Q plots to see if my data exhibited skewness, which it did, so therefore I took the next steps of examining a histogram of each of the constructs individually. To contextualize this in an example, one of my constructs, Total Expert Nominations, had a median that was eight times that of the mode. Furthermore, process limits curtailed the development of a normal distribution by creating a “cut-off” for scores, as one could not receive a score below zero. A histogram of total expert nominations depicts the extent of this skew.



Part of my research questions focused on understanding the characteristics associated with perceptions of expertise. However, my data violated the assumptions of normality. To be able to use the data in a linear regression (and thus compare among the various factors associated with expert nominations), it was necessary to normalize or the data. Since I wanted to compare among variables, and examine each variable by itself, for ease of interpretation, I opted not to use Box-Cox transformation. Using logarithm transformations as much as possible allowed me the opportunity to compare more directly between variables. I did so by following the steps prescribed by Tabachnick and Fidell (2007); specifically, I used transform function in SPSS to calculate the logarithm. This was done by taking the Log of the variable plus one.

Furthermore, since my objective was to form a sense of how these variables related to each other, as opposed to forming causal relationships, the logarithm transformations were the most appropriate selection for what I wished to achieve in my analysis. Since I had strong reason to believe that many of the variables I was

working with were correlated with each other, the selection of a linear regression made even more sense.

I performed logarithm transformations on the following variables, which had skew values between 3.8 and 7, and kurtosis between 39 and 80:

- Number of Logins
- Expert Nominations Given
- Total Expert Nominations Received
- Queries
- Replies
- Total Posts
- Forums Commented in (total number of *unique* forums one commented in)
- Specialist areas Commented in (total number of *unique* speciality areas one commented in

I performed a square root transformation on the number of specialist areas commented in, which displayed a smaller skew and kurtosis, which was in keeping with the smaller likelihood of outliers, and the smaller standard deviation possessed by the construct. These transformations were important because they allowed me to use multiple linear regression, versus other forms of non-parametric analyses that might be less appropriate for addressing my research questions. In the course of these analyses, I noticed that one of the metrics I had collected, FAQ written, displayed an extremely large skew and kurtosis, and I used the more intensive inverse transformation to normalize the data. Since the data included 0, I used the form of (1/[x+1]) to complete the transformation. However, even these transformations did not produce meaningful data, because it was primarily dichotomous in nature. Since this factor did not feature heavily in theorising around ENoPs, and it exhibited very low variability in its measurement, I omitted it from my

data set because these features made it extremely difficult to draw relevant conclusions related to the construct.

Finally, in the third stage of my research, I actually conducted analyses using SPSS, which allowed me to examine the relationship between two or more variables. To do so, I performed a several partial correlations, looking at the relationship between several variables I measured in my study. This was undertaken with the objective of understanding the casual direction of the relationship, as well as the intensity of the relationship. In this step, I examined a variety of relationships, exploring how the variables fit together. I performed correlations (and partial correlations) between:

- Expert Nominations Received and Total Posts
- Expert Nominations Received and Expert Nominations Given (Controlling for Total Posts)
- Expert Nominations Received and Queries (controlling for total posts and expert nominations given)
- Expert Nominations Received and Replies (controlling for total posts and expert nominations given)
- Expert Nominations Received and Total Number of Forums Commented in (controlling for total posts and expert nominations given)
- Expert Nominations Received and Total Number of Specialties Commented in (controlling for total posts and expert nominations given)

Table 8 below extends Table 5 to include the types of techniques that will be used to address my research questions.

MOTIVATING FACTORS	RESEARCH QUESTIONS	METHODOLOGY
Body of research on informational benefits offline (i.e. Cross et al., 2001) but not online. Generally know little about the dyamics of exchange in ENoPs (Whelan, 2007).	**What types of information do members seek in ENoPs?** (Within specialty or outside of speciality? What types of informational benefits?)	1) Determine % of queries asked within and outside one's specialist area. 2) Code queries to assess which of the 5 informational benefits are sought. Determine percentage of each category
Information-seeking part of the dialogical process of knowledge creation (Tsoukas, 2009), so may also be perceived as form of expertise	**How is information-seeking perceived in ENoPs?** (Is it a source of expertise?)	Partial correlation between queries and expert nominations
Expertise tends to be associated with highly specific skills (e.g. Collins and Evans, 2007), but exchange may be impeded by virtual communication (e.g. Cherny, 1999). More investigation needed to ascertain whether expertise is also highly specified in an online environment.	**Are the contributions of perceived experts valued in only a specific/narrow domain?** (Does commenting in multiple areas reduce number of nominations?)	Partial correlation between # of forums one replied in & expert noms. received; Partial correlation between # of specialties one replied in & expert noms. received; Linear Regression between expert noms. and different types of replies.
Knowledge the product of a joint enterprise in CoP (Wenger, 1998). When it is not a joint enterprise, we do not know the types of people most likely to produce 'knowledge.'	**What characteristics are associated with perceived experts?**	Linear Regression with using metrics mined from network

Table 8: Relationship between literature, research questions & methodology

4.5 Limitations of the Data Collection

The limitations of the data collection typify the kind of issues one faces when using metrics to conduct research. Namely, I was unable to ascertain community member motivations for engaging in nominations or postings, and there were several contextual variables that limited the interpretability and generalisability of my

results. For this reason, I am unable to conclusively state that perceptions of expertise influence the *action* of individuals in the ENoP.

First of all, the nature of my data collection leaves me unable to explain the reasons members give expert nominations, and the way receiving such nominations impacts their behaviour in the community. However, given the dearth of research (e.g. Wasko and Faraj, 2005; Wasko and Faraj, 2000; Ardichivelli, Page, and Wentling, 2003; Zboralski, 2009; Ardichivelli, 2008) on the motivations to contribute in ENoPs, this was a line of research that may not produce much added value. My data collection had two central purposes: the first was to understand the type of information people both seek and value in the ENoP. The second purpose was to collect variables that would allow me to explore the relationship between perceived expertise and engagement in the community. The greater issue is the fact that the nomination of expert answers could be considered to be a form of good community citizenship or of reciprocity, and I did not directly assess the motivations members had for making such nominations. However, a focus on nominating motives reaches far beyond the scope of my research intentions.

A second problem arises from my use of quota sampling, and the variance present among the forums I studied. Some forums were relatively well-populated, with busy and thriving centres of exchange. In these forums, the criterion to be considered "expert" is much more stringent than in forums that are less popular. For example, a person commenting in Materials Metal Engineering would need more than nine expert votes to be an "expert" in that community. In Computer Fiber/Wireless/Copper Transmission, a person would only need one nomination. In the Materials Metal Engineering forum, I sampled 50 experts, but in the Computer

Fiber/Wireless/Copper Transmission, I only sampled 12. For this reason, there are not *consistent* criteria on what it means to be an expert in a given forum. This discrepancy stems from issues associated with quota sampling, and consequently, my dataset might not be considered an accurate representation of the "true experts" in this community. I could have dealt with this issue in two ways: exclude the forums with less than 50 experts from the data set, or include the data with the knowledge that I am increasing the skew in my data.

I chose to do the latter for several reasons. Firstly, excluding the forums with fewer than 50 experts would have drastically reduced my sample size, which I did not believe was beneficial for subsequent analyses. Secondly, this would have created a distorted picture of the *average subject-matter expert* in the ENoP. There are several incidents where a couple of comments garnered expert status in a smaller forum. If I excluded these data sets, I would effectively distort the picture of the average ENoP expert. Thirdly, since I wanted to analyse the relationship between commenting across multiple forums and perceptions of expertise, this was the only appropriate way to proceed. Lastly, I knew there were statistical techniques that would allow me to correct the skew in the data, and I believe it was equally important to capture those people who are perceived as experts in smaller, less 'busy' forums. Although my quota-based sampling technique might have led to oversampling of experts with fewer votes, it did allow me to collect a fairly robust sample. In addition, since my research question focused on the individuals perceived as experts in a given forum on Eng-Tips, it was the only appropriate way to proceed with the data collection. Ultimately, because I was interested in exploring how range of contributions might impact perceived expertise, it was the only appropriate way to proceed.

A final limitation centres on my decision to use Cross et al. (2001)'s categorization of coding. The decision not to continue with grounded theory coding is limiting, because it is possible that different categories of information-seeking could emerge from the data that may be unique to ENoPs themselves. Furthermore, reliance on a previously established taxonomy means that no 'new' findings about information-seeking will emerge from the research in this area. Naturally, this influences the nature of the analyses, because this line of inquiry leads to a discussion that focuses on contrasting online and offline information-seeking behaviour. The use of Cross et al. (2001)'s taxonomy effectively constrained the type of data that could emerge from my research; however, it permits a specific and measurable contribution to research on information-seeking. Furthermore, initial forays into grounded theory coding suggested there was little room for improvement upon the existing categories developed by Cross et al (2001).

Despite these limitations, purpose of my research, a large sample size and extensive data allows me to develop a firm understanding of the relationship between type of network participation and perceptions of expertise. In addition, the interpretation of my analyses took place within these parameters. I did not, for example, attempt to assess why some contributions received nominations and others did not. Furthermore, the type of data I collected was in keeping with what I wished to achieve in my research objectives. Given the fact that I knew my analysis was not going to favour a stringent interpretation of the data, I did not believe these limitations excessively constrained my data.

4.6 Chapter Summary

This chapter explains the methodology used to conduct my research, the more finite details associated with preparing my data for analysis, and the limitations of the data set. As detailed, my data is based on both the query type and community metrics. The data were collected by coding queries and direct observations of the ENoP in the form of metrics, which provided detailed information about a large number of member behaviours. Natural process limits meant most of the data I collected were subject to positive skew, so logarithm transformations were used to normalize the data and enable it to be used in a linear regression. Despite some limitations that arose from my decision to use quota sampling, my reliance on Cross et al. (2001), and the fact that I did not assess motivations behind expert nominations, my robust data set and careful interpretation of the data ensured these limitations were not overly problematic or restrictive.

VI. RESULTS

5.1 Introduction

In this chapter, I present the results of my research questions. This chapter is divided into five main parts. The first section is devoted to a discussion of the characteristics of my sample, which are those individuals who were identified as the 'Most Valuable Person(s)' (MVP) or 'top-ranked experts.' The purpose of this first section is to build a general understanding of the individuals perceived as experts, which may facilitate subsequent analyses; therefore, the data in this section is mostly descriptive. The second section involves looking at a few very basic, yet highly critical relationships that will influence the way subsequent analyses take shape, namely the relationship between number of expert nominations one receives, total contributions, and number of nominations given out. These first two sections form a general background and understanding of my data.

The third through sixth sections address my research questions more directly. The third section focuses on analyzing the type of information individuals seek in the ENoP; specifically I examine which of Cross et al. (2001)'s five informational benefits members are likely to seek. I also explore whether information-seeking is focused within or outside one's immediate area of specialty, a line of research that will help me understand whether individuals appear to rely on the network to supplement the type of information available in their offline relationships.

The fourth section explores how information-seeking is perceived in ENoPs, using a partial correlation to determine whether queries are regarded as a form of expertise in their own right. The fifth section uses partial correlation to determine

whether perceived expertise is associated with a 'range' of contributory patterns. Namely, I seek to understand whether contributions of experts are valued only in a specific domain, or whether they are valued in multiple domains. This is done in two steps: first by looking at whether commenting in multiple *forums* is positively associated with perceptions of expertise, secondly by looking at whether commenting in multiple *specialties* is associated with perceptions of expertise. The fifth section assesses the characteristics associated with expert nominations through the use of a linear regression. This allowed me to compare among variables to identify the factors with the greatest influence on constructing perceptions of expertise.

5.2 Understanding the Group of Individuals Identified as MVPs

There was a large amount of variance among the people who received the top number of expert nominations in their community, in regards to logins, length of members, total number of posts, and total number of expert votes. Since I used quota sampling in my data collection, the data in this section are interpreted ***in reference to the typical criteria it takes to become an 'MVP' or 'top-ranked expert' in any given forum.*** This is emphasized, because in subsequent analyses, my focus is on the number of expert nominations one receives. The purpose of this analysis is to give some insight and clarity on what it takes to become a "top expert" in any given forum I studied. Furthermore, it gives us some additional insight into the range of participatory behaviour in the community. By understanding what the average 'expert' looks like, we are better positioned to interpret and understand the data. For this reason, I will examine several factors including: total expert nominations, expert nominations given, total contributions, average number of logins, duration of membership, number of forums commented in, number of forums

with expert nominations, number of specialities areas commented in, and number of functional areas of expertise.

5.2.1 Total Expert Nominations

In the sample I assessed, 30% of people who are 'MVPs' or 'top-ranked experts' in a given forum received only one expert nomination. Half of this sample received more than four votes, indicating some degree of consensus. Like most of the data I discuss here, the data are positively skewed, taking on an inverse shape as is characteristic of a group with natural process limits. This can impact our subsequent interpretations; for this reason I favour a linear analysis approach in my subsequent interpretations of the data.

5.2.2 Expert Nominations Given

The vast majority of contributors who attain 'MVP' status in the ENoP studied give out fewer nominations than they receive. A quarter of my sample did not give out any nominations at all, and another quarter gave only one nomination. In general, for every nomination a 'MVP' makes, they will receive over two in return. This clearly reveals a pattern of nomination among top experts that is not self-sustaining—nominations come from other (non-expert) members of the ENoP.

5.2.3 Total Contributions

Approximately 9% of my sample contributed only once. The median number of contributions is 28, and the mean 287, which reveals a data set that is likewise positively skewed. The 'shape' of the data has extremely long tails, which is evident by the fact there is a sharp delineation between the average expert and the top ten percent of experts in my sample. Ninety percent of the people perceived as the top experts in the forum contribute 625 times or fewer; the next five percent contribute

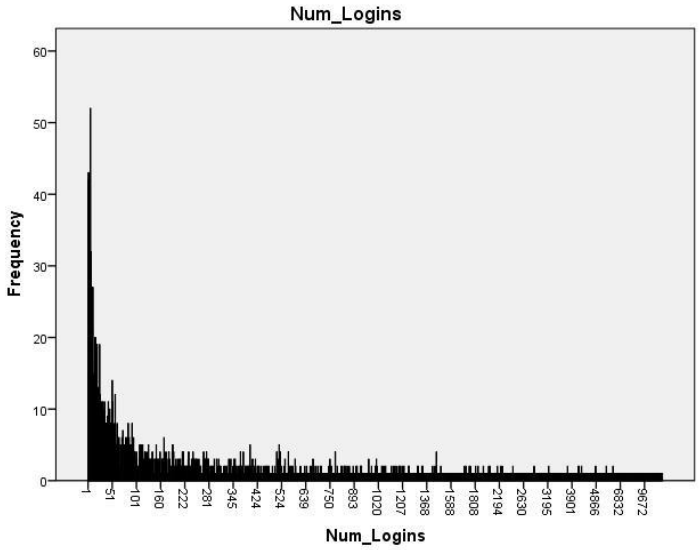
between 626 and 1,186 times, and the remaining five percent contribute between 1,186 times and 15,124 times. This indicates there is a great deal of range in contribution rates for the upper ten percent of the sample, and one could make the argument for the presence of super-contributors in the community, which are those individuals who contribute up to five-hundred times the amount of the average expert.

This finding maps on relatively well to the known structure of networks of practice and online communities. Specifically, these types of entities are said to be supported by a core group of contributors, which are a small minority of individuals who produce a disproportionate amount of the dialogue and exchange in a community (Thompson, 2005). Therefore, this presence of a smaller group of higher contributors is in keeping with many of the characteristics of online communities (e.g. Cothrel, 2000). In sum, this finding suggests that even among the people perceived as experts in this ENoP—an elite group—there is still a smaller subset of individuals who are responsible for a disproportionate amount of group outcomes.

5.2.4 Average Number of Logins

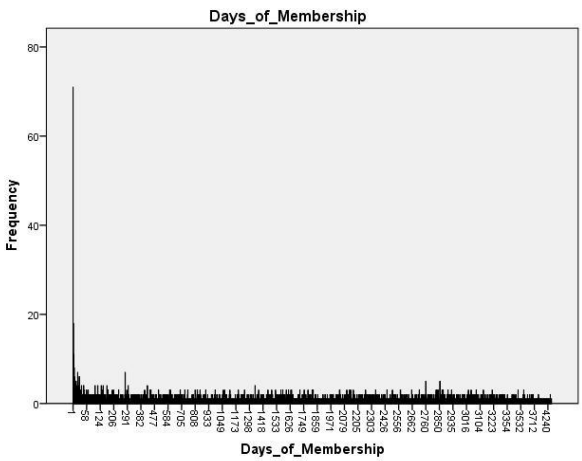
For the group comprising my sample of perceived experts, the mean number of logins for my sample was 1078, while the median was 203. The result shows an inverse relationship with long tails. This relationship might be anticipated due to the presence of natural process limits. On the whole, some experts logged in as few as one time, while the most active member of the my sample logged in 40,598 times. Most people who obtain expert status in their community only login a handful of times. This might reveal one of two possible outcomes associated with short-term membership (a) individuals might have previously 'lurked' the community and

developed a login specifically to ask/respond to a given question, (b) individual needs may not have been fulfilled by the network, resulting in a failure to return to the network, or a combination of both of these factors.



5.2.5 Duration of Membership

Duration of membership was calculated by the total number of days individuals had actively been engaged in the ENoP. This was determined by subtracting the last login date from the first login date. My data revealed that there were a disproportionate amount of individuals who were engaged in the network for one or two days only. (Nearly 3% of the sample was active in the forum for one day only.) This was followed by a general decreasing trend, and by after two months of engagement in the network, the distribution appears to adopt a fairly random distribution. This dovetails with the data on number of logins, suggesting that a small but distinct number the people who attain the status of MVP (i.e. top-ranked expert) in the Eng-Tips forums are only active in the network for a brief period of time.

