

ORGANIZATIONAL COMMUNITY CHARACTERISTICS AND BARRIERS TO  
ENVIRONMENTAL MANAGEMENT: ADDRESSING THE ROLE OF  
COMMUNITIES OF PRACTICE, LANGUAGE, AND MENTAL MODELS IN  
ORGANIZATIONAL CHANGE

by

Geneviève Mireille Perron

Submitted in partial fulfilment of the requirements  
for the degree of Doctor of Philosophy

at

Dalhousie University  
Halifax, Nova Scotia  
June 2011

© Copyright by Geneviève Mireille Perron, 2011

DALHOUSIE UNIVERSITY

Interdisciplinary PhD Program

The undersigned hereby certify that they have read and recommend to the Interdisciplinary PhD Program for acceptance a thesis entitled “ORGANIZATIONAL COMMUNITY CHARACTERISTICS AND BARRIERS TO ENVIRONMENTAL MANAGEMENT: ADDRESSING THE ROLE OF COMMUNITIES OF PRACTICE, LANGUAGE, AND MENTAL MODELS IN ORGANIZATIONAL CHANGE” by Geneviève Mireille Perron in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

Dated: 13 June 2011

Supervisor: \_\_\_\_\_

Readers: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

DALHOUSIE UNIVERSITY

DATE: 13 June 2011

AUTHOR: Geneviève Mireille Perron

TITLE: ORGANIZATIONAL COMMUNITY CHARACTERISTICS AND  
BARRIERS TO ENVIRONMENTAL MANAGEMENT: ADDRESSING  
THE ROLE OF COMMUNITIES OF PRACTICE, LANGUAGE, AND  
MENTAL MODELS IN ORGANIZATIONAL CHANGE

DEPARTMENT OR SCHOOL: Interdisciplinary PhD Program

DEGREE: PhD CONVOCATION: October YEAR: 2011

Permission is herewith granted to Dalhousie University to circulate and to have copied for non-commercial purposes, at its discretion, the above title upon the request of individuals or institutions. I understand that my thesis will be electronically available to the public.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

The author attests that permission has been obtained for the use of any copyrighted material appearing in the thesis (other than the brief excerpts requiring only proper acknowledgement in scholarly writing), and that all such use is clearly acknowledged.

---

Signature of Author

## DEDICATION PAGE

À mon frère Pascal Perron, il aurait été si fier.

-

To my brother Pascal Perron, he would have been so proud.

# TABLE OF CONTENTS

List of Tables .....	viii
List of Figures .....	x
Abstract .....	xi
List of Abbreviations Used .....	xii
Acknowledgements .....	xiii
CHAPTER 1      Introduction .....	1
1.1      Main Theories .....	2
1.1.1      Communities Of Practice Theory .....	2
1.1.2      Social Identity Theory .....	5
1.1.3      Symbolic Interactionism Theory .....	7
1.1.4      Mental Model Theory .....	8
1.2      Theory Interaction .....	9
1.3      Research Objectives .....	13
1.4      Thesis Structure .....	15
1.5      References .....	16
CHAPTER 2      Documenting Some Speculation from the Theory of Communities of Practice: Assessing Environmental and Business Community Identity from Linguistic Repertoires .....	21
2.1      Abstract .....	22
2.2      Introduction .....	23
2.2.1      Creating Solutions in Environmental Management ...	24
2.2.2      Language and Community Barriers .....	26
2.2.3      Communities and Common Environmental Issues ..	27
2.3      Method .....	29
2.3.1      Content Analysis .....	32
2.4      Results and Discussion .....	34
2.4.1      Content Analysis .....	41
2.5      Conclusion .....	43
2.6      References .....	45

CHAPTER 3	Apprenticeship in a Modern Age: A Study of the Use of Lanugage Repertoires from Communities of Practice.....	48
3.1	Abstract .....	49
3.2	Introduction .....	50
3.2.1	Background .....	51
3.2.2	Language and Cop .....	52
3.2.3	Levels of Membership .....	53
3.2.4	Apprenticeship .....	54
3.2.5	Communities of Interest .....	55
3.3	Method .....	57
3.4	Results and Discussion .....	59
3.4.1	Additional Observations .....	67
3.5	Conclusion .....	69
3.6	References .....	71
CHAPTER 4	Organizational Mental Models and Natural Resources: A Study of Change .....	74
4.1	Abstract.....	75
4.2	Introduction .....	76
4.2.1	Models for Action .....	77
4.2.2	Mental Models and Decision-Making.....	78
4.2.3	Mental Models in Organizations .....	80
4.2.4	Change for the Environmental Information Orphan ..	81
4.3	Method .....	82
4.3.1	The Participants.....	85
4.4	Results and Discussion .....	86
4.4.1	The Change Content of Comments .....	92
4.4.2	On the Case Studies .....	95
4.4.3	Changing the Organizational Mental Model .....	101
4.5	Conclusions .....	104
4.6	References .....	106
CHAPTER 5	Conclusions .....	110
5.1	On the First Study .....	110

5.1.1 First Study Limitations.....	112
5.2 On the Second Study .....	113
5.2.1 Second Study Limitations.....	117
5.3 On the Third Study .....	118
5.3.1 Third Study Limitations.....	119
5.4 Contribution to Other Related Theories.....	120
5.5 Future Research.....	123
5.6 References .....	129
Bibliography.....	131

## List of Tables

Table 2.1	Selection of field-specific concepts for linguistic repertoire. ....	30
Table 2.2	Content analysis coding criteria. ....	33
Table 2.3	Significant different results when comparing the self-reported familiar concepts of the environmental community and business community (p<.05, 18 df). ....	34
Table 2.4	Significantly different results when comparing the self-reported environmental community's selection of relevant concepts for the environmental community of practice compared to the business community of practice (p<.05, 18 df). ....	36
Table 2.5	Significantly different results when comparing the self-reported business community's selection of relevant concepts for the environmental community of practice compared to the business community of practice (p<.05, 18 df). ....	38
Table 2.6	Number of significant differences when comparing the sets of field-specific concepts where participants were grouped by self-reported membership or by program of study. ....	40
Table 2.7	Percentage of self-reported business and environmental community participants providing additional content after exposure to field-specific terminology. ....	42
Table 2.8	Percentage of participants who increased field-centricity after exposure to field-specific terminology. ....	42
Table 3.1	Field-specific concepts used in terminology exercise. ....	59
Table 3.2	Comparing the self-reported <b>environmental</b> CoI selection of familiar concepts and of relevant concepts of the equivalent CoP (p<.05, 18 df). ....	60
Table 3.3	Comparing the self-reported <b>business</b> CoI selection of familiar concepts and relevant concepts of the equivalent CoP (p<.05, 18 df). ....	61
Table 3.4	Typology of community of practice membership peripherality. ....	66
Table 4.1	Interview Likert scale values. ....	84
Table 4.2	Interview questions. ....	84



Table 4.3	Participant scores on questions regarding the identification of opportunities by the organization.....	87
Table 4.4	Participant scores on questions regarding choices and values by the organization.....	88
Table 4.5	Participant scores on questions regarding choices and values by the organization.....	90
Table 4.6	Participant responses and scores on questions regarding past experience of the organization.....	92
Table 4.7	Instances of change statements in participant commentary.....	93

## List of Figures

Figure 1.1 Communities of practice, language, and mental model interaction with organizational decision-making.....	11
Figure 3.1 Structure of membership from community of interest to community of practice.....	64
Figure 4.1 Limited processing of natural environment information for decision-making.....	102
Figure 4.2 Addition of natural environment information in decision-making.....	102
Figure 5.1 Structure of membership from community of interest to community of practice .....	116
Figure 5.2 Communities of practice, language, and mental model interaction with organizational decision-making .....	120

## **Abstract**

The current state of organizational environmental management is inadequate to face the risks posed by the natural environment such as resource scarcities resulting from natural, social and/or economic processes such as increases in extreme weather events, natural resources-based conflicts, regulatory restrictions, or trading commodities fluctuations. These changes to the organizational environment call for adaptation so that we may maintain our ability to produce and function sustainably.