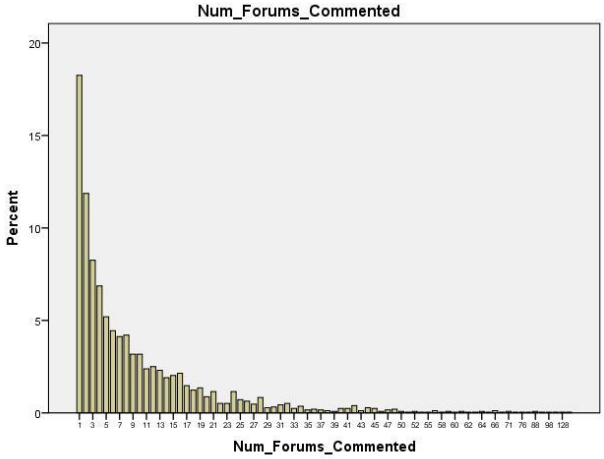


The graph of the data does not reveal the same striking inverse relationship displayed by the number of logins due to a difference of scale, as well as the fact that there is greater potential for variance when calculating a range of dates, which—unlike number of logins—is not necessarily sequential. On the whole, this aligns with my findings in 5.2.4, which suggests people either become disillusioned and exit the network, or "lurk" the forum, reading but refraining from contributing until they have identified a specific area in which they either have the potential to contribute.

5.2.6 Number of Forums Commented in

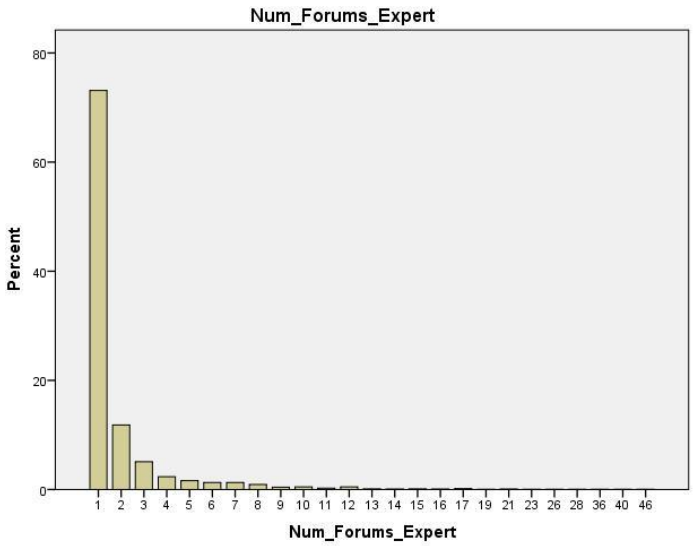
The number of forums the top contributors commented in ranged from 1 to 182. In my sample, the average individual who achieved expert rating (i.e. those individuals rated as MVPs) contributed to five or fewer forums. Approximately 18% of my sample contributed to only one forum, meaning that the vast majority of people perceived as experts in this ENoP contributed to more than one forum. This suggests a large number of experts engage with multiple forums in the community, and do not restrict their engagement to a specific forum or niche. The graph below depicts the percentage of MVPs who made *n* number of contributions. Due to

natural process limits, as well as the presence of skew in total contributions, the data below are skewed, revealing a distribution with an inverse relationship and long tails.



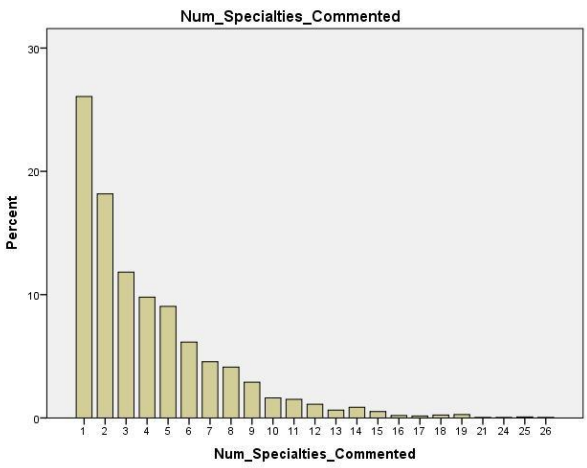
5.2.7 Number of Forums with Expert Nominations

Unlike the total number of forums in which experts contributed, the number of forums in which one received an expert nomination is comparatively small. The data clearly reveal that most people are rated as a top expert in only one forum. Specifically 73% of my sample attained an expert nomination in only one forum, which is striking when compared to the fact that 18.3% of people only contribute to one forum. Although individuals commented in multiple forums, they were only recognized by an expert nomination in one forum. This might reflect the relative difficulty of attaining an expert rating, or it is possible this does not take into account the distribution of comments. Specifically, individuals might make dozens of comments in one forum, but a single comment in another. From a basic probability perspective, it would be much easier to obtain an expert nomination in the first forum, but not the second. Regardless of the underlying reason, these data highlight the difficulty of obtaining an expert nomination in the community at a more general level.



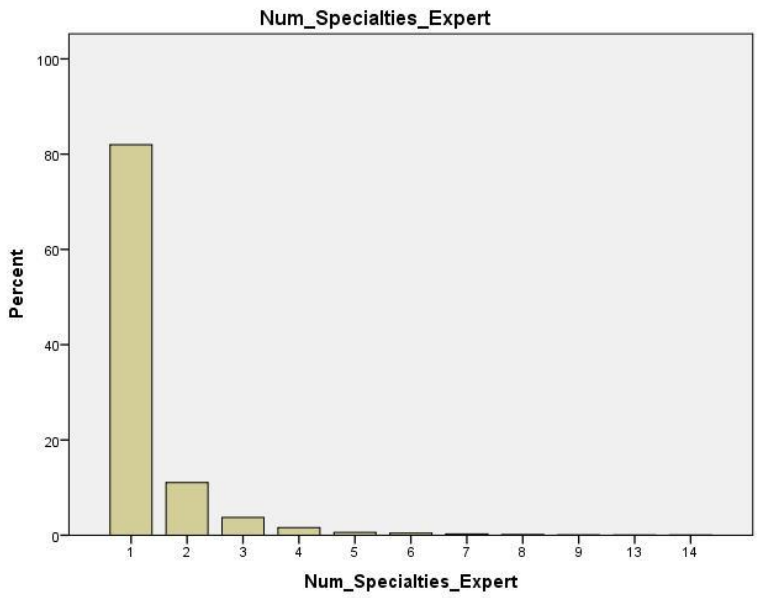
5.2.8 Number of Specialties commented in

Much like the data on the number of forums commented in, the data adopt an inverse relationship. Slightly less than a third of individuals in my sample focused their contributions in one specialty area, and 44% focused their contributions in two or fewer speciality areas. This means that the vast majority of individuals comprising my sample contributed to multiple specialties. On the whole, this seems to suggest a pattern of engagement that is not confined to one's own speciality, training, or background, and in fact, individuals appear to use the ENoP to proactively connect to others with different specialist backgrounds.



5.2.9 Number of Specialties with Expert Nominations

Generally speaking, it is increasingly difficult to obtain expert nominations in more than one specialty area, and the inverse nature of my data reveals this difficulty. Although individuals comment in multiple specialties, the probability of receiving an expert nomination in multiple specialties is extremely low. Only 18% of my sample received an expert nomination in more than one specialty. This mirrors my findings on acquiring expert nominations in a forum, which was also relatively low. This is likely associated with the fact that my sample often received expert nominations in only one forum; hence they would only received expert nominations in one specialty area.



5.3 Exploring initial relationships between constructs

This section explores the relationship between the expert nominations one receives and two variables: total contributions and number of expert nominations given out.

5.3.1 Total Contribution and Expert Nominations

The more a person contributes, the more likely it is they will receive recognition for their contributions. This is based on the statistical premise that more contributions will means a person has generated more material to 'assess.' Much like purchasing a lottery ticket, the chances of obtaining an expert nomination increase with the number of contributions one makes, provided those contributions are of a reasonable standard of quality. Thus, we might expect individuals who contributed fifty times to the community to receive more expert nominations than those individuals who contributed only once. This relationship is very important to

understand because it may influence all subsequent analyses and interpretations involving perceptions of expertise. For this reason it is assessed first.

Due to the fact that I am looking for a simple relationship between two variables, I performed a simple bivariate correlation. This type of correlation uses no control variables; it simply assesses the relationship between two or more variables. In this case, it allows me to see whether there is a relationship between the total contributions made and the total number of expert nominations. The purpose of this analysis was to provide a very general 'overview' of the relationship between contributory behaviour and perceptions of expertise.

Correlations

		Expert_Nominations_Received	Total__Posts
Expert_Nominations_Received	Pearson Correlation	1	.823**
	Sig. (2-tailed)		.000
	N	2520	2520
Total__Posts	Pearson Correlation	.823**	1
	Sig. (2-tailed)	.000	
	N	2520	2520

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

The data reveal there is a strong positive relationship (correlation of .823) between the total expert nominations one receives and the total posts one makes. This means that larger numbers of contributions or "posts" to the community are associated with greater numbers of expert nominations. Likewise, fewer contributions are associated with smaller numbers of expert nominations. This finding is extremely important because it reveals the need to control for the total number of contributions in additional analyses, such as the one below.

5.3.2 Expert Nominations Given and Expert Nominations Received

The extent to which somebody actually receives a nomination for a contribution may have an element of bias to it. Specifically, individuals who give out nominations may be more likely to receive nominations in exchange. It is possible that these nomination patterns have an element of reciprocity or quid-pro-quo. Thus, a nomination may engender a sense of obligation to return the favour. For this reason, it is necessary to assess the relationship between the expert nominations given out, and the nominations one receives.

Due to the fact that I am looking for the presence of a relationship between these variables, I will use a correlation once again. However, because Total Expert Votes and Total Posts are so strongly correlated, I need to control for Total Posts. For this reason, I use a partial correlation. This is similar to a bivariate correlation but with the presence of control variables, which allow me to control for total posts. This was the appropriate way to proceed because—as discussed above—total posts were highly correlated to total expert nominations. The results of this partial correlation are below:

Correlations

Control Variables			Expert_Nominations_Received	Nominations_Given
Total_Posts	Expert_Nominations_Received	Correlation	1.000	.275
		Significance (2-tailed)	.	.000
		df	0	2517
	Nominations_Given	Correlation	.275	1.000
		Significance (2-tailed)	.000	.
		df	2517	0

This partial correlation reveals the number of nominations one receives is significantly related to the number of nominations one gives out. Although technically this may be considered a weak relationship, this does suggest there is

likely to be a degree of reciprocity associated with nomination patterns. This does not indicate the extent to which nominating patterns are direct quid pro quo or adopt a transitive structure (e.g. A nominates B who nominates C who nominates A). However, it does indicate that giving nominations is related to getting nominations. For this reason, future analyses should also control for expert nominations given out in conjunction with total posts.

5.4 What types of information is sought in ENoPs?

The objective of one of my research questions was to understand the role ENoPs played in the information-search. Social network theory suggests that individuals tend to interact with people with whom they are very similar (e.g. McPherson et al., 2001; Anderson and Jay, 1985); online communities have the potential to connect individuals to diverse perspectives (Preece, 2000). For that reason, people may seek information from the ENoP that is not ordinarily available in the face-to-face environment. My objective in the ensuing research questions is to understand what type of information people want to "get" from the ENoP.

5.4.1 Information-seeking within or across specialities?

To see how ENoPs were used, I first looked at information-seeking patterns in my sample of experts. In SPSS, I used 'transform' to calculate the variable Ratio_Query_Within. This variable told me the ratio of queries that were within a person's own domain of expertise. It was calculated by dividing the number of queries within one's own speciality by the number of total queries. For example, if a civil engineer asked one question in the civil engineering forums, and three questions in other areas (e.g. aerospace, computer, etc.), the ratio of questions she asked would

be calculated as .25 (i.e. one divided by four). I then ran descriptive statistics to understand what the "average" query ratio looked like in my sample:

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Ratio_Query_Within	1810	.00	1.00	.5370	.40622
Valid N (listwise)	1810				

The mean ratio was .5370, meaning that in my sample, 53.7% of queries were in one's own specialist area. Although many members of my sample did not ask any questions (hence the n value is lower than that of my sample size), it did appear that many individuals were using the ENoP to ask questions outside their own specialty. Out of all the queries in this sample, 53.7% were inside one's own domain of expertise, meaning 46.3% were outside one's own area of speciality or expertise.

To put this into context, I needed to look at reply patterns. If 46.3% of queries were outside of one's own area of expertise, and 46.3% of replies were also outside of one's own area of expertise, this would mean the amount of information-seeking outside of one's own area of expertise was not exceptional. By looking at reply patterns in the ENoP, I could begin to understand whether query patterns were unique in some way. In SPSS, I again used 'transform' to calculate the variable Ratio_Reply_Within. This variable told me the ratio of replies that were in one's domain of expertise. It was calculated by dividing the number of replies in one's own specialty by the number of total replies. For example, if a chemical engineer replied to three questions in their own area of expertise, and one question outside their own area of expertise, their Ratio_Reply_Within would be calculated as .75 (i.e. three divided by four). I then ran descriptive statistics to understand what the "average" reply ratio looked like in my sample:

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Ratio_Reply_Within	2298	.00	1.00	.6043	.40518
Valid N (listwise)	2298				

The mean ratio was .6043, meaning that in my sample 60.43% of replies were within one's own specialist area. This meant that the majority of individuals were responding to queries within their own area of expertise; however, there were still a significant number of responses outside one's own area of expertise (i.e. 39.57% or 100% minus 60.43%).

The next step was to determine whether the pattern of queries and replies were significantly different from each other. Although there appeared to be a difference, with a larger number of queries as opposed to replies taking place outside of one's own area of expertise, this needed to be assessed statistically. Specifically, I wanted to know whether individuals were comparatively more likely to seek information (versus reply) to areas outside their own expertise. This would indicate a fundamental difference in the way individuals used the community to meet and supply information needs. To do so, I did a basic t-test to determine whether the mean of the ratio of replies within one's area of expertise (i.e. .6043) was statistically different from the mean of the ratio of queries within one's area of expertise (i.e. .5370). For this reason, I use .5370 as my test value, and the results of this t-test are below:

One-Sample Test

	Test Value = .5370					
					99% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Ratio_Reply_Within	7.967	2297	.000	.06734	.0455	.0891

The ratio of replies within one's area of expertise is significantly different from the ratio of queries within one's area of expertise when tested with a 99% confidence interval. Translated into non-statistical terms, it means that experts are comparatively more likely to seek information, compared to reply to information, outside their own specialty, or area of expertise. These findings reveal the presence of a discontinuity in the way experts sought and contributed information. This finding has important ramifications for the way people interact in ENoPs.

Finally, there were some additional calculations that were necessary to generalize these results to ENoP studied in this thesis. This data were collected using a second wave to support the findings here. Due to the fact that the sample above is based on experts (as opposed to the general user of the forum) I performed a second set of analyses based on a sample of general user of the ENoP. To do this, I gathered data on the specialist match of the individuals seeking information in each of the forums I studied. I did so using a quota-based sample that allowed me to maintain the balance of the population I studied. For example, posts in the forum "Chemical Plant Design" represented 3.5% of the total subject-matter posts on Eng-Tips. Therefore, 3.5% of my sample [n=825] was drawn from this forum. Emulsion engineering represented only .09% of the total subject matter posts in Eng-Tips. Therefore, .09% of my sample [n=23] was taken from that forum. After sample size was determined for each forum, sampling within that forum was random. My total sample size was 23,226, which was distributed across each of the 74 forums I studied in Eng-Tips.

To determine information-seeking patterns of the general user I followed the same set of analyses described above, and took the total number of queries that were

shared-speciality (i.e. 12,488), and divided it by the total number of queries (i.e. 23,266). This gave me a ratio of .5377, meaning that 53.77% of queries took place within one's own area of expertise. I then performed a t-test to see if the ratio I calculated was significantly different from the ratio calculated in my expert sample. It was not. This means that information-seeking patterns do not differ between experts and non-experts, and that only slightly over half of queries take place within a shared area of expertise.

I then performed a similar quota-based sample to assess the reply patterns of the general forum user (and to see if this different from the reply patterns of the average expert). I did so by gathering information on the replies on each of the forums I studied. To determine reply patterns of the general user, I followed a similar set of analyses described above, and took the total number of replies that were shared-speciality (n=14,176) and divided this by the total number of replies (n=22,972). This gave me a ratio of .6171, meaning that 61.71% of replies were in a shared specialty. I then performed a t-test to see if the ratio I calculated was significantly different from the ratio calculated in my expert sample. It was not statistically significant (p value of .131). This means that reply patterns do not differ between experts and non-experts, and that slightly over six out of ten replies will take place within a shared area of expertise.

On balance, my research here reveals that individuals are comparatively more likely to seek information from outside of their own area of specialty, and demonstrate a tendency to contribute within their own specialty. This may suggest individuals use the ENoP to supplement the type of information that is available

within their immediate social network. The ramifications of this finding are discussed in 6.2.

5.4.2 Types of questions people ask in ENoPs

To further understand the role ENoPs play in information-seeking, I evaluated the type of knowledge that is sought in these communities. Specifically, I wanted to know what type of informational benefits, as described by Cross, Rice, and Parker (2001) were sought from the ENoP. For this reason, I examined whether individuals sought solutions, meta-knowledge, validation, problem reformulation, or legitimacy from the ENoP. Figure 3 reveals the relative frequency that a given informational benefit was sought in the ENoP.

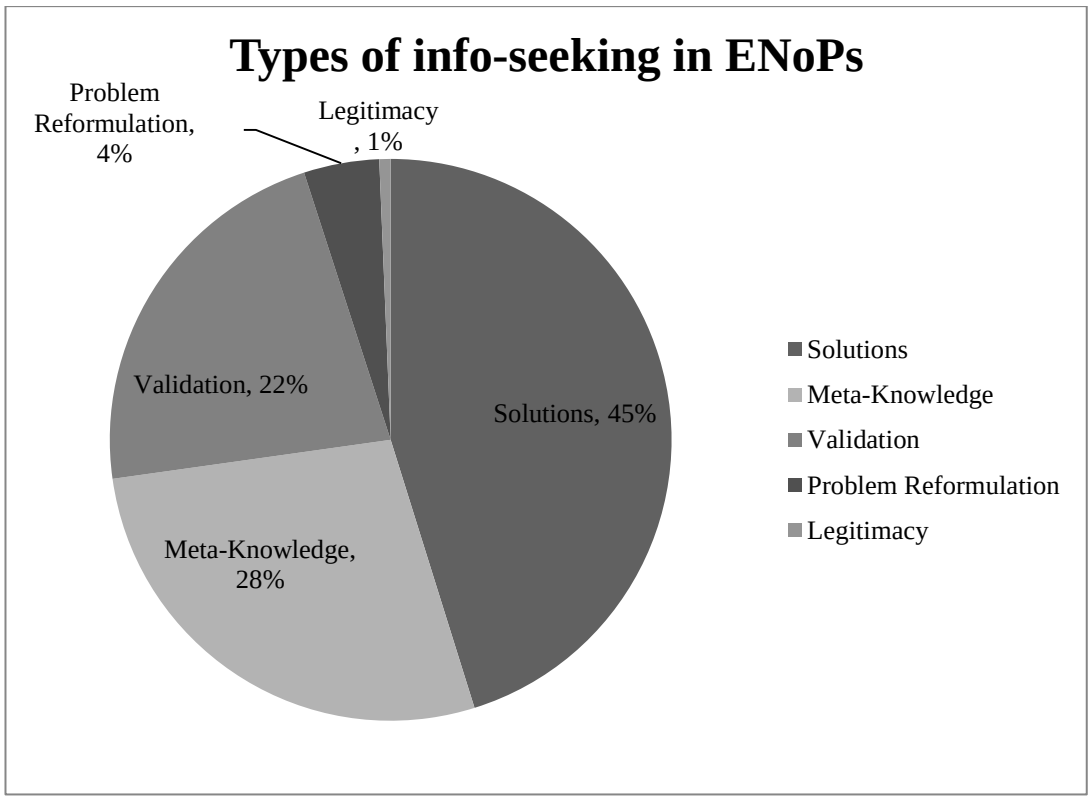


Figure 3: The five types of information-seeking that occur in ENoPs

Specifically, there was a great deal of emphasis on solutions, followed by meta-knowledge and validation. Very few queries focused on problem reformulation, and only a handful of queries were centred on obtaining legitimacy. I wanted to see if the focus of information-seeking was influenced by the type of information one sought. Specifically, I wanted to know how seeking information outside of one's specialty might alter the type of information sought. The results of this inquiry are depicted in the graph below:

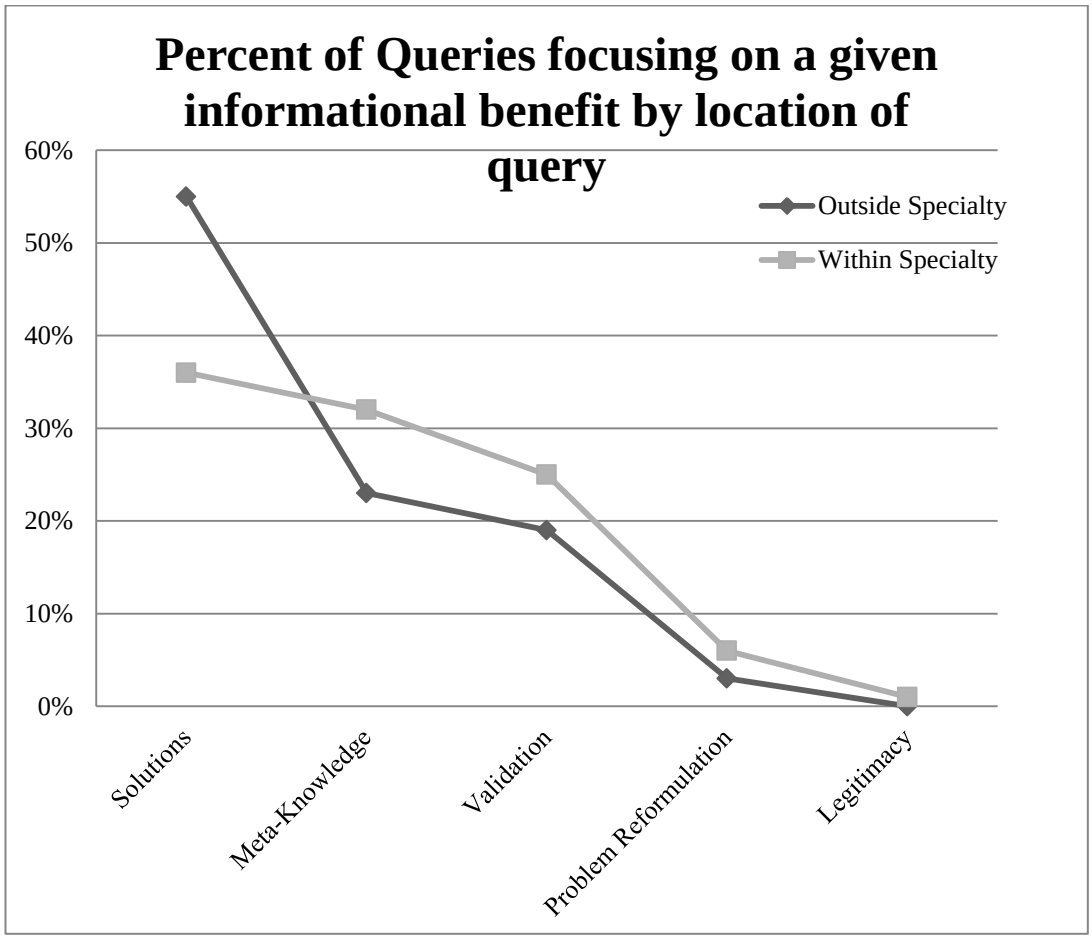


Figure 4: Percentage of queries focusing on a given informational benefit by query

The results of my analysis clearly indicated there was a material difference between the type of queries people asked within and across specialties. Specifically, when seeking information outside of their own area of expertise, individuals were

more likely to focus on solutions. When seeking information from within their own area of expertise, there was an enhanced focus on meta-knowledge queries, and a slightly stronger emphasis on validation. These findings are analysed further in 6.2.

5.5 How is information-seeking perceived in ENoPs?

One of my research questions was to understand how information-seeking was perceived in ENoPs. Specifically, I wanted to see whether information-seeking was generally regarded as a type of expertise. In ENoPs, queries are particularly important because they serve as a starting point for dialogue and exchange. For this reason, queries may be perceived as a type of expertise, because they can highlight problems, issues, contradictions, or new applications in a given field of practice. The objective of this next analysis was to determine whether information-seeking (i.e. queries) were perceived as a source of expert wisdom.

In this analysis, I looked at the correlation between queries (i.e. information-seeking) and total expert nominations. I control for both expert nominations given out and total posts because these variables are positively correlated with the total expert nominations one receives, as seen in 5.3. By controlling for these two variables, I was able isolate the relationship between total expert nominations and information-seeking queries. The results of this partial correlation are below:

Correlations

Control Variables			Expert_Nominations_Received	Info_Seeking_Queries
Total_Posts & Nominations_Given	Expert_Nominations_Received	Correlation	1.000	-.159
		Significance (2-tailed)	.	.000
		df	0	2514
	Info_Seeking_Queries	Correlation	-.159	1.000
		Significance (2-tailed)	.000	.
		df	2514	0

My results reveal a weak negative relationship between queries (i.e. information-seeking) and expert nominations. When this relationship is interpreted—taking my control variables into consideration—it means that queries diminish the number of expert nominations one will receive. Generally, this seems to suggest a lack of acknowledgment for the value of queries, indicating that information-seeking is typically not perceived as a form of expertise worthy of acknowledgement.

The next logical step is to assess behaviour that is perceived as a source of expertise. If information-seeking is not perceived as a form of expertise, then it is important to understand the types of behaviours that are perceived as facilitating expertise, namely the number of replies a contributor makes. For this reason, I perform a partial correlation between total expert nominations and the number of replies posted to the community, controlling for both the number of expert nominations given and total posts, as described in the previous analysis. The results of this partial correlation are depicted below:

Correlations

Control Variables			Expert_Nominations_Received	Replies
Total_Posts & Nominations_Given	Expert_Nominations_Received	Correlation	1.000	.288
		Significance (2-tailed)	.	.000
		df	0	2516
	Replies	Correlation	.288	1.000
		Significance (2-tailed)	.000	.
		df	2516	0

My results reveal what one might categorize as a moderately strong positive relationship between replies posted and total expert nominations. This relationship means that replying to queries is positively associated with perceptions of expertise.

Generally, this seems to suggest that replying to queries is to accumulate nominations in the ENoP.

5.6 Are the contributions of experts valued in a narrow or broad domain?

One of my research questions was to understand how interaction patterns in the community affected perceptions of expertise. Specifically, I wanted to know whether perceived experts had only a narrow domain in which contributions were valued, or whether their contributions were valued outside their immediate specialist area. To understand how range of commenting behaviour is associated with perceptions of expertise, I first look at patterns of nomination. I then explore number of forums people comment in, before examining how commenting in multiple specialties affects the number of expert nominations one receives.

5.6.1 Pattern of Nominations given out

To understand potential biases and distortions in nominations, I needed to examine the pattern of nominations given out by experts. Specifically, I was interested in understanding how one's own area of expertise or specialty influenced the pattern of nominations given out. For this reason, I looked at nomination patterns within and outside of a person's own area of specialty or expertise. I was able to find the mean number of contributions in each of these areas using descriptives.

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Nominations_Given_In_Specialty	2520	412.00	.00	412.00	4.1468	17.40551
Nominations_Outside_Specialty	2520	546.00	.00	546.00	6.4123	28.64504
Valid N (listwise)	2520					

I found that individuals appeared to nominate people outside of their own area of expertise more often than people within their own area of expertise or specialty. Specifically, the average number of nominations given to people of shared specialty was 4.1, while the average number of nominations given to people who did not share a specialty was 6.4. To see if this difference was significant, I did a basic t-test to determine whether the mean number of nominations given in a specialty (i.e. 4.1) was statistically different form the mean number of nominations given outside of one's own specialty (i.e. 6.4). For this reason, I use 6.4 as my test value, and the results of the t-test are below:

One-Sample Test

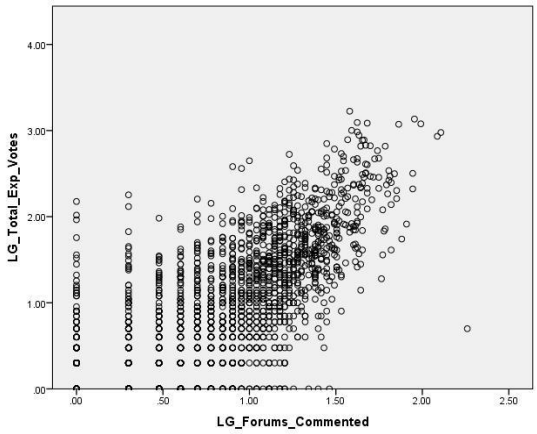
	Test Value = 6.4					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
Nominations_Given_In_Specialty	-6.498	2519	.000	-2.25317	-2.9331	-1.5733

These results indicate that people are more likely nominate individuals as experts when they do not share a specialty. This finding could be considered somewhat surprising because replies and information-seeking (albeit barely) tend to focus more heavily on engaging with one's own discipline.

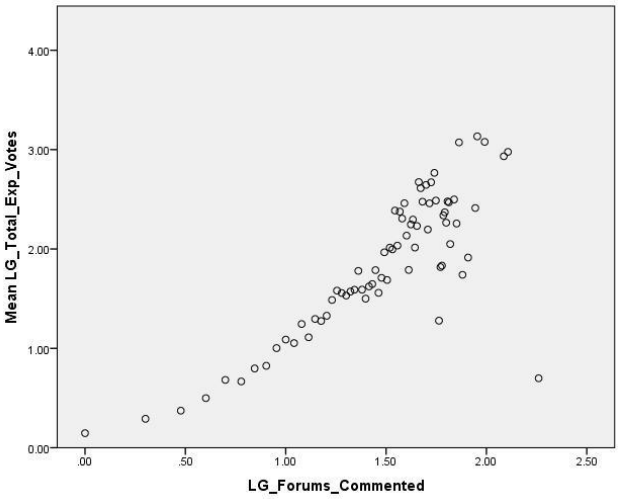
5.6.2 Expertise and Number of forums Commented in

In these types of communities, one of the central questions I had was to understand whether individuals who accrued expert status did so within their own

specialty, or whether they were perceived to be experts outside their own speciality. In essence, I wanted to know how the range of one's expertise was related to the number of nominations they received. To understand this, I first looked at commenting patterns. Specifically, I examined the number of specialist areas one commented in, and the number of expert nominations they received. The following graph depicts the relationship between the natural log of the number of forums commented in and that of total expert votes. Due to the presence of positive skew in the data, natural logs were used to allow the data to assume a more illustrative form.



To see the general trend and overall relationship between these two variables, the data were grouped in the subsequent scatter-plot, which better illuminated the relationship between the two variables, clearly showing that expert votes are positively associated with the number of forums one comments in.



However, this scatter-plot does not take into account the potential mitigating role that other variables might play in increasing total expert votes (e.g. total comments). For this reason, I performed a partial correlation to better understand and assess the relationship between these two variables. I controlled for the total posts and expert nominations given out because these two variables do have a strong impact on the number of expert nominations received.

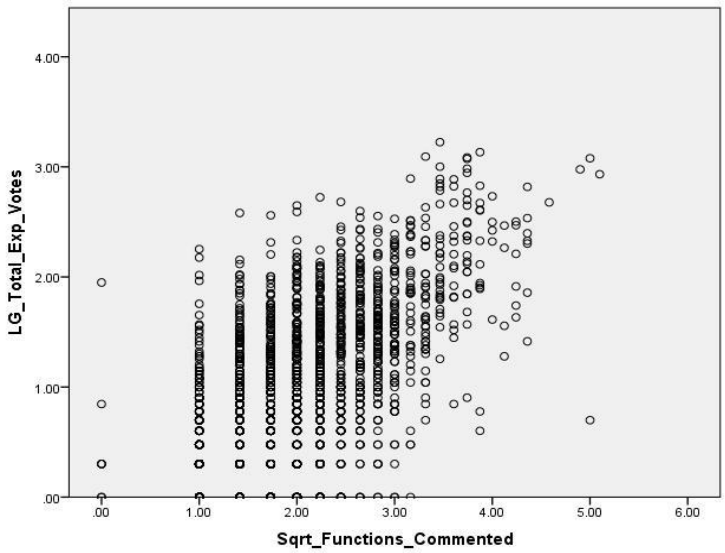
Correlations

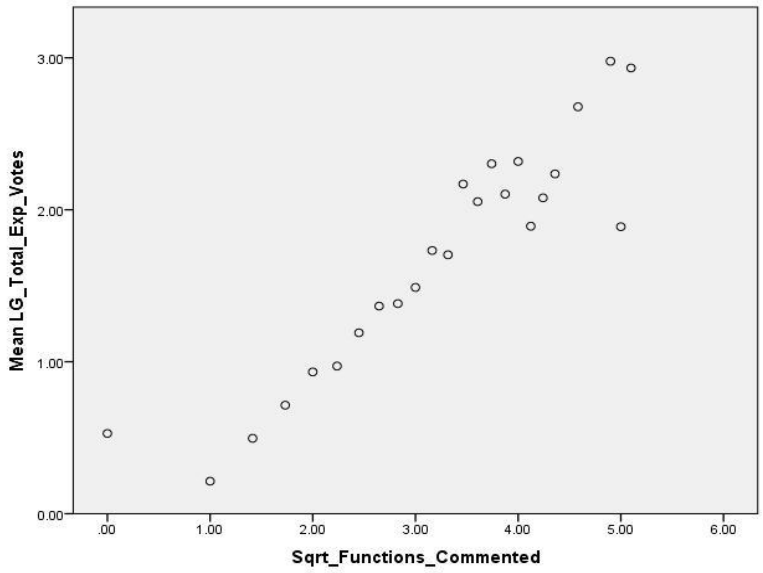
Control Variables			Expert_Nominations_Received	Num_Forums_Commented
Total__Posts & Nominations_Given	Expert_Nominations_Received	Correlation	1.000	.164
		Significance (2-tailed)	.	.000
		df	0	2516
	Num_Forums_Commented	Correlation	.164	1.000
		Significance (2-tailed)	.000	.
		df	2516	0

The partial correlation reveals a weak (.164), yet statistically significant (.000) relationship between the total number of votes accrued and the number of forums individuals commented in. This suggests that commenting in a larger number of forums does not have a negative impact on perceptions of expertise. In fact, perceptions of expertise may be augmented by a pattern of interaction that engages multiple groups in the community.