Organizations need to adopt practices and processes that consider the natural environment. The adoption of environmental management practices and processes has, however, met barriers. Faced with initiatives that promise considerable financial and environmental benefits, research has reported resistance to buy-in. I suggest that perception barriers, imbedded in language, have a role to play in this lack of change. I propose that individual's mental model of the organization filters information for decision-making based on language. I suggest that the linguistic repertoire of communities of practice is used to filter information relevant to organizational decision-making.

A quantitative study showed that differences in community of practice linguistic repertoires are found between the environmental and business communities. In addition, varying levels of familiarity with the repertoire of a community of practice were explored to determine whether community membership is reflected in the linguistic repertoires of individuals. The results suggested that the familiarity of graduate students with the linguistic repertoire of the community of practice they were studying was more akin to membership in a community of interest than a community of practice. In addition, the results suggested that environmental and business communities held opposing sets of relevant linguistic repertoires, providing grounds for communication barriers.

Finally, in addition to exploring language's potential as a barrier and opportunity for change, the individual's mental models ability to change was explored. Through case study observations, I showed that a change in the individual's mental model of the organization could result from participation in an eco-efficiency program. The participants, high-level decision-makers in the organizations, introduced the natural environment as a new aspect to their future decision-making process following participation. Contributions to management and social theory are also discussed.

## **List of Abbreviations Used**

CoP	Community of practice
CoI	Community of interest
O1	Organization 1
O2	Organization 2
O3	Organization 3
O4	Organization 4

## **Acknowledgements**

I want to thank Jack Duffy for his mentoring and assistance in managing this project, for giving up a lot of his precious and sought after time, and for putting his health in harm's way to help me complete this thesis. Thank you to Richard Apostle and Raymond Côté for their support, contributions, time, and constructive approach to improving my work and my skills as a researcher. My own decision-making process has taken a few lessons I could hardly forget.

Je veux remercier mes frères Pascal et Sylvain, mon inspiration et mon idole, pour la force que je retire encore et toujours de réaliser la chance d'avoir été leur sœur. À ma mère qui aurait été satisfaite que je sois heureuse et que je passe inaperçu. À mon père qui est encore fier.

Thank you to my friends who suffered both watching me surf this process in mixed weather and having to hear me talk research while still very sober.

Thank you all, I could not and did not accomplish this alone.

## **CHAPTER 1      Introduction**

The fundamental motivation for this research is the need for change. Above all, as a practitioner, I felt overwhelmed by the inadequate pace of change towards greater implementation of environmental practices in organizations. We now cannot overlook the impact of our industrial/business practices on the environment and our health, the impact of economic growth on the quality of our groundwater, or the frequency of natural disasters. Climate change has brought a new layer of complexity to our struggle, as it is expected to engender new risks for social unrest across national boundaries, and over the resources that lie within them (Metz et al, 2007; U.S. EPA, 2010). Most of all, the long term impact of wasteful practices damage the very resources on which our economy depends. Behaviours that contribute to climate instability, or lead to a use of resources that outpaces the rate of renewal of those same resources jeopardize our future ability to produce in order to meet our needs.

The implementation of processes and behaviours that consider environmental consequences in our organizational lives is an important part of a diverse and integrated approach to changing the way we produce. The challenge seems to lie in implementation rather than opportunity. Increased efficiencies are a win-win situation for organizations. Whether they are for profit or not, resources and costs are unavoidable. There are also numerous accounts of technologies as well as case studies, fact sheets, and organizational accounts of successful implementations of environmental initiatives that produce significant organizational advantages in process and resources (Perron, 2006). Thus, the challenge appears to be changing the status quo where this information is not being used for its potential gains.

My experience in the field of organizational environmental management suggests that there is no lack of information, but a lack of credibility regarding the financial benefits of environmental initiatives (Gerrans et al., 2000; Peters and Turner, 2004). Admittedly, not all environmental initiatives produce financial advantages. A significant number, however, do provide financial advantages by creating improved efficiencies in the use of fundamental organizational resources. Initiatives such as investments in insulation at

cargo-bay doors and electronic lighting systems can save copious amounts of money using energy efficiently as well as prevent wasted energy and related pollution. This opportunity, as observed by numerous authors and other practitioners, is seldom exploited by organizations, especially small- and medium-sized organizations (Tilley, 1999; Lambert and Boons, 2002, Peters and Turner, 2004; Russell, 2005). I propose that language, in identifying group membership, can be an important barrier to using relevant information in decision-making; and, that experience with eco-efficiency initiatives can overcome barriers.

## **1.1 MAIN THEORIES**

My studies focus on community of practice theory, symbolic interactionism theory, and mental model theory, with a reference to social identity theory, to attempt to explain and intervene in the process by which organizations overlook environmental initiatives.

### **1.1.1 Communities Of Practice Theory**

The term communities of practice was coined by Jean Lave and Etienne Wenger (Lave and Wenger, 1991) to describe a form of learning that is produced, retained, and renewed by groups of people who share practices. Wenger *et al.* (2002, p.4) define communities of practice as “groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis.” They are based on the relationship of methodical work where sharing knowledge is fundamental to maintaining and expanding expertise.

The theory of communities of practice (CoP) has been of much interest to a number of fields of study including sociolinguistics (Bucholtz, 1999; Bucholtz and Hall, 2005; Davies, 2005), gender studies (Eckert, 1992; Holmes & Meyerhoff, 1999), network theory (Wong, 2008), its original field of learning (Wenger, 1998; Iverson & McPhee, 2002; Kerno, 2008;) and often in very interdisciplinary contexts (Koliba and Gajda,

2009). All this interest, however, has generated little quantitative research on CoP and, in those cases where quantitative analysis was used, it took the form of network analysis (Koliba and Gajda, 2009).

This level of multi-disciplinary interest in communities of practice may stem from the almost obvious nature of the theory, as though it described something that simply made sense. When describing communities of practice, and introducing the theory, Lave and Wenger (1991) refer to a number of existing communities of practice, including non-drinking alcoholics, quartermasters, butchers, tailors in Goa, and midwives in the Yucatan. Other communities include guilds in the Middle Ages and craftsmen, from metalworkers to potters and masons (Wenger & Snyder, 2000; Wenger et al., 2002; Kerno, 2008). Today, a long list of practices could be added to include groups such as marine biologists, economists, and even public servants.

As for their *raison d'être*, the communities of practice theory is a frame for learning. Members of communities of practice are engaged in creation with a sense of being on a common course to accomplishing more. Communities of practice theory recognizes that knowledge is a social phenomenon, that knowledge acquires meaning from people and their interactions. Knowledge is bound to, and multiplied by, the interaction of people's experiences (Wenger et al., 2002). Since the communities are based on practice, work is a central part of the process. Practice is what joins the community in order to provide an opportunity for learning. These communities are places where individuals learn both how to practice, and the meaning of these practices (Wenger, et al. 2002). Communities provide meaning to actions and direction to participation. In addition, communities of practice create a source of identity for its members.