5.6.3 Expertise: Multiple Specialities v. Single Domain

I next examined the relationship between perceptions of expertise and a commenting pattern across multiple specialties. The ultimate objective of the following analyses are to understand how engaging in multiple areas or specialties influences perception of expertise. An initial scatter-plot was created to understand the relationship between these two variables. Generally speaking, the data appear to follow a linear trend, which is more apparent in the second scatter-plot that clusters the data to form an overall picture of the data trend.





To ascertain that the nature of this relationship is not a product of exogenous variables, a partial correlation was performed, controlling for both total posts and total expert nominations given out. The results are below:

Correlations

Control Variables			Expert_Nominations_Received	Num_Specialties_Commented
Total__Posts & Nominations_Given	Expert_Nominations_Received	Correlation	1.000	.156
		Significance (2-tailed)	.	.000
		df	0	2516
	Num_Specialties_Commented	Correlation	.156	1.000
		Significance (2-tailed)	.000	.
		df	2516	0

The partial correlation reveals a weak (.156), yet statistically significant (p .000) relationship between the total number of expert nominations received and the number of specialties an individual has commented in. This suggests that commenting across specialist areas does not have a negative impact on perceptions of expertise. In fact, perceptions of expertise appear positively influenced by a pattern of interaction that engages with multiple specialties. Given the fact that I have controlled for total posts, this relationship is somewhat peculiar in the fact it suggests that commenting across multiple specialties is associated with increased perceptions of expertise. This finding seems counterintuitive, because expertise tends to be very specific and 'niche;' therefore, commenting across multiple specialties seems like it would be associated with reduced perceptions of expertise. Ultimately, this suggests engaging with a broad range of forums and specialities can make a person a more effective commentator, one who is more likely to be perceived as an expert when commenting both within her area of specialty and across it. I suggest this is because replying across a number of forums and specialties allows a person to develop suitable language (or interactional expertise) for communicating

with people from different backgrounds and specialites. Given the fact that nearly 50% of queries occur across function, this is an extremely important skill to develop. I discuss these findings in greater detail in 6.4.

5.7 Characteristics associated with perceived expertise in ENoPs

My last analysis is an exploratory linear regression designed to develop an understanding of the types of variables most closely associated with perceptions of expertise in the ENoP. The objective of this linear regression is to understand—in part—the characteristics that are associated with a larger number of expert nominations. By using a linear regression, I have the ability to compare among variables, which is particularly useful when determining the types of factors that most influence perceptions of expertise in the ENoP. In this analysis, I look at the number of replies, queries, nominations, number of logins, total number of forums commented in, and number of specialties commented in to determine how these factors might influence the number of expert nominations one receives. My previous findings and theory guided my decision to use these variables.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.896[a]	.802	.801	.33286

a. Predictors: (Constant), LG_Specialties_Commented, LgQueries, LG_Num_Logins, LG_Nominations_Given, LG_Replies, LG_Forums_Commented

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.562	.035		-16.013	.000
	LG_Replies	.436	.018	.513	24.242	.000
	LgQueries	-.199	.022	-.133	-9.185	.000
	LG_Nominations_Given	.164	.018	.148	8.932	.000
	LG_Num_Logins	.295	.020	.310	14.743	.000
	LG_Forums_Commented	.082	.048	.046	1.693	.091
	LG_Specialties_Commented	.012	.005	.058	2.509	.012

a. Dependent Variable: LG_Total_Exp_Votes

In the course of this analysis, I found that the number of expert nominations one receives is most closely associated to the number of replies one has made, followed by the number of times they have logged into the community. In the model above, a 1% increase in the number of replies one makes would yield a .517% increase in the number of expert nominations one receives. This can be determined by looking at the beta values for each of the five variables. These findings suggest certain factors associated with the core group (i.e. replies and logins) are also associated with perceptions of expertise, suggesting the two groups overlap to an extent. From a practical perspective, this also identifies the extent to which certain behaviours will increase one's perceived expertise in the community.

5.8 Chapter Summary

In this chapter, I perform several quantitative analyses with the objective of discovering more about information-seeking and expertise. First, I explore the general relationship between my constructs, looking at the properties of several of the variables I assess in my thesis, including: total expert nominations received and given, total contributions, logins, duration of membership, number of forums commented in/expert in, and number of specialties commented in/expert in.

Secondly, I explore the relationship between key variables, finding that the total number of expert nominations received is significantly related to the total contributions one makes and the nominations given out. Thirdly, I examine the type of information sought in ENoPs, finding many people seek information outside of their own domain of expertise, and there is a strong focus on obtaining solutions, meta-knowledge, and validation. I also find this emphasis varies as product of seeking information across or within specialties. Fourthly, I find that information-seeking is not perceived as a type of expertise in and of itself in the ENoP. Next, I find that people who comment across multiple specialties and domains are more likely to be perceived as making expert contributions. I also find people are more likely to acknowledge the contribution of others as 'expert' when that person is outside their immediate areas of specialty. Although people are more likely to make their most valuable contributions in their own area of expertise, it is evident that having the ability to engage with multiple specialties is fundamental to perceptions of expertise. Finally, I perform a linear regression to compare among variables, finding that many of the factors one might traditionally associate with the core group (namely volume of posts and frequency of login) are also associated to perceptions of expertise. I summarize these findings in the table below, and the ramifications of these findings are discussed and analysed in the subsequent chapter.

MOTIVATING FACTORS	RESEARCH QUESTIONS	METHODOLOGY	OUTCOME
Body of research on informational benefits offline (i.e. Cross et al., 2001) but not online. Generally know little about the dyamics of exchange in ENoPs (Whelan, 2007).	**What types of information do members seek in ENoPs?** (Within specialty or outside of speciality? What types of informational benefits?)	1) Determine % of queries asked within and outside one's specialist area. 2) Code queries to assess which of the 5 informational benefits are sought. Determine percentage of each category	1) 54% outside of one's own specialty 2)Focus is on solutions, meta-knowledge & validation. Greater emphasis on solutions for cross-specialty queries
Information-seeking part of the dialogical process of knowledge creation (Tsoukas, 2009), so may also be perceived as form of expertise	**How is information-seeking perceived in ENoPs?** (Is it a source of expertise?)	Partial correlation between queries and expert nominations	Very weak negative relationship. Queries (i.e. information-seeking) does not lead to the accrual of expert nominations.
Expertise tends to be associated with highly specific skills (e.g. Collins and Evans, 2007), but exchange may be impeded by virtual communication (e.g. Cherny, 1999). More investigation needed to ascertain whether expertise is also highly specified in an online environment.	**Are the contributions of perceived experts valued in only a specific/narrow domain?** (Does commenting in multiple areas reduce number of nominations?)	Partial correlation between # of forums one replied in & expert noms. received; Partial correlation between # of specialties one replied in & expert noms. received; Linear Regression between expert noms. and different types of replies.	Range of information associated with increased number of nominantions.
Knowledge the product of a joint enterprise in CoP (Wenger, 1998). When it is not a joint enterprise, we do not know the types of people most likely to produce 'knowledge.'	**What characteristics are associated with perceived experts?**	Linear Regression with using metrics mined from network	Most associated with replies, followed by logins, number of nominations given out, queries, and number of forums in which one commented

Table 9: Relationship between literature, research questions, methodology & results

VI. ANALYSIS AND DISCUSSION

6.1 Introduction

In this chapter, the results described in the previous section are discussed and their ramifications for theory and practice are analysed. This chapter is divided into ten main sections. Section 6.2 follows this introduction, and is devoted to a discussion of information-seeking in ENoPs. The next section, 6.3, focuses on perceptions of information-seeking and explores conditions under which information-seeking may be particularly valuable. The following section, 6.4, explores the perceived expertise that emerges from the discussions based on those queries. Section 6.5, offers concluding thoughts on my findings, while 6.6 explores the theoretical ramifications of my findings in greater detail. In section 6.7, I discuss boundaries associated with practice, before exploring the linguistic implications of interactional expertise in 6.8. My concluding thoughts on ENoPs as centres of dialogue are offered in 6.9, and my final chapter, 6.10, provides a summary of this chapter. The analytical themes explored in this chapter develop from my research questions, and are intended to illuminate the dynamics of information valuation and exchange that occur within ENoPs.

The broad overarching objective of my research was to understand the type of information sought in ENoPs and the factors associated with perceived expertise in these networks. This objective grew out of my desire to understand more about how information was both sought and valued in an online community. Understanding the type of information-seeking benefits provided by the ENoPs allowed me to understand the specific information needs these entities fulfilled. Likewise, understanding perceived expertise in the community enhanced our understanding of

the characteristics of those individuals who best fulfilled information needs. This thesis is somewhat exploratory in nature, in the fact it seeks to address several variables (i.e. information-seeking and perceived expertise) that have not yet been studied in ENoPs. Thus, several points of this discussion focus on examining how information-seeking and expertise are shaped by virtual media.

The analysis brought a variety of issues to the forefront that were somewhat unexpected and others less so. Generally speaking, the fact that ENoPs were used to access information outside of one's immediate area of expertise was anticipated to a degree, because intuition would suggest people are likely to rely on the ENoP when they are unable to obtain that information from face-to-face contacts. However, the rate at which people sought information outside of their specialty (i.e. 46%) was not anticipated. In addition, certain patterns of information-seeking that emerged in ENoPs were also unexpected. Specifically, my analysis reveals that information-seeking in ENoPs tends to focus heavily on acquiring solutions, meta-knowledge as well as validation. This finding actually stands in contrast to the previously hypothesized information-seeking role fulfilled by computer-mediated communication. Specifically, Cross et al. (2001) suggest validating questions are an unlikely outcome of computer mediated communication, yet, across the ENoP approximately 22% of questions were validating in nature. In this discussion, I explore how certain factors, such as anonymity are likely to influence the type of information-seeking that takes place in these networks.

One of my most important findings was the discovery that a range of contributions was positively associated with increased perceptions of expertise. Specifically I found those individuals who commented in multiple forums and across

multiple specialities were statistically more likely to obtain nominations for their contributions. This suggests individuals who possess familiarity with a range of knowledge were more likely to produce valued contributions in ENoPs. However, this finding was less surprising when interpreted in the overall framework of the ENoP. As discussed, there is a great deal of information-seeking occurring across specialities in ENoPs, which means people responding to a query needed to possess the ability to engage in a meaningful dialogue with people from different specialities and backgrounds. For this reason, I suggest the ability to engage in dialogue across specialties may be particularly valued in the ENoP.

As I will discuss in 6.3, my findings reveal that information-seeking was not typically perceived as a form of wisdom or expertise. Even if a query produced many nominated replies, the query itself did not typically achieve an expert nomination. This indicates the development of valuable information was perceived to take place in the replies or discussion following a question. This aligns with existing face-to-face depictions of information-seeking in the fact the discussion (instigated by the query) is typically where knowledge is developed or produced through dialogical exchange (Tsoukas, 2009).

My analyses confirmed that the number of expert nominations one accrued were most strongly associated with replies, frequent logins to the community, and nominating others in conjunction with a large number of replies. Several of these factors are also related to the core group of contributors in the community, and I discuss these factors briefly due to the fact they have more relevance at the practical (as opposed to theoretical) level. In the course of my discussion, I explore both information seeking and perceived expertise. Information-seeking patterns influence

the type of replies that occur, which subsequently influences the pattern of nominations that take place; these nominations then give rise to the centres of perceived expertise in ENoPs. While these constructs are distinct, they are interrelated, as Figure 5 reveals below.

Figure 5: Summary of the relationships between constructs evaluated

My theoretical contributions focus on both information-seeking and expertise, ultimately revealing several tensions between my findings and the practice-based view of ENoPs. Firstly, by describing the type of information that is sought and exchanged in ENoPs, I am able to further delineate it as a distinct form of organizing. Secondly, I extend Cross et al.'s (2001) information-seeking framework to the virtual environment, and explore the reason why it tends to adopt a similar structure to information-sharing in face-to-face friendship ties. I also explore what types of informational benefits (and losses) are associated with using ENoPs.

Thirdly, I discuss how these findings provide some support for the idea that interactional expertise is particularly valued in ENoPs. I then discuss the ramifications of this finding in greater detail in relation to the type of interaction medium used and the ramifications this may have for motivations to contribute. Finally, I explore what these findings—as a whole—might mean for the traditional practice-based view of the ENoPs.

6.2 Type of Information-Seeking in ENoPs

The result of my data analysis in the preceding chapter [5.4] revealed a relatively large percentage of people sought information outside of their own area of expertise, and the type of information-seeking that occurred tended to focus on solutions, meta-knowledge, and validation. In the following discussion, I will explore both the reasons and ramifications for these findings on both theory and practice.

6.2.1 Seeking across speciality

The high prevalence of information-seeking outside of one's own specialty (i.e. 46.3%) stands in contrast to the number of replies outside one's own specialty (i.e. 39.57%). My analysis reveals that the ENoP is disproportionately used to seek information outside of one's immediate domain of expertise. In general, this suggests the ENoP is an excellent tool for fostering communication across specialties. Due to the reliance on virtual communication in these communities, the ability to engage in joint learning is curtailed to a large extent, because there is a lack of shared context or situatedness. For this reason, people may use the ENoP as more of an information portal, seeking answers to specific questions.

In general, it appears that the ENoP is more representative of a distribution centre, with individuals from different specialist backgrounds converging on a shared spot to exchange ideas and knowledge. Thus, the ENoP does not represent many small networks confined to specialist areas; it represents one broad, far-reaching network. Generally speaking, this pattern of interaction is consistent with the use of the ENoP as a supplement to one's face-to-face social network. Due to the potential to work with people who share one's same specialty, and the tendency to

form ties with similar persons (McPherson et al., 2001), it may be less likely for relationships to form between people who specialize in a different area. In general, my findings here fit nicely with existing theory, suggesting that the ENoP may be a particularly effective way of obtaining information outside of—what is often—a homophilous face-to-face network (e.g. McPherson et al., 2001). From a practical perspective, my inquiry in this area gives us an enhanced ability to understand the conditions in which ENoPs provide maximum benefits to users. Information-seeking behaviour in the ENoP reveals that people actively capitalize on the benefits associated with the reach of the network structure, which may include the ability to access experts outside of one's immediate domain of expertise.

6.2.2Types of Informational Benefits

Cross et al. (2001) identified five types of information-seeking benefits: solutions, meta-knowledge-validation, problem-reformulation, and legitimacy. The objective of my empirical research was to understand the prevalence of these information-seeking types in the virtual environment. Out of the stratified random sample of queries assessed in the ENoP, 45% were solutions, 28% were meta-knowledge, 22% were validation, 4% resulted in problem reformulation, and 1% focused on obtaining legitimacy. In general, the focus on validation aligned heavily with the informational benefits associated with friendship networks. The figure below, reprinted from Cross et al., (2001) reveals the extent to which a given structure predicts an informational benefit. The work here suggests that task interdependence is the strongest predictor of seeking information. However, friendship ties are disproportionately used to obtain validation.

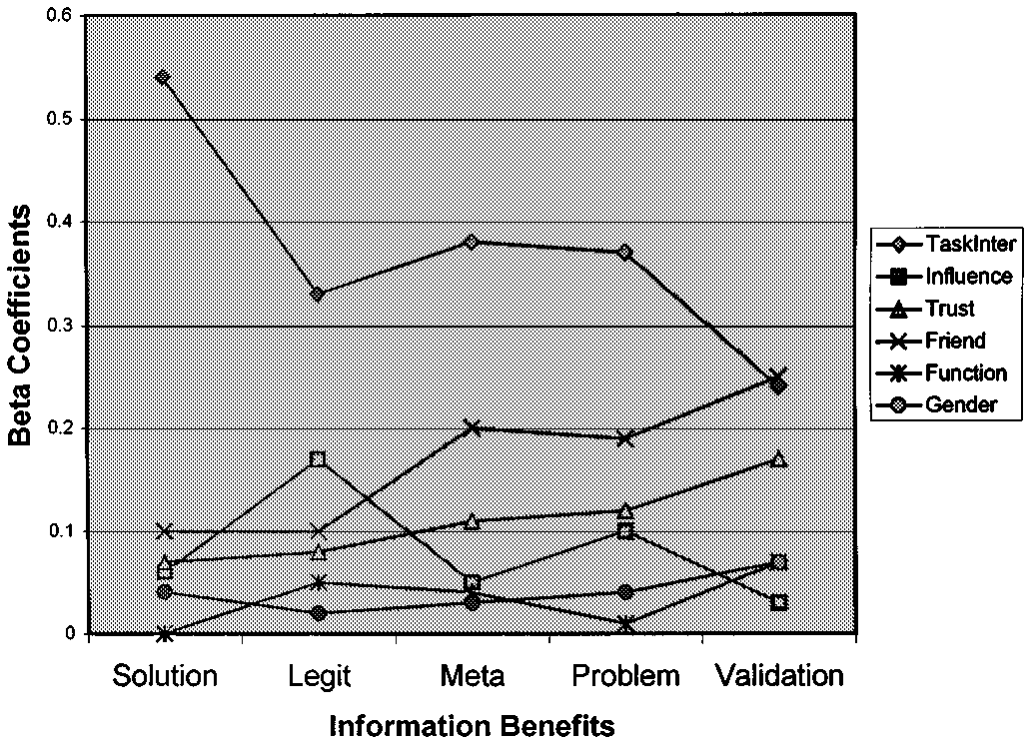


Figure 6: Information Benefits Identified by Cross et al. (2001)

The overall pattern of information-seeking I found in ENoPs does not directly align with information-seeking in face-to-face environments as described by Cross et al. (2001), because ENoPs do not tend to focus on problem reformulation or legitimacy. Thus, we must conclude ENoPs provide unique informational benefits. In the ensuing discussion, I examine the various types of information-seeking benefits in relation to the role they play in the ENoP. I explore several factors that may be responsible for my findings, which include the structure of one's offline networks, the presence of anonymity in the ENoP, and characteristics of virtually-mediated technology. I then discuss the ramifications of my findings for theory and practice.