Instances of a community of practice can be identified through what Wenger (1998) labels 'competence', and it is within the communities of practice that competence in a given practice is defined. The theory presents three dimensions of competence: 'joint enterprise' (collectively developed understanding of what their community is); 'mutuality' (norms and relationships developed through interaction); and 'shared



repertoire' (communal resources including language, routines, stories, and styles) (Wenger, 1998). The three dimensions set these communities apart from other types of communities. The mutual engagement dimension focuses on participation. It is embedded in the interactions of individuals, where exchanges are carried out, and more participation is received in return. The joint enterprise is formed by the direction that a community takes in its practice. Joint enterprise is the shared goal and drive of community members, and is constantly redirected through participation. This direction is defined by members and, in return, is instrumental in shaping it. The shared repertoire can take many forms. It is found in the symbols, language, and concepts the communities use, to name a few, and are frequently refined and reified (Wenger, 1998; Koliba & Gajda, 2009).

In addition to the three features that help define and frame what makes communities of practice different from other communities, a few characteristics are also worth noting. A number of authors and articles have suggested or addressed the place that identity and language have in communities of practice (Lave & Wenger, 1991; Wenger, 1998; Fischer, 2001; Wenger et al., 2002; Davies, 2005). In the field of sociolinguistics, this relationship is also becoming important. Bucholtz and Hall (2005) propose that language is an important function of communities of practice and Bucholtz (1999) argues that the theory of communities of practice is relevant in studying the role of language in building group identity. Language and identity are linked to the shared repertoire dimension of the community of practice, as the repertoire includes an important linguistic dimension. In fact, Wenger (1998, p.152) notes that the "dimensions of competence, [...], become dimensions of identity."

The theory of communities of practice is of particular importance to this research, not only as a theory of how people congregate to learn about how to work and how to work better, but it was the context that accurately described the worlds I love. My first love was biology, whether it be wildlife, genetics, or ethology. This has withstood the test of time to lead me into environmental protection and stewardship. My work then led me to management and organizational studies in order to improve the relationship we have with the environment with a focus on how we use and distress natural resources which has

dramatic repercussions on human personal and community health. This dual work community membership and experience of the barriers to communication in two communities of practice have affected my work and continue to influence my research.

In his book *The Two Cultures: And a Second Look*, Snow (1969) describes elegantly the experience of belonging and working in two work communities, two communities of practice. I experienced personally and daily the barriers to communication and decision-making. Specifically, the barriers born of the linguistic repertoires of the environmental and business communities of practice appeared to influence whether or not communication was welcome and the information was to be used in producing future decisions. Communities of practice associate quickly and apparently seamlessly and this seemed largely a product of the language used by each individual. I was thus motivated to better understand the role of language in the exchange of information for decision-making for communities of practice to hopefully find ways to overcome them and create more integrated and effective organizational strategies and public policies.

### 1.1.2 Social Identity Theory

Social identity theory addresses discrimination between groups based on identity (Brewer, 2001). Categorization is fundamental to our ability to make sense of the world by compartmentalizing it so as to direct our behaviour (Brewer, 2001). Once categorization has occurred, identity can be generated and, in order to provide one's self with a positive sense of self, distinctions are made to assign a positive identity to one's group (Tajfel, 1982). Social identity theory is concerned with behaviours that arise from categorization of, and self-identification with, social groups. It discusses the self in terms of its relation to others (Tajfel & Turner, 1986). Tajfel et al. (1971) suggest that our socio-cultural environment creates and values differentiation into groups to navigate our social world. People in groups are driven to categorization based on group action and are inclined to in-group favouritism (Tajfel et al., 1971). In order to situate intergroup behaviour, Tajfel et al. (1971, p.151) suggest that context for categorization is fundamental to identifying "the pertinent social criteria for the lines of division of people

into ‘us’ and ‘them’, into ingroups and outgroups.” In fact, Turner and Tajfel (1986) showed that individuals who identify themselves as members of a particular group also display ingroup favouritism (Brewer, 2001). This is of particular relevance to communities of practice as they are, in essence, a form of social grouping based on practice.

Social identity theory was unavoidable in dealing with organizations. As humans are in the end making organizational decisions, their psychological dispositions in the community context is a central factor in the study of information use for decision-making in communities of practice. Without expanding on Maslow’s hierarchy of needs, the human need to belong is a strong and fundamental need that leads to associations, groups and communities. It is a useful tendency that brings strength in numbers and opportunities to learn. As such, it is the drive for communities of practice where we join to work, learn, and create new ways of accomplishing work. Communities join because they have a common sense of things and because they recognize that this shared sense of things is not shared by all humans (Cohen, 1985).

The theory, however, does not only describe the nature and benefits of finding each other in groups, but also offers the opportunity for discrimination between groups based on differences. With social group formation comes identity with that group. In many ways, one’s identity is discovered and described when it is faced with differences. This theory has therefore much to offer to communities and the study of their interactions. It predicts their creation and resulting frictions in their interactions. These potential frictions are where my research on barriers to communication link to social identity theory. Identity with a community of practice may bring many benefits to members and the growth of that practice but it therefore can also lead to communication barriers between communities of practice that are routed in social identity (or membership) based differences and discrimination.

Social identity theory also offers opportunities for change (Brown & Ross, 1982). Change in relation to social identity theory is thought to occur in situations of insecurity.

According to Brown & Ross (1982), insecurity arises “whenever a change in *status quo* is conceivable, perhaps because of some instability in the positions of the groups or because attributes of status and power in one of the groups are seen as being illegitimately acquired (Turner & Brown, 1978)”. In order to address this instability, groups engage in a search for new positive differences. To find new positive difference, the groups may engage in ‘social creativity’ where existing group characteristics, or differences, are reinterpreted favourably (Brown & Ross, 1982).

### 1.1.3 Symbolic Interactionism Theory

The role of language is of particular importance when considering language as a potential barrier. The construct I attach to language is that of symbolic value, relying on symbolic interactionism theory. Language is of special interest in symbolic interactionism as, according to Turner (2000, p.198), “[...] truths are conceived in terms of the sensible effects produced through language; [...]” Herbert Blumer coined the term symbolic interactionism in 1973 based on the work of Charles Sanders Peirce, George Herbert Mead, and Charles Horton Cooley. It is a perspective which views meaning as formed and shared through interactions (Lal, 1995; Crotty, 1998).

The interactionist stance to research in language argues that meaning in language is produced through interaction, with specific context important in the establishment of meaning (Blumer, 1969; Cossette, 1998). The perspective proposes that language has a symbolic meaning for each individual sharing it, and that this meaning can be to some degree different. These meanings are developed through an individual’s interactions and experiences, suggesting that each individual interprets language in his or her own way. Meaning is therefore central to the symbolic interactionist approach to language where the most efficient instances of communication would utilize the same or very similar meanings (Cossette, 1998). Individual will thus adjust meaning in a search for efficient communication. In reference to this search for similar meanings, Cossette (1998, p. 1363) stated that “the meaning the hearer will ascribe to the statements of the speaker will depend, among other things, on the former’s perception of the latter’s intentions or

objectives or of any other cognitive factor considered to be important.” This interactionist view admits that meaning varies in language and is ultimately created, influenced, and re-created by the individual through context-specific communication to attain the Holy Grail: shared meaning.

Language in communication, or miscommunication, can be a barrier. Language may be the central means by which we communicate ideas. Language, however, is not an inert medium. As mentioned above, the meaning associated with language can vary, and thus affect the interpretation of communicated information. Our experiences affect and reshape the words and concepts we use or are exposed to. In fact, Hansson and van de Bunt-Kokhuis (2004, p.2) suggest that “[w]e need to select our words carefully, and craft our presentations so that they will touch our listeners on a deeper emotional level. It is at this deeper emotional level where the most effective communication is achieved.”

#### 1.1.4 Mental Model Theory

Community of practice theory and its linguistic emphasis are linked to mental model theory through locality. Mental model theory proposes that, to navigate everyday life, we produce models of the world that allow us to predict behaviour, and choose ways to engage each other to produce desired results. These mental models are the product of people’s interaction with their environment (Anderson et al., 1996). The concept of mental models has been developed by a number of authors. The most prominent of these would be Phillip Johnson-Laird (see Johnson-Laird et al., 1998).

The concept of mental models has raised much interest partly because of its simplicity and intuitive appeal. However, defining mental models has created much debate, as the theory has been used in many fields of research, from language to human-to-computer interfaces (Green, 1996). One general definition of mental models is offered by Langan-Fox et al. (2004, p.331), with reference to Wilson (2000), where mental models are “internal (mental) representations of objects, actions, situations or people, and are built on experience and observation, of both the world in general and the particular entity of

interest.” For example, we have a mental model of buying in a store which involves currency and various steps to complete a transaction.

Mental models are thus products that respond to our need to act in the face of limited time, numerous instances of experience, considerable options analysis, and abundant information of various degrees of relevance. Green (1996, p.119) suggests that “one function of the mind is to create models of reality so as to allow effective action and decision-making”, where the properties and relations of the mental models correspond to actual external realities. These realities are vastly simplified for ease and speed of use in navigating situations (Chermack, 2003; Langan-Fox et al., 2004). They are often a mental version of a rule of thumb or a set of assumptions by which we assess situations and make decisions. Just like a rule of thumb, mental models don’t always get it right. They introduce a level of error in our decision-making, as noted by Senge (2006, p.5): “[t]he problems with mental models lie not in whether they are right or wrong--by definition, all models are simplifications. The problems with mental models arise when the models are tacit--when they exist below the level of awareness”. This is particularly important to this research and I suggest to every interaction we entertain as these models direct our decisions often anonymously. We function with these models without necessarily acknowledging that they are driving our behaviour; and therefore we seldom revisit them. Finding ways to change their imbedded relationships is an important task in any change effort.

## **1.2 THEORY INTERACTION**

With regard to the research at hand, I suggest that language is an important barrier to the implementation of eco-initiatives. This stems from the three main elements of community of practice (CoP) theory which include repertoires: a number of socially constructed items from hand signals to language. I suggest that the repertoire of a CoP allows member recognition and that the linguistic repertoire of a CoP goes beyond simply member recognition to form a condition for information commerce.

I also suggest that CoP members manipulate the CoP language with more competence than non-practitioners or learning practitioners. Repertoire must be learned to be a member and graduate students are learning CoP language and thus have a different level of competence in reference to the CoP. I propose that graduate students are more like a community of interest (CoI) while learning to become members of a CoP.

Last but not least, I suggest that our mental model of the organization uses the CoP linguistic repertoire to filter information for decision-making. We have a mental model of an organization which defines what is relevant to the organization in order to succeed. I offer that the CoP's linguistic repertoire guides the decision-process of organizations by identifying relevant information. Experience builds and modifies the information filter of the mental model and therefore what was relevant in the past should be relevant again with new experiences modifying the filter to include new types of information.

Connecting the theories, I thus suggest that identity and membership with a community of practice forms a barrier to organizational decision-making due to intergroup dynamics, and that the community of practice mental model for decision-making can exclude information based on the linguistic repertoire it draws on and change that filter through experience. I offer a representation of the interactions between the relevant theories in Figure 1.1 below.

## Community of Practice

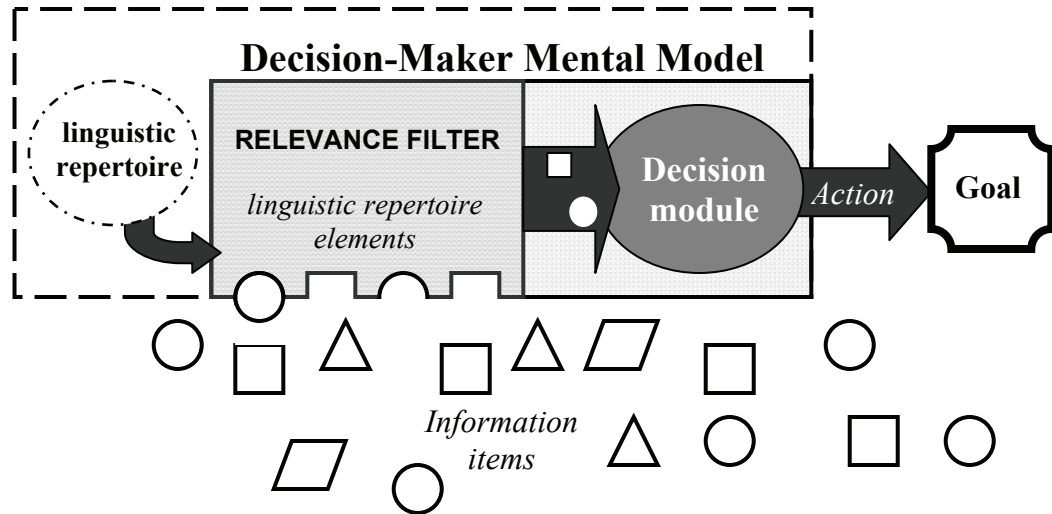


Figure 1.1 Communities of practice, language, and mental model interaction with organizational decision-making.

Language is central to the figure above, as it is the item that is exchanged, used and manipulated in the mental model. As noted previously, the repertoire of a community of practice comprises a number of socially constructed items, from hand signals to language. It is the linguistic repertoire that is of interest in this search for barriers to decision-making. Community of practice theory thus recognizes the value of language as a means for affiliation, as a symbol. In fact, symbolic interactionism theory offers support to this emphasis on language in membership identity (Lal, 1995). In addition, a number of studies have supported the value of language as a fundamental part of our interactions and information processing, and an important part of our identity (Ochs, 1993; Barrett et al., 1995; Bucholtz, 1999; Holmes & Meyerhoff, 1999; Bucholtz & Hall, 2005). We will offer a limited comment on the difference between language and information. There is what is said, and then how it is said. The wording or language used to convey information is part of the information. People are known to use different ways of ‘saying the same thing’ in different contexts or situations, depending on their social identity (Silverstein, 1998).

In communities of practice, language binds members by allowing them to recognize each other and interact. Language embodies meaning and “[p]ractice is about meaning as an



experience of everyday life” (Wenger, 1998, p.52). I suggest that the linguistic repertoire of a community of practice goes beyond simple member recognition. In being a vector for meaning, I suggest that language is both a tool and a condition for the commerce of information. I suggest that members of a community of practice use the linguistic repertoire to identify relevant information. To determine the value in this assumption, a study was devised to first identify whether communities of practice could be found beyond casual observations, and shown using quantitative analysis.

Suggesting that language is used to identify members also suggests that the proficiency with which members of a community manipulate the language associated with their practice is greater than that with which non-practitioners, or learning practitioners, are endowed. This idea finds some support in a related notion from the theory of communities of practice, the notion of apprentices. To become a member of a community of practice, you must learn the ‘craft’. I suggest that graduate students may be able to identify the linguistic repertoire of a community of practice, but fall short of being full members themselves. Their linguistic repertoire of familiar concepts may not yet fully embrace those concepts most relevant to the community of practice being studied. Graduate students are learning the practices of a field of study, and may in fact form a community of interest (individuals who share a common interest), rather than a community of practice.

Language as a barrier to decision-making leaves open the question of how it acts on the decision-making process of organizations. Figure 1.1 above illustrates how language informs the way decision-makers filter information items for decision-making. Filtering, or a selective approach to information, is an important part of decision-making, as there is more information available than we can process (Simon, 1997; Davenport and Beck, 2001). In addition, in processing information, consequences and repercussions are numerous and, to a point, infinite, leading Simon (1997) to suggest that knowledge of consequences is always fragmentary. We are forced to make decisions regarding what information will and will not be used in our decisions in order to meet our goals. We must assign relevance to allow for selection.