6.2.2.1 Solutions

Face-to-face information-seeking that emphasizes a search for solutions tends to occur among people who share a degree of task interdependence. In fact, task

interdependence predicts almost 54% of all information-seeking behaviour that focuses on acquiring a solution (Cross et al., 2001). This indicates that a degree of shared context is an important predictor of the types of people consulted for solutions. This stands in stark contrast to the ENoP, which is characterized by a lack of shared context and no task-related interdependence. I suggest that the reason for the emphasis on solutions stems from the fact people seeking information in ENoPs are aware of the potential for others to be engaged in similar tasks, across different organizations. Although there is no task interdependence, there is a high potential for task relatedness. Solution-seeking queries may be an attempt to access individuals who have experienced similar problems and are willing to contribute their expertise on the topic. In this way, people seeking solutions can benefit from the wisdom of those people who have 'done it all before.'

This has important ramifications for people who are engaged in a project that is largely autonomous. When people do not have the ability to seek information from peers jointly engaged in a project, seeking information from people who have done something similar may be particularly helpful. Generally speaking, the ENoP may be best suited for addressing problems that are relatively well-developed, because a lack of shared context means that a person must be able to articulate that context, thus problem must have distinct parameters.

Finally, the ENoP offers the potential to gain access to a solution anonymously, which does not compromise one's status or position in the organization, an issue that may be particularly important when seeking both solutions and validation.

6.2.2.2 Validating

The extent to which validation was sought in ENoPs was somewhat surprising, in light of Cross et al.'s (2001) suggestion that validating queries would be particularly unlikely in online communities due to the difficulties associated with using virtually mediated technology. However, I suggest that the benefits associated with anonymity in these communities override the problems associated with virtually-mediated technologies. In addition, the ENoP is particularly attractive due to its ability to gain consensus from a large majority who are likely to possess diverse perspectives. For these reason, a relatively large proportion of information-seeking focuses on obtaining validation.

A validating question is likely to reveal a degree of insecurity in a solution that a person has, in part or full, developed herself. For individuals working in the organization, this type of question may be particularly sensitive because it requires admitting—to an extent—a lack of confidence or security in one's explanation or solution. Although sufficiently knowledgeable to develop a plausible explanation, she does not know enough to have total confidence in that solution or explanation. Thus, a person is not in a state of total ignorance, but they are not in a state of complete competency. In the organization, this middle ground—where one knows enough to know what she does not know—may be perceived as a weakness. Although the ability to acknowledge the limits of one's knowledge is indicative of a certain type of wisdom (Cook and Brown, 1999), I suggest it is unlikely this type of wisdom will be rewarded in an organizational context, where the ability to produce 'right' answers and demonstrate confidence in those answers is paramount. In this situation, asking for help or assistance from others may undermine one's reputation and status, and for this reason, validating queries are particularly sensitive.

Given the sensitivity that surrounds these queries, it should not be surprising that Cross et al. (2001) found that validating queries were most closely associated with friendship ties. In fact, people tend to "overemphasize their friends when conceptualizing and validating problems and solutions" (Cross et al., 2001, p. 444). This type of information-seeking strategy may actually be detrimental, because friendship networks tend to possess a high degree of informational homophily (McPherson et al., 2001). This means the people one relies on for validation will often think in a similar manner to the person seeking the validation. As a result, the tendency to focus on friendship networks for information can lead to detrimental outcomes, such as groupthink which emerges from shared perspectives on a problem (e.g. Janis, 1971). Access to heterogeneous perspectives may actually prove more beneficial in these cases.

Directing the validation queries at a community like the ENoP can be a way to obtain diverse opinions, while simultaneously obtaining consensus from a larger audience. This may have the added effect of increasing one's confidence in a proposed solution when it is examined by people with different perspectives of the problem, and a large number of individuals are in agreement about the best way to proceed. However, there is one major caveat. The person seeking the information describes and defines the parameters of the problem, and describes a solution within those parameters. If they fail to identify certain contingencies, the [validated] solution may still be less than optimal.

In regards to both solution-seeking and validating queries, ENoPs may represent an optimum scenario by providing the ability to access diverse knowledge anonymously. The anonymous structure of the ENoP allows individuals to place

themselves in a potentially vulnerable position (i.e. admitting the limitations of their knowledge), without incurring potential damage to either reputation or perceived expertise in the organizational setting. In the network I studied, people are only identifiable through the information they choose to reveal, which is characteristic of many ENoPs. For this reason, queries have the potential to be completely anonymous; with people only identifiable by usernames they select themselves. In the ENoP, acknowledging the limitations of one's knowledge is not cause for potential embarrassment, but a justification for seeking information.

6.2.2.3 Problem Reformulation

Information-seeking that focuses on problem reformulation leads to a joint creation of meaning through a series of interactions that focus on understanding 'terrain' of an issue. This type of interaction begins with a vague conceptualization of the problem and moves to a more developed and concrete understanding of the issue. For this reason, dialogue plays a particularly important role in problem reformulation. For example, a verbal opening of "What do you know about aircraft wings?" might be appropriate opener in face-to-face conversations, where individuals have the potential to engage in a 'tapering' process, moving toward greater specificity until a problem is both outlined and defined. In the online community, such as an ENoP, this type of query is likely to be too broad to produce meaningful responses, and the asynchronous nature of exchange will make clarification attempts rather arduous. For this reason, it is unlikely to observe the process taking place directly in this context.

When problem reformulation did occur in ENoPs, it was rather broad in scope, and tended to occur when a query was too poorly worded, confusing, or lacking vital

information. Examples of problem reformulation include: "I would like to design an Embankment Dam, but I am not going anywhere. Can you help?", "Does anybody here do work on transistors?" Generally speaking, these queries tended to be vague, and although they might be formed with the intention of developing dialogue, replies to these questions were limited. Outcomes associated with problem reformulation tended to be similar to the outcomes associated with meta-knowledge, meaning replies focused on articulating the problem as best as possible before directing the individual to a source of knowledge that might provide greater assistance. Individuals who produced queries lacking a clearly defined problem set were alternately ignored, requested for additional information to clarify the problem, or directed to a different forum that might be a more appropriate source of information.

Although problem reformulation was not readily observed on the surface, this does not mean the ENoP was unhelpful during this stage of information-seeking. In the ENoP, it appears the ability to fully articulate a problem set is an essential precursor to obtaining a solution. This surfaces a potentially unique benefit of virtually-mediated communities—the fact that a person must put the 'problem into words' in order to obtain worthwhile assistance. Thus, they must be able to develop their information search sufficiently to reach this point. This also suggests there is some possibly the benefits of problem reformulation may be obtain when developing the actual question itself, because the development of a clear and concise query may lead an individual to develop a better understanding of the problem itself. Furthermore, the learning that occurs while browsing the forums may further assist in defining a problem. Thus, virtually mediated communication might, in these instances, provide a great deal of benefit because this technology requires a greater refinement in problem specification to adequately explain a situation. Furthermore,

the reliance on virtual communication means information is archived in the ENoP, which—unlike a face-to-face conversation—can be revisited multiple times. Thus, there is a potential for members to learn from previous conversations which may facilitate problem reformulation.

6.2.2.4 Meta-Knowledge

Information-seeking focusing on meta-knowledge is predominantly concerned with identifying, locating, or accessing a database or information repository. The context of ENoPs makes them ideally suited for meta-knowledge information-seeking because of the straightforward nature of the request and their range of access. This access may be particularly important when searching for an obscure item. The ENoP is also efficient, because a single post will reach a large number of individuals with varying levels of knowledge and information. For this reason, it is not surprising that many individuals engaging in the ENoP sought meta-knowledge. Since this type of information is focused on identifying a secondary data source, it is less likely to be subject to communication limitations that typify virtual exchanges, so long as a person has the ability to describe the type of resources they need. Generally speaking, the ENoP is an excellent place to engage in meta-knowledge information seeking because it can yield multiple results with minimal effort.

6.2.2.5 Legitimacy

There were very few requests that focusing on legitimacy-seeking in the ENoP. Cross et al. (2001) conceptualize information-seeking focusing on legitimacy as a way to prove the worth of the solution in the fact an expert had been consulted. Legitimacy-seeking in the ENoP did not focus on securing the opinion of a specific expert, rather attempts to obtain legitimacy focused primarily on aligning behaviour

with the practice in general or an industry leader. However, it is difficult to suggest this is a general rule, because these types of requests were exceedingly rare. For example, a person seeking information explained that she was trying to justify the use of a certain computer program to her superiors, so she was hoping other Eng-Tips members could confirm they used the same program in their organizations. In this way, she was seeking external legitimacy. Most likely due to the anonymous nature of ENoPs, these types of legitimacy-based requests were extremely infrequent.

6.2.3 Variation in Type of Info Sought

One of the more interesting findings in the area of information-seeking was the extent to which information seeking differed when search within one's own specialist domain and outside that domain. Generally speaking, my data revealed people seeking information outside their own speciality were far more likely to focus on obtaining solutions, while people seeking information within their own specialty were more likely to focus on meta-knowledge and validation. I suggest this pattern of information-seeking emerges because people searching within their own area of expertise typically have the requisite skills to develop a solution, although they may not have confidence in that solution. In addition, people seeking within their own area of expertise would be better equipped to understand whether a specific resource (e.g. computer program, component part, material, etc.) actually existed and would have the necessary skills to use that resource to develop a solution on their own. In essence, there are a large number of people who are engaging with their own specialty who are not seeking solutions; rather, they are seeking the correct tools that will allow them to develop the solutions offline. Finally, seeking validation in an area in which one is supposed to have expertise may be a particularly sensitive

undertaking. This type of query involves admitting a lack of knowledge in an area one is—theoretically—supposed to be an expert in. This might be difficult to admit, even to trusted confidents or close friends.

My finding on the type of questions one seeks from an ENoP has important ramifications for the structure and dynamics of the community. Specifically, interactions among people of a shared specialty focus more heavily accessing codified or validating a solution. Interaction across specialties focuses more heavily on the production of a solution, which suggests there is a greater degree of ambiguity associated with the query. Given the possibility for greater discussion around solutions (as opposed to meta-knowledge), this might influence the shape of dialogue in these communities.

6.2.4 Ramifications for Theory on Information-seeking

My research has contributed to theory on information-seeking and ENoPs in several ways. Firstly, I have demonstrated that the type of information-seeking in electronic networks is substantially different from information-seeking in the face-to-face environment. Secondly, I find that ENoPs are centres of cross-specialty information seeking, indicating that these communities might be used to supplement a face-to-face network that might be more homophilous. As a result, we can speak to the types of information problems which ENoPs are capable of addressing, and the reasons for the popularity of certain types of information-seeking. Furthermore, this can expand our understanding of the types of information-seeking that occur among professionals in an online environment, which is particularly important given the widespread use of virtual media.

In general, most of the informational benefits associated with ENoPs that are explicitly sought concentrate on the later stages of information-seeking (e.g. Marchionini, 1989), in which the parameters of a problem are identified and tentative solutions may be developed. However, this does not mean that the ENoP is not helpful in the earlier stages of problem-solving, such as problem reformulation. By lurking the forums, individuals will have the potential to read and learn from previous dialogues and exchanges (Nonnecke & Preece, 2003). Furthermore, the act of seeking information in a written form may push information-seekers to develop problem parameters to accurately explain the issue at hand. Thus, it is possible the characteristics of virtually mediated communication may facilitate problem reformulation in a less explicit way. Additional research should be conducted in these areas.

When comparing information-seeking in ENoPs to face-to-face information-seeking, I found the nature of the exchanges do not take place in the way hypothesized by Cross et al. (2001). I suggest this is due to the anonymity in the ENoP, which allows people to admit the limitations of their knowledge without incurring reputation loss. Information-seeking in ENoPs tends to share many similarities with information-seeking in friendship networks or in trusted relationships through this emphasis on validating. Validating queries were not the only informational benefits of ENoPs. There was a strong focus on meta-knowledge searches, indicating that several people used the ENoP to assemble the necessary resources to develop a solution on their own.

In general, there was a lack of information-seeking that focused on defining or reformulating a problem, most likely because this occurred prior to engagement in

the community. Since asking a question in the ENoPs requires the ability to articulate that problem, it is unlikely to observe problem reformulation occurring in this context. However, it is likely that reading the forums will allow individuals to focus their queries and learn about different aspects of the engineering profession. In general, it does appear that legitimization is not a typical outcome associated with ENoPs.

My research suggests that the anonymity produced by the virtual structure of the ENoP appeared to increase the number of sensitive questions, such as validating queries. Simultaneously, the range and diversity of the network facilitates the ability to access a large number of individuals who potentially possessed novel ideas and solutions. From a theoretical standpoint, these communities occupy a very interesting space; they can offer many of the benefits associated with seeking information in one's friendship network while minimizing the problems associated with homophilous information-seeking.

Of note was the impact anonymity created in the ENoP. Specifically, there appeared to be a trade-off between legitimacy and validation. Anonymity allowed for more validating queries, but it curtailed the possibility of engaging in legitimacy-based information-seeking. Although it was not explicitly noticed or addressed by Cross et al. (2001), I suggest that this trade-off is likely to exist in the face-to-face environment as well, because acknowledging the limitations of one's own knowledge to a particularly respected or esteemed figure in the organization might be a particularly sensitive issue. A review of the data generated by these authors seems to support my contention, revealing the types of relations associated with legitimacy-based information-seeking are the ones least likely to be consulted for

validation. Due to the extreme conditions created by anonymity, my research illustrated this trade-off in sharp relief. Anonymity may engender a safe environment by giving people the freedom to admit what they do not know, and obtain security in their solutions, but it does so at the expense of being able to secure a powerful faction or agent.

The large amount of information-seeking that takes place across specialties has ramifications for the overall quality of information contained in the ENoP. The access to cross-speciality information can provide benefits by encouraging diversity of perspective, and acting as a centre for individuals to exchange ideas and information with people they may not normally encounter in the workplace setting or offline. However, there may be some drawbacks because a more dispersed centre of communication may make it difficult for a dialogue or consensus to develop among the experts in that specialist area. This may be the underlying reason why information-seeking within one's own specialty tends to focus more heavily on meta-knowledge.

From a sociomaterial perspective, reliance on ENoPs may lead to the integration of technology in a way that advances the practice itself (e.g. Johannesen et. al., 2012). For example, it may lead to changes in the way individuals perform their work, with an enhanced number using ENoPs to 'double-check' their solutions prior to implementation. This may lead to a fewer errors in work performed by individuals. In addition, interfacing with the community may support a more creative approach to problem solving in the engineering field and allow individuals to fine-tune or adjust their ideas. It may also expose them to novel ideas and cause them to approach problems differently or even more effectively.

There are several practical benefits to my research findings. As a result of my research here, managers of ENoPs may be better able to understand the strengths and weaknesses of the ENoP in the information-seeking process, and leverage those strengths to enhance the quality of the community. Specifically, they may configure their community in a way to promote cross-speciality information-sharing, which appears to be a particular strength of these kinds of communities. In addition, they may consider adopting a structure that allows members to vote "yes" or "no" in response to a validating query to ensure these members obtain consensus on their query. In addition, organizations could also promote the use of external sites as a means to access novel information and gain cheap access to novel insights or information.

6.3 Perceptions of Information-seeking in ENoPs

My data suggests that information-seeking is not commonly perceived or acknowledged as a source of expertise or wisdom in its own right within the context of the ENoP. Instead, knowledge and expertise are perceived to emerge in the ensuing replies and discussion. This relationship might actually emerge as a product of the type of questions that are asked in ENoPs. Given that the focus on certain types of queries such as solutions, meta-knowledge, and validation, it is perhaps unsurprising that queries were not particularly well-regarded. However, anecdotal evidence suggests there are certain types of queries that may be well-regarded, which tend to produce a large number of replies and responses. First, I explore what my data actually means in relation to my findings; then, I tentatively explore these types of queries in the ensuing discussion, with the objective of identifying a future line of potential research in ENoPs.

The relationship between queries and perceived expertise was weakly negative, meaning that a greater number of questions were associated with lessened perceptions of expertise. This relationship is influenced by the control variable of total posts, so the data do require a careful interpretation. To put this in basic terms, the person with ten replies is more likely to receive a larger number of expert nominations than the person with five replies and five queries. Although queries form the backbone of knowledge created in the community, they are not generally perceived as a form of knowledge in and of themselves. For that reason, queries are not an effective way to gain acknowledgement in an ENoP. From a practical perspective, this suggests individuals who seek to raise their profile in online communities ought to focus on replying to queries rather than developing their own queries. From a theoretical perspective, this highlights the distinction between the perceived value of certain elements of online dialogue, i.e. the query and the development of a response.

Part of my research focus was on identifying the types of questions asked in ENoPs. Given the emphasis on finding 'answers' through queries focusing on meta-knowledge, solutions, and validation, it is perhaps unsurprising that questions were not positively associated with perceptions of expertise. However, the line of research on information-seeking types which I translated from Cross et al. (2001) neglected to focus on understanding the relative 'interestingness' of a query. I believe it is possible certain queries may be evaluated as particularly insightful or expert under certain conditions. One of those conditions is the ability to engage with people who have 'beginners' eyes,' meaning they have no preconceived ideas about the way things 'ought' to work, and so they may have an increased potential to produce a particularly novel line of inquiry. The benefits of 'beginners' eyes' are

evident in our own scholarly pursuits, featuring heavily in the development of grounded theory, in which the person developing theory does not expose themselves to pre-existing theory for fear of tainting the ensuing research with the ideological perspective of others (e.g. Strauss and Corbin, 1990). In a similar way, individuals who are not wholly familiar with the standards and limitations of certain professions may seek information that inadvertently challenges the limitations and ideologies of the existing practice. Ultimately, this may help practitioners perceive an old concept through a new lens.