I suggested previously that communities of practice and language found their locus in mental models. In essence, I suggest that the matter of language, and the relevance assigned by communities of practice to language, is housed in a decision-maker's mental model. Mental model theory proposes that we use mental mock-ups of our environment and how it works in order to efficiently navigate it (Langan-Fox et al., 2004). It is a model of how things work to get what and where we want. I postulate this mental model houses those things that are relevant, in our case, to the organization. Part of how the decision-makers see themselves depends on how they attribute relevance. When we ask what the decision-makers stand for, we pull from our mental model the features of the organization and how it interacts with the environment. A list of relevant issues is part of the decision-maker's mental model, and is used to select information relevant to decision-making.

Now, how do we introduce new issues into the list of relevant issues? I suggest that experience can introduce new items by inducing a change in the decision-maker's perception of the relevance of issues. Given the focus on the natural environment, I suggest that experience of environmental issues can move the natural environment from irrelevant to relevant in the eyes of decision makers. Interviews with participants of programs that promote and facilitate the implementation of eco-efficiencies have suggested that the experience of such a program can shift the perception of the benefits of environmental initiatives in the organizational context from doubt to commitment (Eco-Efficiency Centre, 2006).

### **1.3 RESEARCH OBJECTIVES**

Given that studies face limits in addressing theories, the three studies presented in this thesis address the above theories with three intents:

- to provide further empirical support to the theory of communities of practice;

- to investigate the presence of a gradation of community of practice membership reflected by familiarity with a practice's linguistic repertoire;
- to explore the potential change in organizational mental model for decision-making from experience.

Three studies were devised to address the above issues. The first study aimed at providing further evidence for the communities of practice theory, but did not attempt to assess the specific use of concepts by communities of practice. It did, however, attempt to show that linguistic repertoires are a promising tool for identifying communities of practice members, and for inspiring effective communication based on relevant community concepts. The second study investigated the presence of a gradation of community of practice membership through a practice's linguistic repertoire, but did not presume to prove that the selected concepts could decipher communities of practice members from communities of interest members, nor did it presume to advance a definition of communities of interest (in contrast to communities of practice). The study does try to show that membership assumes a gradient in member competence, as reflected by their familiarity with community-relevant concepts. I suggest that further study of the potential typology of membership, as well as further definition of the two theories, would help in understanding interactions and structure of communities of practice and of interest.

Last but not least, the third study explored the potential change in organizational mental models for decision-making based on the experience of environmental initiatives, but did not attempt to prove that experience guarantees changes to the organization's assumptions of relevance in decision-making. Within the limits of case study research, it explored changes in the perceived relevance of environmental issues using mixed methods. It offers a first step to identifying a mode for decision-making behaviour change. It attempts to identify whether experience can induce change as perceived by the participants. The studies, as most research does, raises more questions than they answer. . The research presented here invites more investigation, but may also lead to an improved

understanding of organizations and decision-making for more environmentally respectful and risk-aware institutions.

## **1.4 THESIS STRUCTURE**

In summary, I identified a need for change in organizational behaviour, the potential presence of an unknown barrier, and a potential pathway to successful change. The following research studies attempt to suggest some answers, as well as offer avenues for further investigation into the model of theory interaction. This chapter has outlined the theoretical framework guiding the studies, and defines the boundaries of the research and its findings. The next three chapters present the studies, with Chapter 2 offering a study of communities of practice, Chapter 3 a study on gradients of membership in communities of practice, and Chapter 4 a case study of change in organizational mental models as a function of experience with eco-efficiency. The last chapter offers conclusions regarding the suite of studies, their interplay, and the contribution they make to research, and the issue of environmental management in organizations.

## 1.5 REFERENCES

- Anderson, T., Howe, C. & A. Tolmie. (1996). Interaction and mental models of physics phenomena: evidence from dialogues between learners. In J. Oakhill & A. Granham (Eds.), *Mental models in cognitive science - Essays in honour of Phil Johnson-Laird* (247-273). Exeter, UK: Psychology Press (Erlbaum (UK) Taylor and Francis).
- Barett, F. J., Thomas, G. F., & Hocevar, S. P. (1995). The central role of discourse in large-scale change: a social construction perspective. *Journal of Applied Behavioural Science*, 31(3), 352-372.
- Blumer, H. (1969). *Symbolic interactionism: Perspective and method*. Berkeley: University of California Press.
- Brewer, M. B. (2001). Ingroup identification and intergroup conflict. In R.D. Ashmore, L. Jussim, D. Wilder (eds), *Social identity, intergroup conflict, and conflict reduction* (17-41). Oxford, New York: Oxford University Press.
- Brown, R. J., and Ross, G. F. (1982) The battle for acceptance: An investigation into the dynamics of intergroup behaviour. In: Tajfel, H. (Ed.), *Social identity and intergroup relations*. Cambridge, UK: Cambridge University Press.
- Bucholtz, M. (1999). "Why be normal?": language and identity practices in a community of nerd girls. *Language in Society*, 28, 203-223.
- Bucholtz, M., & Hall, K. (2005). Identity and interaction: a sociocultural linguistic approach. *Discourse Studies*, 7(4-5), 585-614.
- Chermack, T. J. (2003). Mental models in decision making and implications for human resource development. *Advances in Developing Human Resources*, 5(4), 408-422.
- Cohen, A. P. (1985). *The Symbolic construction of community*. London: Routledge.
- Cossette, P. (1998). The study of language in organizations: a symbolic interactionist stance. *Human Relations*, 51(1): 1355-1377.
- Crotty, M. (1998). *Foundations of social research: Meaning and perspective in the research process*. Thousand Oaks, Calif: Sage Publications
- Davenport, T. H., & Beck, J. C. (2001). *The attention economy*. Boston: Harvard Business School Press.

- Davies, B. L. (2005). Communities of practice: legitimacy not choice. *Journal of Sociolinguistics*, 9, 557-581.
- Eckert, P. (1992). Think practically and look locally: language and gender as community-based practice. *Annual Review of Anthropology*, 21, 461-490.
- Eco-Efficiency Centre (2006). *Follow-up survey of the business assistance program pilot*. Halifax, Nova Scotia, Canada: Eco-Efficiency Centre.
- Fischer, G. (2001). Communities of Interest: learning through the Interaction of Multiple Knowledge Systems. Proceedings from *24th Annual Information Systems Research Seminar In Scandinavia (IRIS'24)*, Ulvik, Norway. Department of Information Science, Bergen, Norway, 1-14.
- Gerrans, P., Cowan, E., & Hutchinson, B. (2000). Sustainable development and small to medium-sized enterprises: a long way to go. In R. Hillary (ed.), *Small and medium-sized enterprises and the environment: Business imperatives* (75-81). Sheffield: Greenleaf.
- Green, D. W. (1996). Models, arguments, and decisions. In J. Oakhil and A. Granham (eds), *Mental models in cognitive science: Essays in honour of Phil Johnson-Laird* (119-137). Exeter, UK: Psychology Press (Erlbaum (UK) Taylor and Francis).
- Hansson, H., & van de Bunt-Kokhuis, S. (2004). E-learning and language change: observations, tendencies and reflections. *First Monday*, volume 9, number 8 (August 2004), URL: [http://firstmonday.org/issues/issue9\\_8/hansson/index.html](http://firstmonday.org/issues/issue9_8/hansson/index.html)
- Holmes, J., & Meyerhoff, M. (1999). The community of practice: theories and methodologies in language and gender research. *Language in Society*, 28(2), 173-183.
- Iverson, J. O; & McPhee, R. D. (2002). Knowledge management in communities of practice. *Management Communication Quarterly*, 16(2), 259-266.
- Johnson-Laird, P. N., Girotto, V., & Legrenzi, P. (1998, April 7). *Mental models: A gentle guide for outsiders*. Retrieved from <http://icos.groups.si.umich.edu/gentleintro.html>