In the ENoP I studied, there was some anecdotal evidence that basic questions tended to produce a large number of responses. Queries formulated at the level of a layperson (e.g. "Why do flags flutter?" "Can you crush an aluminium can without making a sound?" "Does a bullet move faster before or after it leaves a gun barrel?") were among some of the more discussed topics in a given area. These questions might generate a large amount of interest through their ability to connect the engineering function back to the everyday context, which could be perceived as a novel undertaking. Conversely, a larger number of individuals may feel qualified to participate in the discussion, so the increased responses may simply be a by-product of the fact that even relative novices have the potential to contribute. In a group like the ENoP that has a high degree of information seeking across specialties, these types of questions have the potential to generate debates and perspectives from different points of view. The example of the bullet leaving the gun produced 109 responses from six different types of engineers, one of whom commented, "What a refreshment for many of us whose college days were hidden in remote memory!" Generally speaking, these types of questions are still limited in their ability to

produce 'dialogue' due to the restrictions generated by the medium of communication.

One of the reasons I focused on understanding on this relationship was to understand the extent to which the exchange of information was actually asymmetrical, meaning I wanted to know whether people who sought information were also—in some way—able to give back to the people who providing information. In this way, people contributing in the form of reply would actually accrue informational benefits from the people they are theoretically 'helping.' Although my data support a model of asymmetrical exchange—indicating queries are not perceived as a form of expertise—these findings may be biased by my sample and the types of queries that are generally asked. My sample focuses on experts (not novices), meaning the likelihood of developing a query at the level of a layperson is curtailed. This is problematic, because as I discuss above, those types of queries may produce the most interest and excitement. Secondly, the types of queries experts ask may tend to focus on the necessary resources to perform their job effectively, such as obtaining meta-knowledge. I believe these factors may be responsible for the reason that queries had a weak negative correlation to total expert nominations received.

Although queries may not be perceived as a source of expert wisdom in their own right, they may act as catalysts, prompting people to think outside of the traditional paradigm or revisit some of the basic tenants of the practice. This could be a potential reason why people engage with the community. While there is a relatively large body of research on the motivational factors associated with contribution in ENoPs, I suggest that contributors may derive informational benefits

from interacting with people who have different perspectives, particularly those people whose queries are characterize the novelty associated 'beginners' eyes.' The ramifications of my findings here reveal a line of inquiry that demands some follow-up. Specifically, scholars seeking to understand the motives for contributions should perhaps expand their analysis to focus more heavily on understanding the informational benefits individuals receive from the contribution process. Furthermore, greater attention should be paid to the impact low barriers of entry have to the quality of discussion. It is possible that lower barriers may produce novel dialogue, or conversely, the inclusiveness may 'dumb down' the conversation and turn experts away from the community. At any rate, it is important to understand how relative novices might influence the quality of dialogue in ENoPs.

6.4 Perceived Expertise in ENoPs

My empirical research into the types of contributions perceived as expert in ENoPs produced several important findings. Firstly, perceived expertise is most closely associated with the number of replies one makes, the number of times that person logs into the community, and number of nominations that person gives out. Secondly, people are more likely to nominate people as experts who are from an unshared specialty. This reveals the extent to which subjectivity shapes the perceptions of the most expert individuals in ENoPs. These findings are discussed and analysed in greater detail below. Lastly, people who contribute to multiple forums and specialty areas tend to obtain more expert nominations. This suggests the ability to interact with a broad range of individuals is key to perceived expertise in ENoPs.

6.4.1 Factors most closely associated with perceived expertise

One of my research objectives was to identify the characteristics associated with the nominations one received in ENoPs. While I was able to do so, much of my findings here have ramifications at the practical level. For this reason, my discussion of these immediate factors is somewhat limited (taken as a whole, my findings have strong ramifications for the practice-based perspective, which I discuss at length in section 6.7 through 6.10). The accumulation of nominations in ENoPs is positively associated with the number of replies one makes, the number of times one logs into the community, the nominations given out, the number of queries, and the number of forums one comments in. Generally speaking, the results here favour an explanation of perceived expertise as strongly related to the same behaviours that underpin the core community. Thus, we could infer a large degree of overlap between core group and expert group.

From a practical perspective, this reinforces some key behaviours that are associated with the development of perceived expertise. Specifically, individuals seeking to increase the number of nominations obtained should focus their effort on replying to the queries of others; in addition, giving expert nominations to others is an effective strategy for increasing the number of nominations one obtains. Finally, individuals seeking nominations should not concentrate their efforts in only one area of the forum; commenting across multiple forums will raise the chances of obtaining an expert nomination if that is the desired outcome.

6.4.2 Nomination Patterns

Part of the information-seeking process is the evaluation and assessment of the information one receives. In an online community, this is exemplified by the process

of evaluating or rating the perceived wisdom or expertise contained in a response. In communities that contain feedback systems, the quality of response can be evaluated by any member of the online community. As detailed in 5.6.1, my findings show that people are more likely to nominate individuals outside their own area of expertise, which suggests subjective nature of expertise—as described by Collins and Evans (2007)—influences nomination patterns in online communities. Essentially, this suggests one's own level of wisdom plays an important role in nomination patterns in online communities. This occurs because people are less likely to know something when it is not in their immediate domain of expertise. Therefore, when a contribution does not overlap with their existing knowledge, it is more likely to be perceived as novel, expert, and worthy of a nomination. As a result, people who share information with different specialties may be more likely to obtain an expert nomination. The subjective nature of wisdom may be partly responsible for the reason why people are more likely to nominate outside their own area of expertise.

This pattern of nominations has ramifications for the centre of expertise in the network. Specifically, this means that people who are perceived as experts are likely to obtain nominations from people both within and outside their area of expertise. The more nominations a contribution receives, the more likely that contribution represents true expertise. Essentially, this is due to the 'wisdom of crowds' argument, which suggests a large and diverse group is better able to develop solutions that more closely approximate reality (Surowiecki, 2004); this is partially due to statistical reasons; the more nominations received, the more likely these nominations patterns will take the shape of a normal distribution, reflecting the underlying perceptions of the *average nominator*, which in this case is a trained

engineer. This tendency may influence the type of people that are most valued in the ENoP.

6.5 Information-Seeking and Expertise in ENoPs

For the sake of clarity, I have discussed my findings in relation to information-seeking and expertise separately. As a whole, my research focuses on the dynamics of the ENoP, and how these dynamics give rise to the production of valued content. Figure 7 depicts how these constructs fit together, and provides a synopsis of my findings.

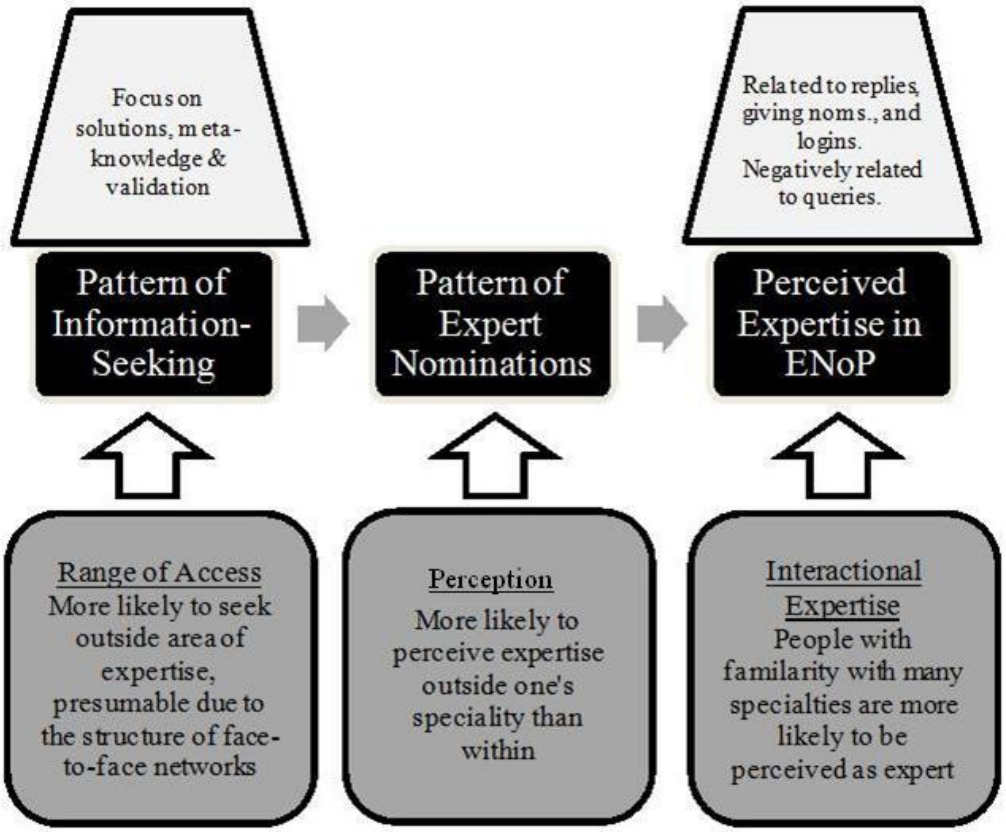


Figure 7: Synopsis of my findings in relation to information-seeking and perceived expertise.

To reiterate, my research has revealed three several important findings that may have a strong influence on the type of information sought and the valuation of that information. Firstly, ENoP members are likely to use the network to access people who are outside of their own immediate area of expertise. Secondly, there is

a strong element of subjectivity, meaning people are more likely to acknowledge expert wisdom in specialties outside their immediate domain of practice. Thus, individuals are comparatively less likely to reward contributions in their own specialty, reflecting the subjectivity associated with the evaluation of expertise. Thirdly, ENoPs demonstrate a great deal of cross-speciality information-seeking behaviour, which shapes the type of interactions that take place, and presumably influences nomination patterns as well.

In regards to research on information-seeking, Cross et al. (2001, pg. 445) suggest a focus on what is "lost and gained through computer mediated communication among people offers important insight into the way in which technology might be effectively employed." To that end, my discussion has explored some of the benefits and detriments associated with virtually-mediated information-seeking in ENoPs. Specific gains emerge from the presence of anonymity and access to a broad range of information, which lead to a greater number of validating queries and ease of accessing meta-knowledge. In addition, the increased range of the community allows people to connect to larger numbers of individuals who may be more likely to represent a heterogeneous perspective (e.g. McPherson et al., 2001). The ENoP allows individuals to obtain consensus in information seeking while simultaneously accessing information that is likely to be more novel than the information contained in one's face-to-face network. However, certain losses also emerge from anonymity as well, most notably the fact that the ENoP becomes an inappropriate place to seek legitimatization. Other types of losses likely emerge from actual medium itself, specifically, the inability to engage in turn-taking and repair reduces the potential to engage in a back-and-forth dialogue, and the asynchronous nature of communication reduces the potential to gain immediate

feedback. Taken as a whole, it appears that ENoPs have a strong potential to influence the way individuals access knowledge and information in the course of their everyday work.

In regards to the evaluation of the information gifted to the network, perceived expertise is, unsurprisingly, subjective. This means that individuals are more likely to perceive expertise outside of their own area or discipline. This is reflected in the pattern of nominations demonstrated in my network. This may be part of the reason why individuals who are familiar with multiple specialties are more likely to be perceived as expert. Ultimately, interactional expertise may be disproportionately valued in the ENoP because of its utility in communicating with a broad range of diverse individuals.

My contributions here have focused on examining the type of information needs ENoPs fulfil, and the people perceived to fulfil them. This is a very important area of research because it speaks directly to the purpose of these entities; however, it has been overlooked in the literature, partly because it is not emphasized by the traditional theoretical lens used to evaluate these entities (i.e. situated learning and the social network perspective). My work here represents the first step toward developing a more robust understanding of the type of informational needs met by the ENoP and the type of people most likely to meet those needs.

6.6 Theoretical implications for the Practice-Based View

Taken as a whole, this body of research has important ramifications for our understanding of the practice-based view of knowledge and the organization. One of my findings focused on the extent to which ENoPs were used as vehicles of information-sharing across specialist boundaries. My findings revealed that

individuals frequently sought information from a domain of expertise that may be primarily situated in another speciality. In my literature review, I suggested that ENoPs can be characterized as centres of trans-situated learning, because exchanges occur between individuals who perform similar practices, yet are not co-located in the same working context (Vaast and Walsham, 2009). However, this model of trans-situated learning does not fully reflect the reality of information-sharing in ENoPs. Learning not only occurs between two petroleum engineers employed in different organizations on similar projects, learning also occurs between the petroleum engineer and the chemical engineer. In fact, information-seeking across specialist boundaries is fairly frequent. Thus, the information-sharing patterns observed in the ENoP highlight an important issue: the definition of a practice in this context.

In the literature review, I also identified several key differences between CoPs, and ENoPs. One of these differences was the fact that members of ENoPs do not engage in a joint enterprise, which is defined by Wenger (1998) as the process of working toward a shared goal or purpose that is cooperatively developed. However, members of the ENoP may exhibit a shared repertoire to an extent, which is the co-constructed set of ideas and outcomes associated with a practice (Wenger, 1998). Unlike CoPs, in ENoPs member engagement is guided by individual motives and objectives. Members of the ENoP could be said to engage in a 'common practice' which does not exhibit joint enterprise, which is the act of working together to resolve a shared problem or issue (Wasko and Faraj, 2005). This 'common practice' is predicated on similar work experiences, background, and training (Wenger, 1998).

Essentially, there is a distinction between a 'shared practice' which is exhibited by a CoP, and a common practice, which characterizes ENoPs. Brown and Duguid (2000) suggest that a common practice enables knowledge to flow easily across that practice, leading to the development of social networks to support the exchange of that knowledge. But understanding what constitutes a 'common practice' within the context of the ENoP is less than straightforward. The issue raised in my research here is the level at which this "common practice" exists. What is apparent is the clear distinctions in different levels of practice that emerge from both training and work practices. Within the broad occupation of engineering, there are several distinct specialities; however, among these specialties there are certain domains of expertise that may overlap to an extent. This is depicted in Figure 8 below, which demonstrates an overlap between the specialities of mechanical and aeronautical engineering where a specific domain of expertise—airfoils—rests. A domain of expertise is most often found within a single specialty, but it may reside at the nexus of specialties. It can be conceptualized as a practitioners' specific niche or area in which they contribute to practice.

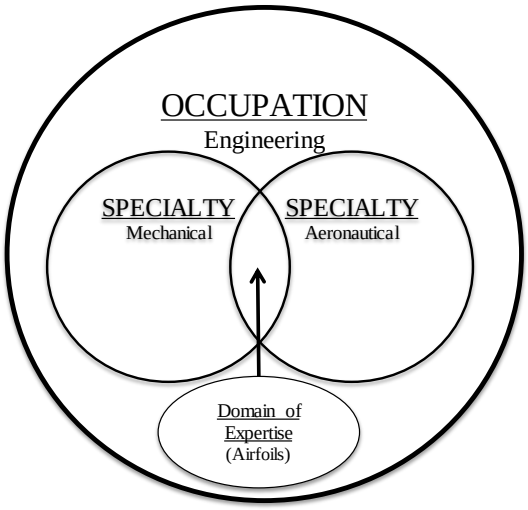


Figure 8: Layers of Practice in Eng-Tips

My research in this area brings into sharp focus our conceptualizations of occupation, speciality, domain of expertise, and practice itself. Firstly, I reveal that within the ENoP, the notion of a 'practice' is highly dimensional and multi-faceted. Within the occupation itself there are clear boundaries and divisions. This suggests the occupation of engineering may technically be a 'common practice' but it is a fragmented one, because and there are clear boundaries in the occupation that influence information-seeking patterns, working relationships, terminology and communication. A shared specialty (e.g. Mechanical engineering) suggests a greater cohesion, because engineers from a shared specialty have strong similarities in training and perspectives. However, it is inappropriate to define 'common practice' at the level of a specialty, because nearly half of the information-sharing that occurs in ENoPs happens across specialties. It is the commonality of the practice of 'engineering' that allows this dialogue to occur. Obviously, the greatest overlap in practice resides at the domain of expertise; in this area, practitioners are likely to experience similar problems and issues. The type of sharing that occurs in this area most closely represents Vaast and Walsham's (2009) conceptualization of trans-situated learning.

However, the type of information-sharing that took place in the ENoP studied most frequently occurred between people who perform dissimilar tasks. This problematizes the notion of ENoPs as a relative of Communities of Practice, because a 'common practice' in the context of the ENoP does not have clear and definite parameters. If we adopt the loosest and most inclusive sense of the word 'common practice' by defining it as the occupation of engineering, then it is in only partially in keeping with Brown and Duguid's (2000) conceptualization as an area in which knowledge flows easily across practice. There are some areas, such as biological

engineering, in which information exchanges with non-biological engineers is extremely infrequent. However, in other areas, such as materials, there the majority of information-sharing and exchange occur with non-materials engineers.

Generally speaking, information-exchanges in ENoPs do not follow a clear set of rules across the board, and ultimately, this increases the distinction between the ENoP and the CoP. Firstly, practice cannot be categorized neatly or distinctly, which is reflected by the lack of sharing across certain specialties in what should—theoretically—be a common practice of engineering. The inability to create distinct parameters for practice in this context further emphasizes the dissimilarities between the ENoP and the CoP, which focuses on people working together on a shared problem, thus engaging in a shared practice (Wenger, 1998). Furthermore, the pattern of information seeking I found in my study suggests the information search, and the ensuing information-sharing, does not always focus on what is shared by other members of the ENoP, it often focuses on what is *not* shared. This is reflected by the enhanced emphasis on seeking solutions when engaged in cross-speciality information seeking. This is a stark contrast to the purpose of the CoP, which fosters a strong emphasis on commonalities (Zboralski, 2009). Thus, the ENoP is a place where practice is fragmented, and differences are—to a large extent—amplified by the type of information seeking that occurs.

To conclude, my research here has explored the multi-dimensionality of practice, and I suggest that within the context of the ENoP studied, engineering can bet conceptualized as a broad, yet fragmented, practice that is comprised of various specialties. Within those specialties there are domains of expertise, which are the specific niches in which a person contributes knowledge or information. This

expansive array of specialities reveals a lack of cohesion in the ENoP itself, which subsequently problematizes ENoPs as a relative of CoPs. Furthermore, due to the large amount of information seeking across specialist boundaries (i.e. among individuals performing dissimilar roles), it is inappropriate to characterize ENoPs as centres of trans-situated learning as conceptualized by Vaast and Walsham (2009). By turning our attention to the way boundaries operate in ENoPs, we may be able to increase our understanding of the types of interactions that occur in these entities.

6.7 Boundaries

Boundares can be conceptualized as the cusps of a practice, where much learning and experience has the potential to occur; however, there is heightened potential for communication problems and misunderstandings at these boundaries (Wenger, 1998; Carlile, 2002). Within the practice of engineering, I have alluded to the fact that many boundaries emerge as a result of specialist training and one's specific domain of experise. I have not, however, explored the nature or specific type of those boundaries, which can both facilitate and impede the sharing of information in ENoPs.

Generally speaking, there are three kinds of boundaries associated with practice: syntactic, semantic, and pragmatic (Jantsch, 1980; Carlile, 2004). The syntactic boundaries are associated with an information processing approach, and overcoming these boundaries focuses on developing a shared syntax capable of managing information needs. A semantic boundary is associated with the way syntax or language is interpreted, and the miscommunication that can arise as a result of cultural background or experience. Finally, a pragmatic boundary focuses on understanding the significance or consequences that emerge from interdependences. This pragmatic boundary is most relevant to my findings in the ENoP. Carlile

(2004) suggests that communiction across these boundaries is difficult because people must change their perspective or knowledge to align with a new schema or way of doing things. Not only must they be willing to modify their existing knowledge, they must also find ways of transforming or influencing the knowledge held by others.

Pragmatic boundaries have been characterized as the most difficult to cross; however, engagement in CoPs are one way of facilitating dialogue across these barriers by focusing attention on a shared problem (Carlile, 2004; Swan et al., 2002). In the context of the ENoP studied, engineering specialties (e.g. mechanical, chemical) represent pragmatic boundaries, because each specialty will have specific ways of addressing problems, which emerge from differences in educational background as well as institutionalized approaches (Shuchman, 1981).

One of the more interesing findings of my research is the fact that many contributors appeared to cross pragmatic boundaries with relative ease, developing a special way of balancing both specialization and integration. This is evidenced by the fact that a wider range of commenting is associated with a greater number of expert ratings. In addition, there is a large number of individuals who engage with the ENoP to seek information from other specialties. Thus, there appears to be an active desire to cross specialist boundaries when seeking information, a capability equaled by respopndents.

To a large extent, this is somewhat surprising given the traditional depiction of pragmatic boundaries as difficult to cross (Carlile, 2002; Carlile, 2004). This places the ENoP in a unique context, which is one that facilitates the exchange of information across pragmatic boundaries in a way that appears both easy and natural. However, the extent to which this information is then integrated back into practice is

unknown. It is possible that a person esteems the information they receive from a member of a different specialty as valuable; however, they may not have the requisite skills to incorporate this knowledge into their existing practice. While valuable, this line of inquiry is beyond the scope of the study. However, I have demonstrated that several contributors appear capable of balancing their own specialist perspective with that of the broader domain of engineering, which allows them to communicate effectively with other specialties. It appears that there is a specific discursive competency that emerges in this setting, which I explore in the following section on interactional expertise.

6.8 Interactional Expertise

My findings revealed that individuals who contributed across multiple forums and specialties were comparatively more likely to have a given nomination rated as expert. To state this in more basic terms, this means that individuals who have a larger range of contributions are more likely to be perceived as expert. This is not an intuitive finding, because one might expect contributory experts—who specialize in a small niche—to be more esteemed in this context.

To interpret these surprising results, I step away from the traditional practice-based view of the ENoP to use a framework of interactional expertise that relies on a linguistic framework to explain why these types of contributions may be particularly valued. I combine my findings in this area with other relationships observed in the community (i.e. high prevalence of cross-speciality information-sharing and greater likelihood of nominating people outside one's own area of expertise), to form an overall understanding of the types of people who share valued information in the ENoP.

Taken together, my findings suggest that people who are most esteemed in the ENoP are likely to possess the ability to engage in dialogue with a large group whose members are likely to have diverse backgrounds, perspectives and knowledge levels. To be perceived as an expert in this context, an individual must have the ability to communicate that knowledge effectively, even within the limitations placed on communication by the use of virtual technology. Interactional expertise is the ability to communicate ideas related to a specific practice—although that person might not actually perform that specific practice (Collins and Evans, 2007). In the context of this study, I focus more on a conceptualization of 'interactional expertise' as the ability to communicate among specialties, for example the ability of the chemical engineer to communicate with the structural engineer. I have previously discussed the difficulties of operationalizing a 'practice' in 6.6, suggesting that engineering could be conceptualized as a very loosely knit practice, with distinctly different competencies and divisions between specialties.

6.8.1 Linguistic benefits of Interactional Expertise

One of the benefits of interactional expertise identified by Collins and Evans (2007) is the ability of interactional experts to engage laypersons in a meaningful dialogue on a given topic without becoming mired in technology or overburdening their audience with too much information. This positions interactional experts as more knowledgeable than the layperson—who does not perform the practice—but less knowledgeable than the contributory expert, who performs the practice. In essence, interactional expertise is the capacity to understand a practice and explain that practice in clear succinct language. While the actual work practices of a chemical engineer may not overlap with that of the structural engineer, he/she may possess sufficient knowledge of structural engineering to engage in a dialogue with

his/her peer. An interactional expert will have the ability to sound like they practice in a given domain (i.e. speak the lingo), but does not actually practice in that area (Collins and Evans, 2007).

I suggest that interactional expertise may be particularly valued in the context of the ENoP for several reasons. Firstly, the structure of communication in the ENoP is likely to restrict the length of dialogue that can occur, so to communicate effectively, people must employ language in a way that is both straightforward and explanatory. Secondly, there is a large amount of cross-specialty information-seeking in ENoPs, which hints at the diversity in these networks. Due to the presence of this diversity, a person sharing information cannot assume there is knowledge overlap among their interaction partners. For this reason, a person sharing information must be able to articulate complex ideas without relying excessively on jargon or the assumption that an interaction partner possesses the same knowledge level. Thirdly, a bias in perceptions of knowledge means that individuals are more likely to perceive contributions outside of their immediate domain of speciality as particularly insightful, as discussed in 6.4.1. This means the ability to effectively translate ideas from one domain to another in a straightforward and clear manner may be seen as particularly insightful in this context.

I have suggested an important element of perceived expertise in ENoPs is the quality of explanation of the reply. Specifically, I suggest that 'quality' is not evocative of technical expertise, but the ability to express that expertise in a way that makes sense to a diverse group that share a loosely knit profession. Not only does this have ramifications for who is likely to be considered an expert in the community, but it has implications for certain types of practices themselves.

An experiment performed by Collins and Evans (2007) reveals that experts appear to have extreme difficulty distinguishing between interactional experts—who are able to speak in the dialogue of the practice—and contributory experts who perform the practice itself. In this experiment, Collins uses his familiarity with gravitational wave physics—or his interactional expertise—to answer a series of questions about the practice without referring to source material. A contributory expert, or practitioner in the field, also answers these questions. The two sets of answers where then submitted to experts in the field who then tried to determine which person was the contributory expert (i.e. practitioner) and which was the interactional expert. The expert panel experienced difficulty correctly identifying the true practitioner (out of the 9 judges, 7 professed uncertainty, while 2 incorrectly identified Collins as the practitioner.) Those who incorrectly identified Collins as the expert professed a preference for his style of answering, because it did not appear as if he 'answered by looking [it] up in a book' but that his replies 'came rapidly out of the mind.' (Collins and Evans, 2007, p. 107). Thus, the language capacity of the interactional expert is so advanced that even practitioners of the field (i.e. other contributory experts) experience difficulties discerning between contributory experts and interactional experts.

While the basic intention of Collins and Evans (2007) was to show that interactional expertise would allow a person to 'talk the talk' of a profession in a way that would allow them to 'fit in' with contributory experts, I have applied this concept slightly differently in my research. Specifically, I am not interested in efforts to 'passing off'; instead, I am interested in understanding how people who are not members of a specific group employ language of that group to communicate more effectively. That is to say, in the context of the ENoP, I suggest that

interactional experts are those people who know enough about different specialties to explain a foreign concept in a way that is meaningful and intuitive, rather than relying on the jargon that characterizes a specific profession. Thus, the outcome which I am interested in when I speak of interactional expertise is not related to creating the illusion of a shared professional practice, but on the ability to create a shared dialogue. For these reasons, in the ENoP appears to be a specific case or context in which interactional expertise is—in some cases—more important than contributory expertise. From a theoretical perspective, my research in this area builds on Collins and Evans (2007) work by identifying a specific work-related context in which interactional expertise is particularly valuable.

While the straightforward language employed by interactional experts might increase the accessibility of information in the ENoP context, there is a potential for problems to emerge in relation to the specific advice dispensed by interactional experts. In the study discussed above, one of the answers provided by Collins was not technically incorrect; however, one of the expert judges suggested it was somewhat unpractical, and could not be considered the 'best' answer. This highlights a potential problem with interactional expertise, namely the potential for disconnect between an answer that may be perceived as best, and one that is best in reality.

6.8.2 Interactional Expertise in the ENoP

I have suggested that familiarity with a range of practices may give some contributors interactional expertise, or the ability to engage with the language of a practice without necessarily performing the practice. For the ENoP members who possess interactional expertise, it is likely that these capabilities were developed in

an idiosyncratic manner. Interactional expertise might emerge from some previous exposure to different specialties, either from the ENoP, one's offline interactions, including books, classes, discussions, or work projects. Regardless of how interactional expertise was developed, membership in the ENoP is likely to either build or reinforce one's ability to be conversant in many specialties, because it can provide repeated exposure to terminology, knowledge, and concepts found in other fields. By reading forums and engaging in the network, members may continually increase their ability to communicate with a diverse group found in the ENoP.

From a theoretical perspective, the conceptualization of interactional experts as the knowledge centres of the ENoP has important ramifications for the way we view community experts and contributors. Firstly, these findings suggest that the type of interaction characterized by virtually mediated communication produces conditions that are favourable to those people possessing interactional expertise. Specifically, there is a potential for interactional expertise to be valued over contributory expertise because individuals are able to employ language more effectively to communicate knowledge to the diverse audience of the ENoP. Ultimately, this has ramifications for the types of people motivated to engage in the ENoP.

As acknowledged in my literature review in 2.2.6.2, there is a growing body of research focused on ego-centric motivations to contribute to online communities. Specifically, recent research on online communities has addressed their importance in fulfilling important needs, such as status and reputation (e.g. Lampel and Bhalla, 2007). Although it was not intentional, my research in this area may also make a meaningful contribution to the study of motivations to contribute. Generally speaking, interactional experts are unlikely to be highly esteemed in a community of

contributory experts, because interactional experts do not actually have the capacity to extend or develop practice (Collins and Evans, 2007). However, interactional expertise may be esteemed in an ENoP. In this way, a 'jack-of-all-trades' but a 'practitioner-of-none' may be perceived as more knowledgeable than an expert practitioner in a niche area who does not possess the ability to communicate those ideas without resorting to jargon that confuses or confounds the information-seeker. This discussion here has surfaced an important deficit in the literature on contributory motives in online knowledge-sharing communities: the fact that these studies have not adequately explored the extent to which ENoPs supplement needs that may not be met in the offline environment.

To summarize, my findings in this area are perhaps one of my strongest contributions to theory. Specifically, I have found that individuals who possess a range of expertise are more likely to obtain expert nominations. I suggest that this is because these individuals have interactional expertise, which allows them to understand a problem set, but forces them to rely on more intuitive explanations and a more simplistic language that lacks institutionalized jargon. My line of inquiry here is somewhat exploratory in nature, and further refinement and research should be conducted to better establish a relationship between range of expertise and the development of interactional expertise.

6.9 Concluding thoughts on Practice-based Approach

In general, my research into ENoPs reveals a difficulty in operationalizing practice, with my results revealing a tension between the practice-based view of knowledge and the people most likely to be perceived as expert. Specifically, those with a wider range of replies are more likely to obtain expert nominations,

suggesting effective contributors develop ways of balancing both specialization and integration. I suggest that effective contributors have the ability to use language to engage others, and thus interactional expertise may be particularly important in the ENoP. Finally, my findings suggest that the ENoP is an area where people connect outside of their immediate practice.

Taken together, these findings have important ramifications for the conceptualization of ENoPs as situated in practice. Specifically, the large amount of boundary-crossing that occurs in these communities suggests that ENoPs may more closely approximate Electronic Networks of Dialogue, in which the boundaries of a specific practice are crossed through a discussion. In CoPs, boundaries appear to be more rigid, which is evidenced in the research by Swan et al. (2002), who found that practitioners experienced difficulties communicating with practitioners from a different domain. Compared to the information-sharing patterns in a CoP, my findings here regarding the amount of cross-specialty information-seeking, and replies across multiple specialties or domains of expertise would represent an anomaly. Since the ENoP represents a place to seek and find information within a broad and loosely defined practice, I suggest it is more appropriate to reconceptualise these groups as Electronic Networks of Dialogue. Table 10 incorporates these findings into my running summary table.

MOTIVATING FACTORS	RESEARCH QUESTIONS	METHODOLOGY	OUTCOME	THEORETICAL CONTRIBUTION
Body of research on informational benefits offline (i.e. Cross et al., 2001) but not online. Generally know little about the dyamics of exchange in ENoPs (Whelan, 2007).	**What types of information do members seek in ENoPs?** (Within specialty or outside of speciality? What types of informational benefits?)	1) Determine % of queries asked within and outside one's specialist area. 2) Code queries to assess which of the 5 informational benefits are sought. Determine percentage of each category	1) 54% outside of one's own specialty 2)Focus is on solutions, meta-knowledge & validation. Greater emphasis on solutions for cross-specialty queries	Identifies ENoP as centre of information-sharing across specialties. Extends Cross et al. (2001) to online context, revealing pattern of info-seeking different from hypothesized, most likely due to anonymity and range of access. High validating focus similar in friendship ties.
Information-seeking part of the dialogical process of knowledge creation (Tsoukas, 2009), so may also be perceived as form of expertise	**How is information-seeking perceived in ENoPs?** (Is it a source of expertise?)	Partial correlation between queries and expert nominations	Very weak negative relationship. Queries (i.e. information-seeking) does not lead to the accrual of expert nominations.	Indicates souce of perceived expertise is in reply, not query. In online communities not all parts of the "dialogue" equally valued. Anecdotal evidence for possible exceptions (e.g. Beginners' eyes).
Expertise tends to be associated with highly specific skills (e.g. Collins and Evans, 2007), but exchange may be impeded by virtual communication (e.g. Cherny, 1999). More investigation needed to ascertain whether expertise is also highly specified in an online environment.	**Are the contributions of perceived experts valued in only a specific/narrow domain?** (Does commenting in multiple areas reduce number of nominations?)	Partial correlation between # of forums one replied in & expert noms. received; Partial correlation between # of specialties one replied in & expert noms. received; Linear Regression between expert noms. and different types of replies.	Range of information associated with increased number of nominantions.	Generalists may be better regarded than specialists. Interactional expertise a likely source of advantage in ENoPs, possibly due to diversity of members and medium of communication. Rewards for interactional experts in ENoP may not occur at same level offline, potential motivate to contribute.
Knowledge the product of a joint enterprise in CoP (Wenger, 1998). When it is not a joint enterprise, we do not know the types of people most likely to produce 'knowledge.'	**What characteristics are associated with perceived experts?**	Linear Regression with using metrics mined from network	Most associated with replies, followed by logins, number of nominations given out, queries, and number of forums in which one commented	Expert and core group share several key characteristics. High prevalence of persons with single comment in my sample may also point toward a pattern of de-lurking to comment.

Table 10: Relationship between literature, research questions, methodology, results, findings& theoretical contributions

6.10 Chapter Summary

In this chapter, I examine the implications of my research findings. My discussions centre on the type of information-seeking, perceptions of information-seeking, and perceived expertise in ENoPs. In the course of my discussion, I examine several probable reasons for the ENoP's emphasis on cross-specialty information sharing that I observed. I then extend theory on information-sharing by applying Cross et al.'s (2001) framework of information-seeking benefits to the virtually mediated context, relying on anonymity to explain why my results were very different from what the authors hypothesized, with interactions in the ENoP appearing similar to that of friendship networks. Next, I probe the reasons why queries may not be perceived as a source of expertise and discuss possible contingencies to this finding. I then explore why contributing across multiple specialities is associated with greater perceptions of expertise. I do so by examining nomination patterns and relying on a framework of interactional expertise to explain my findings. In addition, I discuss more generally the relationship that may exist between core contributors and perceived experts. I then discuss what my findings mean for theory, exploring the theoretical implications for the practice based approach, our understandings of how pragmatic boundaries are crossed in ENoPs, and the way language is employed to cross these boundaries through interactional expertise. Finally, I conclude this chapter by discussing in greater detail my contributions to theory and highlighting some of the distinctive informational benefits associated with ENoPs. I then briefly discuss the practical ramifications of my findings.