- Kerno, S. J. (2008). Limitations of communities of practice: a consideration of unresolved issues and difficulties in the approach. *Journal of Leadership & Organizational Studies*, 15 (1), 69-78.
- Koliba, C., & Gajda, R. (2009). "Communities of practice" as an analytical construct: implications for theory and practice. *International Journal of Public Administration*, 32, 97-135.
- Lal, B. B. (1995). Symbolic interaction theories. *American Behavioural Scientist*, 38(3): 421-441.
- Lambert, A. J. D.; Boons, F. A. (2002). Eco-industrial parks: stimulating sustainable development in mixed industrial parks. *Journal of Cleaner Production*, 22: 471-484.
- Langan-Fox, J., Anglim, J., & Wilson, J. R. (2004). Mental models, team mental models, and performance: process, development, and future directions. *Human Factors and Ergonomics in Manufacturing*, 14(4), 331–352.
- Lave J., & Wenger E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Metz, B., Davidson, O. R., Bosch, P. R., Dave, R., and Meyer, L. A. (eds) (2007). *Contribution of working group III to the fourth assessment report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.
- Ochs, E. (1993). Constructing social identity: a language socialization perspective. *Research on Language and Social Interaction*, 26(3), 287-306.
- Perron, G. M. (2006) Environmental changes and the business mental model. *The International Journal of Knowledge, Culture and Change Management*, 6(6): 55-64.
- Peters, M., & Turner, R. K. (2004). SME environmental attitudes and participation in local-scale voluntary initiatives: some practical applications. *Journal of Environmental Planning and Management*, 47(3): 449-473.
- Russell, C. (2005). Energy management pathfinding: understanding manufacturers' ability and desire to implement energy efficiency. *2005 ACEEE Summer Study on Energy Efficiency in Industry*, 3: 141-152.

- Senge, P. (2006). *The fifth discipline: The art & practice of the learning organization*. New York: Doubleday/Currency.
- Silverstein, M. (1998). Contemporary transformations of local linguistic communities. *Annual Review of Anthropology*, 27: 401-426.
- Simon, H. A. (1997). *Administrative behavior: A study of decision-making processes in administrative organizations*. New York, US: Free Press.
- Snow, C.P. (1969) *The two cultures: And a second look*. Cambridge University Press: London.
- Tajfel, H. (Ed.) (1982) *Social identity and intergroup relations*. Cambridge, UK: Cambridge University Press.
- Tajfel, H., Billig, M. G., Bundy, R. P., & Flament, C. (1971). Social categorization and intergroup behaviour. *Journal of Social Psychology*, 1(2): 149-178.
- Tajfel, H. and Turner, J. C. (1986). The social identity theory of inter-group behavior. In S. Worchel and L. W. Austin (eds.), *Psychology of Intergroup Relations* (7-25). Chigago: Nelson-Hall.
- Tilley, F. (1999). The gap between the environmental attitudes and the environmental behaviour of small firms. *Business Strategy and the Environment*, 8: 238-248.
- Turner, B. S. (2000). *The Blackwell Companion to Social Theory* (Second Edition). Malden, Mass: Blackwell.
- Turner, J. C., and Brown, R. J. (1978) Social status, cognitive alternatives and intergroup relations. In: H. Tajfel (ed.), *Differentiation between social groups: Studies in the social psychology of intergroup relations*. European Monographs in Social Psychology, No. 14. London: Academy Press.
- US EPA. (2010) *Future climate change*.  
<http://www.epa.gov/climatechange/science/futurecc.html>
- Wenger, E. (1998). *Communities of practice — Learning, meaning, and identity*. Cambridge: Cambridge University Press.
- Wenger, E., McDermott, R., & Snyder, W. S. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Boston, Massachusetts: Harvard Business School Press.



- Wenger, E. C., & Snyder, W. S. (2000, January-February). Communities of practice: the organizational frontier. Boston, Massachusetts: *Harvard Business Review*, 78, 139-145.
- Wilson, J. R. (2000). Mental models. In W. Karwowski, (ed.), *International encyclopedia of ergonomics and human factors* (493– 496). London: Taylor and Francis.
- Wong, S-S. (2008). Judgments about knowledge importance: the roles of social referents and network structure. *Human Relations*, 61(11), 1565–1591.

**CHAPTER 2      Documenting Some Speculation from the  
Theory of Communities of Practice: Assessing Environmental  
and Business Community Identity from Linguistic  
Repertoires**

The following is the article submitted to the journal *Business Strategy and the Environment*.

Authors:

Geneviève M. Perron and John F. (Jack) Duffy

Dalhousie University

## **2.1 ABSTRACT**

The theory of communities of practice has found much acceptance in the organizational and social sciences literature. Although applied frequently to assess or explain phenomena, it has seen little research to identify the presence of barriers between communities of practice, or even just differences between such entities. Using members of the environmental and business communities, the following study identifies different communities of practice based on their linguistic repertoire. It also shows that members of one community can identify the linguistic content of another community's linguistic repertoire, and perhaps use differences to exclude reasonable strategies employed by the other community. The research not only offers credence to the theory of communities of practice based on their linguistic repertoire, but it also offers avenues for further research in the use of language as a means of identity and segregation in various forms of institutional contexts.

*Keywords:* communities of practice, language, identity

## 2.2 INTRODUCTION

The term *communities of practice* was coined by Jean Lave and Etienne Wenger (Lave and Wenger, 1991) to describe a form of learning that is produced, held, and renewed by groups of people who share practices. In simple terms, Wenger *et al.* (2002, p.4) define communities of practice as “groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis.” Communities of practice are units through which we learn and improve our expertise in a particular field or topic. They have existed for centuries where they were first knowledge-based social structures in the pre-industrial era. There were also craftsmen (and women), guilds, and other practice-based communities. These groups of individuals with shared interests recognized that knowledge is a social phenomenon, that knowledge resides in people, and that it is more than raw data. Rather, knowledge is bound to, and multiplied by, the interaction of people’s experiences (Wenger *et al.*, 2002). In fact, Oatley (1996) suggests that it is in social systems that the truth can be approached, and thus where science resides. Communities of practice are a locus where searches for learning, for greater understanding and expertise, can be undertaken.

Over the few years this theory has had to bloom, it nonetheless has attracted much attention and is quoted and referred to in many discussions on management and administration (Wenger, 1998; Iverson & McPhee, 2002; Kerno, 2008; Koliba & Gajda, 2009; Gilley & Kerno, 2010; Goldstein & Butler, 2010; Kerno & Mace, 2010; Vickers & Fox, 2010). This may be due to the seemingly instinctual nature of the theory as it hints at our innate needs to socialize, form groups, and exchange information throughout our lives. However, precious little research has been conducted to identify the presence of barriers between communities of practice, or even just differences between such entities. The barriers must be identified to increase the permeability of the community boundaries derived from different shared goals, shared values, and shared language. Such permeability is needed in many realms. For example in the realm of organizational

tactics, this concept may be of particular relevance as we attempt to tackle the environmental challenges ahead. Organizations are increasingly solicited to anticipate, adapt, and mitigate a social environment that begs for greater sustainable management practices and a natural environment that imposes new variables to contend while resources are shifting in value and use. In a world where the price of corn is affected by the new demand for ethanol, the ability to adapt, and the information required for the change, is becoming more and more essential for organizations.