Collectively, my research in this area explores the type and valuation of information in ENoPs. My work here represents a novel contribution because this is

the first time these issues have been empirically examined in this type of setting. Although several of my findings are somewhat exploratory in nature, they create a framework from which to extend and develop additional research.

VII. CONCLUSION

7.1 Introduction

This chapter provides a conclusion to my work. In the preceding chapters, this work was introduced, the relevant literature reviewed, the context and methodology described, the results presented, and the findings discussed. The main aim of this research was to **understand the type of information sought in ENoPs and the factors associated with perceived expertise in these networks.** Understanding how ENoPs meet information needs is important for two main reasons. Firstly, as a particular type of online community, ENoPs are likely to assume an growing degree of importance due to an increased reliance on virtual technologies and the presence of high information demand in certain professions (e.g. physician, lawyer, engineer) (Preece, 2000; Shuchman, 1981). Secondly, the scholarship dealing with ENoPs—and online communities in general—is rather limited. Previous work tended to focus more heavily on understanding the structure of these communities and motivations to contribute (e.g. Wasko and Faraj, 2005; Wasko and Faraj, 2000; Ardichivelli, Page, and Wentling, 2003; Zboralski, 2009; Ardichivelli, 2008). This has led to a lack of clarity about "the dynamics of knowledge exchange that occur within these electronic networks" (Whelan, 2007, pg. 5), which include the type of information that is sought and valued in these networks.

This research had three main objectives that arose from my desire to understand the dynamics of information-seeking and valuation of the knowledge received in ENoPs:

- assess the type of information sought in ENoPs;

- examine how information-seeking behaviour is related to perceptions of expertise;
- understand the characteristics associated with perceptions of expertise in ENoPs;

Each of these objectives has been satisfied. ENoPs were found to be an important vehicle for accessing and exchanging information across specialities. Nearly half of the time individuals used ENoPs to seek information, the focus of their query was outside of their own specialty. The type of information sought varied by specialty as well. Individuals were more likely to seek meta-knowledge and validation when searching for information in their own specialty, while they were more likely to seek solutions when searching outside their specialty. This pattern of information-seeking is likely to emerge from the anonymous nature of the community, the communication medium used, and the fact the ENoP may supplement the knowledge that is available in one's offline network.

During the course of my analysis, I found that information-seeking was not generally perceived as a source of expertise or knowledge, and replies are the type of responses most closely associated with expert nominations. However, there may be certain exceptions to this finding. I use anecdotal evidence to discuss conditions in which queries might be perceived as particularly insightful, such as questions developed at the level of laypersons. I suggest there is a limited amount of evidence to support the idea these questions may be particularly likely to facilitate community dialogue, producing a line of research that demands additional attention. In general, I suggest researchers in this area ought to focus on understanding the conditions in which a query is perceived as a form of expert knowledge or insight in its own right.

Finally, my research examined the various factors associated with perceptions of expertise in ENoPs. I found that commenting across multiple specialties was associated with increased perceptions of expertise, as measured by nominations. Those individuals who have the capability to interact with a diverse audience—whether it proceeds membership in the ENoP or arises because of it—are more likely to make meaningful contributions, and may be more likely to obtain expert nominations. Reconciling this finding with theories of interactional expertise suggests these individuals may possess linguistic abilities that allow them to communicate more effectively with people in their own area of expertise. My findings here are particularly important because they suggest valued contributors develop skill sets, such as linguistic capabilities, that allow them to navigate the boundaries of a given practice. This may be particularly helpful in the context of the ENoP, where 'common practice' tends to be loosely knit at best.

7.2 Contributions to Knowledge

The following two sections summarize the contributions to theoretical and practical knowledge. My theoretical contributions rest in the extension of the information-seeking network to the virtual environment, and the identification of interactional expertise as an important source of knowledge in ENoPs. I suggest the fragmented structure of the 'common practice' in this context means that highly valued contributors in the ENoP must develop ways of balancing both specialisation and integration. My findings and discussion here brings forth a tension in the practice-based view of the ENoP, which is evidenced by the difficulties operationalizing 'common practice' in this context, and the fact that the ability to communicate outside one's immediate area of expertise is viewed favourably. My

practical contributions reside primarily in the enhanced understanding of the ways that ENoPs can meet information needs.

7.2.1 Contributions to Theoretical Knowledge

One of my main contributions to theory was the examination of the content of information-seeking that occurred within ENoPs. This contributed to literature on online communities by articulating the type of informational benefits these communities offer, while simultaneously contributing to the literature on information-seeking benefits by extending Cross et al. (2001) research to the online environment. To date, most theorizing around online communities and ENoPs has focused primarily on understanding the motivations for contribution and sustained engagement (e.g. Wasko and Faraj, 2005; Wasko and Faraj, 2000; Ardichivelli, Page, and Wentling, 2003; Zboralski, 2009; Ardichivelli, 2008). My research represented a departure from this tradition by stepping away from understanding the quantity of contributions to understanding the type of informational benefits sought from the community. By cataloguing the types of information users want to 'get' from their involvement in the community, we have a more articulate picture of the distinct information needs ENoPs fulfil. This has the effect of further delineating the ENoP as a distinct form of organizing and exchanging.

My research findings allowed me to articulate the type of informational needs these communities fulfilled. Firstly, I found that ENoPs are frequently used to seek information outside one's specialty or immediate area of expertise. This suggests that these types of communities likely play an important role in the information-seeking process by providing the ability to connect to individuals with unique perspectives who may reside outside one's face-to-face network. Face-to-face social

networks tend to be dominated by homophily which may adversely impact a person's ability to gain access to diverse perspectives (McPherson et al., 2001; Anderson and Jay, 1985). The ENoP might be particularly valuable due to its ability to supplement one's face-to-face social network by increasing the range of access to expert individuals outside of one's own network.

My findings also reveal that ENoPs are used as a source of information validation relatively often, especially for individuals who are seeking information within their own specialty. This is finding actually stands in contrast to Cross et al.'s (2001) hypothesized pattern of online information-seeking. I have suggested that the anonymity these networks offer can override the problems associated with virtual communication to make the ENoP a particularly alluring space to seek validation. Specifically, these networks offer the ability to gain access to answers without compromising one's organizational status. In general, the ENoP fulfils many of the same informational benefits as friendship networks, although problem reformulation or legitimation is not an explicit outcome associated with the ENoP. However, it is highly probable that reading the forums facilitates problem reformulation and allows individuals to engage with their practice on a different level. On the whole, my findings have contributed to theory by identifying the informational benefits associated with online communities and ENoPs in general. Of my findings here, my most important finding may reside in the identification of certain types of expertise that may be of high utility in these communities.

Specifically, I have suggested people with interactional expertise may be more valued in ENoPs due to their ability to communicate ideas more effectively by employing the language of other specialties. Essentially, the ability to discuss topics

in a way that 'make sense' to people who are not expert in that area is particularly crucial due to the high number of cross-speciality information-seeking queries in ENoPs. Some of the more exploratory research of Collins and Evans (2007) suggests that interactional experts are more likely to rely on intuitive logic, and are less likely to use jargon. I suggest this type of language and logic used by interactional experts may be particularly appealing in areas where multiple specialities exchange knowledge and information. Furthermore, I suggest interactional expertise is particularly crucial in environments that depend on virtual technology to broker exchanges, such as the ENoP, because reliance on asynchronous communication means the opportunity for immediate clarification is reduced.

Incidentally, this finding may be particularly relevant to the work researchers have performed on motivations to contribute in online communities, because the ENoP may represent a unique context where the interactional expert is highly esteemed for their ability to communicate with multiple specialties. Engaging with the ENoP could be a way for the interactional expert to obtain recognition for their knowledge, thereby meeting esteem needs that are not met in the offline environment. Additional research in this area should be conducted to explore these initial findings.

From a theoretical aspect, one of my most important findings here is the impact this research has for the practice-based view. In particular, my research reveals there are many layers of practice, which include occupation, specialty, and domain of expertise. Therefore, it is difficult to define a 'common practice' in specific or narrow terms in the context of the ENoP, a fact which serves to further

divide the ENoP from the practice-based literature of the CoP. In addition, the ENoP's high valuation of interactional expertise further suggests that overlapping practice is not essential to information-sharing in the context of the ENoP. Thus, my research here brings forth a tension with the traditional practice-based view, which is the possibility that a shared practice is not an essential antecedent to effective information-sharing in this context. I suggest these entities might be better conceptualized as Electronic Networks of Dialogue rather than Electronic Networks of Practice due to the fact that most exchanges occur across different types and levels of practice.

7.2.2 Contributions to Practical Knowledge

By examining the type of information members seek and value in ENoPs, this work is also able to make a contribution to practical knowledge. Specifically, I suggest my findings here may benefit organizations and their employees, as well as managers of ENoPs.

My research may help organizations better understand how they might capitalize on ENoPs to acquire informational benefits. Organizations are continually produced to leverage knowledge resources to produce innovative gains, and encouraging membership in ENoPs is one way to facilitate the growth of knowledge. At a more individual level, ENoPs can be used to increase one's access to information without compromising status or reputation by asking peers in the organization. I have suggested that the ENoP produced a high number of validating queries due to its members' anonymity, and organizations can benefit from this finding by possible providing an anonymous or 'non-judgmental' space where persons on a similar technical level can seek and exchange information without incurring professional

ramifications for their questions. This might reduce some of the social and reputational costs associated with seeking information, and could enhance the flow of information through the organization. In addition, engaging with the ENoP might be a way to build for a practitioner to build their understanding of different specialties, and develop the ability to engage with those specialties.

Understanding the type of information that members seek from ENoPs can help managers of ENoPs build more effective communities. For example, the fact that 28% of individuals seek meta-knowledge from the network highlights the fact that many individuals using the ENoP do so to obtain resources that will allow them to perform their job. Developers of ENoPs can create resource portals to meet these needs, or create a specific area of the site that addresses these types of queries. My findings also highlight the extent to which the ENoP is used as a vehicle to exchange information across specialities. This has ramifications for the way that ENoP managers should structure the community, and generally indicates that a broad approach and inclusive ENoP could provide informational benefits by encouraging the exchange of information across specialties. In addition, I found that a large number of individuals perceived as experts only posted to the community once, and their period of active membership was relatively brief. This may possibly be due to a trend of 'de-lurking' to answer a specific query. This highlights the importance of openness and low barriers to entry, which can facilitate valuable, yet singular, contributions.

Generally speaking, this research has many potential practical benefits for organizations and moderators of ENoPs. These benefits include highlighting the type of information-seeking that occurs in these communities, which can lead to

more effective structuring of ENoPs while simultaneously giving organizations ideas on how they can capitalize on these communities. For members of ENoPs who want to obtain more nominations, my work emphasizes the types of behaviours that may increase perceived expertise (i.e. nominating others and engaging in replies).

7.3 Limitations of the Research

Like most research, this work has several limitations. The main limitation of this work is that it is confined to a single context in a single profession. Therefore, the generalizability of these research findings to other professions or other ENoPs is difficult to assess. However, given the similarities ENoPs share—namely the potential for anonymity and the ability to easily connect to a large number of experts both within and outside one's own areas of specialty—it is likely this research has implications for many types of online communities devoted to the discussion of specific practices. Further research that both tests and extends these findings is should be conducted to ensure its generalizability.

My research focused on gathering data that was 'visible,' meaning that members' motivations for giving nominations or answering questions were not assessed in the course of my analysis. In addition, my data did not account for friendship ties in the network itself. Thus, all my analyses were based on what one could 'see' in the forum. This is problematic to some extent because the presence of relationships could have influenced nomination patterns. Furthermore, the data used for my linear regression did not discern between types of replies, or types of information-seeking queries. This is somewhat problematic because there are fundamental differences in information-seeking. A request for a solution is not the same as a request for meta-knowledge; therefore, we should also anticipate a difference between a reply that

provides a solution, a reply that validates a solution, and a reply that suggests consulting another resource. To an extent, some of these issues were minimized through my use of a large sample size, which ensured my data represented a range of different queries, and minimized the potential for 'friendship ties' to influence data patterns.

Finally, my data collection produced several limitations that are discussed more exhaustively in 4.5. Most notably was my reliance on Cross et al. (2001)'s work on information-seeking benefits, which determined the way data were collected and analysed in this study. Essentially, my reliance on this past work meant that no new or different categories of information-seeking benefits could develop in the course of this study. However, an initial foray into grounded theory supported this decision as the best course of action.

7.4 Recommendations for Further Research

The work highlights several areas where additional research should be undertaken. One of the most obvious lines of further research is the extension of these findings into ENoPs in other contexts. Since this work was primarily exploratory in nature, it was logical to restrict it to one context to minimize the potential for exogenous variables to influence outcomes. Research in additional contexts is necessary to ascertain whether the results I found were applicable to other ENoPs as well. An expansion of this research would allow us to speak more authoritatively about the role ENoPs play in the information-seeking process, and the extent to which interactional expertise is perceived as essential to exchange information across specialties. Furthermore, it would reveal the extent to which fragmentation exists in other domains of 'common practice.'

A second logical extension of this research is to understand the conditions that lead people to seek information from ENoPs. Specifically, I would like to confirm whether people consult ENoPs because of sensitive information needs (e.g. they are concerned they would lose status or reputation by consulting peers in their face-to-face network), the inability to receive an adequate answer from one's peers, or if it simply represents the potential to capitalize on—what a user might perceive as—a more diverse range of knowledge. Although my analysis of the data do suggest the reasons for certain contribution patterns, such as the desire to maintain anonymity, additional confirmatory work should be carried out in this area.

A third extension should focus on the types of questions that produce large volumes of exchange. This could dig deeper into a dialogical approach to knowledge creation, enabling a more comprehensive understanding of how virtually-mediated dialogue leads to the development of new knowledge. While the type of question (i.e. meta-analysis, solution, validation, etc.) did not appear to influence the quantity of response, it was clear the relative 'interestingness' of a question did influence the number of responses and the detail level of those responses. As I discuss in 6.3, the type of queries that are associated with beginners might be a particularly insightful line of research. In regards to understanding the sustainability of both online CoPs and ENoPs, I believe understanding how 'interesting' questions produce 'interesting' responses is particularly relevant. For this reason, the long-term survival of an online community may depend—to an extent—on the appeal or 'interestingness' of the queries developed in the community.

My reliance on Cross et al.'s (2001) work has framed my thesis to a substantial degree, which I have discussed at length in 4.3.2. While my initial foray into

grounded theory revealed these categories might be the most appropriate way of categorizing or understanding queries, there is a clear potential to build on this taxonomy. In the above discussion, I suggest exploring what types of queries are particularly useful or interesting to community members, which is the most obvious way of building on this research. However, I suggest extending this further by examining how tenure in the ENoP influences the type of information sought from the ENoP. For example, do novices of a practice seek different types of information than experts of that practice? Could the differences observed in seeking information within and across specialty be attributed to experience? For example, are the information-seeking patterns of a newly minted chemical engineer similar to that of a mechanical engineer seeking information in the chemical engineering domain? This is an important area of research that demands further attention.

In addition, given the increasing prevalence of ENoPs in the last dozen years (Agterberg et al., 2010), it is possible these communities have influenced the way individuals seek information in the face-to-face environment. In essence, it is possible that ENoPs may now shape offline information-seeking behaviour. A socio-material perspective would suggest the actual practice of information-seeking in certain professions might have developed over time with enhanced access to electronic communities (Orlikowski, 2007). For this reason, further research on general information-seeking practices—both online and offline—should be conducted. Ultimately, this may lead to a revision or refinement in Cross et. al's (2001) work on face-to-face information seeking.

My final suggestion for extending my research focuses more specifically on my findings related to interactional expertise. The data I have presented in this paper

suggests that interactional expertise may be particularly valuable for effective communication in ENoPs. However, the extent to which interactional expertise might be a precursor to involvement in the ENoP, or emerge as a result of involvement in the ENoP, is not entirely understood. If ENoPs do facilitate the development of interactional expertise, it would be important to examine how this influences a person's position or status in their offline environment. This line of inquiry merits additional research, because it will allow us to understand the value added by ENoPs and the type of people most valued in them.

7.5 Summary

Given the breadth of information discussed in this thesis, I will aim to provide as succinct a summary as possible. Perhaps the most important aspect of this thesis is its focus on understanding the *type and perceived value* of information sought in an ENoP. To date, there has been insufficient attention on the actual dynamics of exchange in these communities (Whelan, 2007); my research attempts to remedy this issue by examining the specific informational needs these communities fulfil and the types of people most likely to fulfil them. In this way, I contribute to the growing literature on ENoPs by sharpening our definition of these entities, while simultaneously extending Cross et al.'s (2001) information-seeking typology to online communities. This has allowed me to articulate the specific types of informational benefits generated in ENoPs. My findings in these areas reveal information-seeking in ENoPs tends to focus on acquiring information across specialist boundaries, and the types of queries in these communities are similar to those directed toward trusted friends. Furthermore, interactional experts may be particularly helpful in facilitating effective information exchange due to their enhanced linguistic capabilities. My findings here bring into sharp relief the

difficulties of operationalizing a 'practice' and I suggest that these entities are unique due to their ability to facilitate exchange across boundaries. For this reason, I suggest a reconceptualization of these communities as Electronic Networks of Dialogue may be more appropriate.

VIII. REFERENCES

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