### 2.2.1 Creating Solutions in Environmental Management

Significant amounts of endeavour, time, and money have been assigned and expended to creating commonly acceptable solutions and implementing their parameters. These have usually met with little success as agreement often failed even though good intentions were shared by all parties. The study of communities of practice is of particular relevance to any attempts at building agreement between groups, whether they be rooted in political views, policy interests, ideologies, or other sources of shared enterprise, as suggested by Lave and Wenger (1991). Attempting to create and attain common goals requires an agreement on the way ahead. This, in turn, requires an understanding of the issues, the consequences, and the requirements of the tasks ahead. Building agreement is the pathway to effective and efficient problem solving and implementation and this, many would suggest, is an art. We here suggest that building agreement has more to do with the very nature of social structures than art. In fact, we suggest that the barriers to agreement are embodied in the structure of the communities of practice that are engaged in many endeavours.

As mentioned above, a particularly relevant and timely example of such difficulties surrounding attempts at creating solutions is found in the environmental management context. Issues encompassing pollution, environmental degradation, toxics, depleted resources, and climate change have increasingly been brought to the attention of societies and their members, as shown by the signatories of the Kyoto Protocol and the political attendance at the 15th United Nations Climate Change Conference (COP15) held in

Copenhagen on December 2009. The steady increase in media attention, and political attendance, that the conference attracts is a valuable indicator of the political and social pressures that climate change is imposing on societies. With all this pressure to make changes largely initiated by members of the environmental and scientific community, we can expect an increasing number of initiatives being suggested and discussed to find solutions and implement them within all sectors of society, with specific attention to industry. As the latest iteration of the Climate Change Conference (COP15) has again highlighted, the very act of agreement on the issues and solutions at hand has proven to be more elusive than ever. We suggest that the reason for such difficulties lies partly in the communication barriers born of the various and different communities of practice.

Learning is a key concept in attempting to change the way a community of practice functions in attempting to find common solutions.. When attempting to change the behaviour of the business community in the face of potential environmental turmoil, learning new information concerned with the consequences of environmental issues and the benefits of adjusting practices to reduce environmental impacts is key. A fundamental source of learning is found in new information, and thus barriers to information exchange are a critical point to address if change is to be brought to many societal challenges.

Wenger (1998) states that “Communities of Practice presents a theory of learning that starts with this assumption: engagement in social practice is the fundamental process by which we learn and so become who we are.” Within this context of learning, and in a constant attempt to change practices through learning opportunities, many initiatives have been devised to provide the information necessary for organizations to learn, adapt, and succeed in this new environment. Programs and initiatives have been put in place but have suffered from low participation and uptake (Merritt, 1998; Palmer and France, 1998). Put succinctly, organizations are not listening. We suggest that communities of practice affect the selection of relevant sources of information and appropriate processing. This situation may be the cause of the apparent lack of awareness about programs offering environmentally and economically beneficial initiatives to Micro and

Small Enterprises (MSEs) (Merritt, 1998; Tilley, 1999; Natural Resources Canada, 2002; Compas, 2003).

### 2.2.2 Language and Community Barriers

Members of communities of practice need to recognize each other to interact and exchange information and knowledge. To this end, a community of practice's repertoire makes for a prime candidate as the linguistic portion of the repertoire is innately an important source and tool for identity (Ochs, 1993; Barrett, et al, 1995; Bucholtz, 1999; Bucholtz & Hall, 2005). The repertoire of communities of practice includes a number of forms of language like jargon, acronyms, and unique terminology, 'shortcuts', acronyms or shortened words (Kerno, 2008). Familiarity with this repertoire is an important step in acquiring membership in a community of practice. Iverson and McPhee (2002, p.262) go as far as saying that "knowing the shared repertoire can be a proof of membership." Wenger (1998, p.160) adds to this statement by suggesting that the repertoires from one community to another can vary significantly where "elements of one repertoire may be quite inappropriate, incomprehensible, or even offensive in another community."

Although identifying your peers has its benefits, it can have its downfalls. If one can identify an individual as a member of another group, one can move to exclude him or his contributions on the basis of being an outsider (Tajfel & Turner, 1986). This can be applied to a community of practice and its assessment of another community of practice, or its products, its views, and its information. We suggest here that the business community of practice can identify the environmental community of practice and move to exclude the information it has to offer. Our ability to identify communities of practice through the linguistic repertoire they use could thus be the means that keep businesses from hearing, considering, and integrating environmental information in their decisions. We suggest that this ability to identify and dismiss information from a community considered to be irrelevant to one's own is partly responsible for the low participation rates observed in environmental programs aimed at improving business prosperity.

The theory of communities of practice as presented by Lave and Wenger (1991) was used, referred to, and elaborated on by a number of authors in a number of fields, primarily through studies of socio-linguistics (Davies, 2005; Eckert & Wenger, 2005), gender studies (Eckert, 1992; Holmes & Meyerhoff, 1999; Ostermann, 2003; Gillard et al., 2007), network theory (Wong, 2008; Guldborg & Mackness, 2009; Montgomery & McDowell, 2009), and the original field of learning (Wenger, 1998; Iverson & McPhee, 2002; Ruuska & Vartiainen, 2005; Kerno, 2008). Despite the interest in and acceptance of communities of practice, little research has established their existence and their related properties, including their linguistic repertoires. We believe that, until the existence of such repertoires is demonstrated, there is no empirical evidence for communities of practice and thus no reason to apply this theory to the understanding of low participation of MSEs in environmentally and economically beneficial initiatives. Established practices of scientific method support our belief (cf, McBurney & White, 2009). We seek to address these gaps in the literature. The following study identifies the presence of differences in the language used in relation to two self-identified communities of practice and differences in their approach to resolving a business case.

### 2.2.3 Communities and Common Environmental Issues

Wenger et al. (2002, p153) note that new perspectives can be gained if “participants make a genuine effort to listen to each other or to solve a common problem.” It is a subtle but valuable observation of the limit that communities of practice can entail. If boundaries based on language exist, we expect these boundaries are relevant to discussions on the environmental impacts of business organizations. Environmental and business communities of practice offer different histories, norms and views of the world which should be apparent in many ways, including the terminology each community uses. The effort required to understand and exchange points of views and information between what can appear on the surface as fundamentally opposed perspectives and goals has been viewed as daunting (Compas, 2003; Willard, 2005). From this perspective, the late acknowledgement of the role of environmental resources on organizations may have been caused by a lack of communication between business and environmental groups.



Determining that we can indeed identify communities of practice through their use of language, more specifically through their linguistic repertoire, would lead the way to determine the barriers to interaction, communication and learning between the business and environmental communities of practice. If membership with the environmental community of practice prevents interaction across the boundary with the business community, and if language is used to decipher membership, then knowing and managing the use of the linguistic repertoire of a community of practice would promote more favourable interactions between these two communities of practice.

We suggest that the barriers of communities of practice, specifically those born of language and terminology, are present in the interactions between environmental communities of practice and business communities. In attempts to introduce more environmentally friendly approaches to business and management, success or failure is in large part due to the language and terminology used which intentionally or inadvertently identifies the nature of the community from which it emanates. As suggested previously, this information would come into play in a receiving community's assessment of the relevance of the information.

The existence of *unique* language and terminology is intuitively assumed to exist. Yet this assumption has never been tested. If it cannot be demonstrated, then the usefulness of removing, lowering, or otherwise making community boundaries more permeable in order to improve the adoption of environmentally sustainable practices is nil. If the assumption turns out to be correct then this will allow us to search further and determine whether this difference is in fact a barrier to communication, to learning, to innovation and how difficult or easy these boundaries are to break down. Identifying these differences will force us to pay attention to these barriers when attempting to communicate ideas, concepts, and opportunities to another community of practice which has not created, discovered, nor absorbed the information. In short, we need to test the existence of language and terminology differences between the business community of practice and the environmental community of practice before proceeding with

interventions. Furthermore, gathering empirical evidence on how impermeable these barriers are is an inescapable step.

We suggest that the differences between the environmental and business communities of practice are tied to the community identity expressed by a community's shared linguistic repertoire. These differences are either the cause of or caused by an individual's identity with a community of practice. In addition, we suggest that exposure to the linguistic repertoire of another community of practice (CoP) will increase the use of that CoP's terminology in the solution of a problem. Such a triggered use of the repertoire of another CoP would confirm familiarity with that repertoire, but would indicate a lesser propensity for the use of the repertoire. To assess the existence of barriers born of communities of practice at the intersection of the environmental community and the business community of practice, we propose two hypotheses:

Hypothesis 1: There will be a difference in the familiarity of self-reported members of the environmental community and the business community regarding field-specific concepts and terms.

Hypothesis 2: There will be a difference in the relevance to a particular problem of field-specific concepts as selected by the self-reported members of the environmental community and the business community.

Hypothesis 3: Exposure to the linguistic repertoire of another community will increase the use of that community's terminology in the solution of a problem.

## **2.3 METHOD**

MBA students and Masters of Resource and Environment Studies were asked to fill out a questionnaire at the beginning of one of their respective classes. The questionnaire asked them to select a community they identified with most (business or environmental), propose solutions to a MSE business problem, rate their familiarity with concepts from both communities, and then after reading both sets of concepts, add solutions to the business problem if they wished to.

To test the hypotheses, participants also reported their program of study. The business programs grouped the programs of Master of Business Administration, and Masters of Electronic Commerce, while the environmental programs group included the Master of Environmental Studies program and Master of Resource and Environmental Management program. Participants were then presented with 19 concepts that were determined to be relevant to a business community and an environmental community of practice. The selection of the concepts was inspired by a phenomenology approach, based on the first author’s experience as a practitioner in both fields of business and the environment and in consultation with other practitioners of those fields. The list of concepts selected for the exercise is set out below in Table 2.1. The community of practice origin of the concepts is indicated by the respective column headings. In the questionnaire, the concepts were randomly ordered regardless of the community of origin.

Table 2.1 Selection of field-specific concepts for linguistic repertoire.

Business	Environmental
Attracting high quality candidates	Climate change
Cost reductions	Eco-efficiency
Entrepreneurship	End-of-Pipe control
Increased client loyalty	Green Design
Increased sales	Life cycle analysis
Market opportunity (international/national/local)	Pollution prevention
New markets	Sustainability
New product design	Green Supply Chain Management
Profit	Energy efficiency
	Waste minimization

From the 19 concepts, participants were asked to pick the 5 concepts they were most familiar with and the 5 they were least familiar with. This task was directed to

hypothesis 1. In addition, they were asked to choose the top 5 most and 5 least relevant to the business community as well as the 5 most and 5 least relevant to the environmental community as this task was designed to indirectly confirm hypothesis 2. In essence, while participants reported familiarity and identity they also had to sort concepts into community ‘buckets’.

It could be argued that some of the concepts could be put in the other column. This gave participants some room to assign concepts to one or the other community ‘bucket’.

Overall, the concepts were selected so that, although they represented each field, they would be relatively recognizable by each community (not particularly obscure to either community). The concepts were selected from the literature, and the experience of the investigators in the fields of business management and environmental issues.

The questionnaire was handed out to 2 graduate level classrooms of students in environmental studies and one classroom of students in business studies. The total number of participants was 64 with 31 participants from 2 environmental studies classes and 33 participants from the business studies class. Of the total number of participant responses, the submissions from 3 participants were eliminated from the analysis by self-reported community membership due to missing and incorrectly entered responses. Two of those submissions were from the business studies classrooms, and 1 was from the environmental studies classroom, for a final count of 30 valid submissions from the environmental studies classrooms and 31 from the business studies classroom. For the analysis by program of study, of the total 64 participants, a total of 59 participants were used. This was the result of the removal of 3 participants eliminated for the analysis by community and the removal of an additional 2 participants who did not identify a program of study.

In addition, although the directions indicated that 5 selections were to be made for each questions, two participants made more than 5 selections. In each case, the third selection from the top of the list of concepts was eliminated. This decision was made while assuming the last or first selection was no less pertinent according to the participants.

The concepts did not have to be ranked, only selected by the participants. This does not allow us to determine whether they found one selection to be more pertinent than another and so a random approach to eliminating one of the selections was adopted.

### 2.3.1 Content Analysis

Content analysis was used for Hypothesis 3 which looked at the approach and use of language. Participants were invited to answer the following question: “Suppose you are working with an organization that wants to increase its profits. What are the first things you would look at or consider doing to help them achieve this goal?” This question was asked before the terminology exercise and participants were offered an opportunity to add to their answer after the terminology exercise where they were exposed to the terminology of the environmental and business fields.

The answers provided to the question were first reviewed to identify words, terms, or concepts that could be assigned to the business or environmental field of practice. The unit of analysis for each entry was the whole answer to each question (Bernard, 2006). To limit the content to more succinct answers, thus reducing the time for analysis, and hopefully encouraging the use of terminology, a limited number of lines were provided for the answers.

The items were then scored according to their frequency and field-centricity for each output before and after exposure to terminology. The frequency represents the number of concept items provided in the output and the field-centricity addressed the specialization of the concept item provided. For items that were more technical and less accessible to the lay population, a higher field-centricity score was provided. Items that were scored as having a high field-centricity included ‘pollution prevention’ and ‘eco-efficiency’ for the environment field and ‘supply-chain management’ or ‘marketing channels’ for the business field of practice. The investigators applied the coding criteria found in Table 2.2 below.

Table 2.2 Content analysis coding criteria.

Frequency	High	Lots of environmental or business terminology (at least three iterations)
	Medium	At least two uses of environmental or business terminology
	Low	At least one use of environmental or business terminology
	Nil	No use of environmental or business terminology that is relevant to the target context
Field-centricity	High	Terminology used is technical or used by experienced practitioners
	Medium	Terminology used would not be familiar to a lay person
	Low	Terminology used would be familiar to a lay person
	Nil	No terminology used was central/particular to the practice

As for the source of each concept item, those that were deemed to belong to the environmental field included, for example, sustainability, eco-efficiency, clean energy, life cycle analysis, producer responsibility, environment, and recycling. Examples of terms that were deemed to belong to the business field would include: clientele, marketing, product, markets, cut purchases, value chain, and budget costs. A number of concept items in the answers provided by participants were excluded because it was not clear whether the concept was used to refer to the environmental or business field of practice. Such instances include the words ‘efficiency’ and ‘waste’ which, in some instances, could not be classified uniquely in either category. In such instances, they were removed from the analysis.

## 2.4 RESULTS AND DISCUSSION

The participants self-reported their identity with either the environmental or business community most. Their responses to the terminology questions were then assessed using a statistical analysis based on a two-tailed Student's t Test. Using all the data, the 95% confidence interval for the difference between any two means was calculated for 18 degrees of freedom. Thus any pair of mean differences between the two communities that exceeded this confidence interval was declared significant.

For our first experimental task, the participants were asked to select from the list of field-specific concepts shown in Table 2.1 the 5 concepts they found to be most familiar and then to select the 5 concepts they found to be least familiar. The analysis of their selections showed a difference in the selection of most familiar field-specific concepts as selected by the self-reported members of the environmental community when compared to those selected by the self-reported members of the business community. This selection by the members of each self-reported community showed 18 of 19 significant differences (Table 2.3). In addition, the same analysis was conducted on the participant's selections but, instead of grouping the participants by their self-reported community membership, they were grouped by their program of study. When grouped by their program of study, 15 of the 19 field-specific concepts were found to be significantly different.

Table 2.3 Significant different results when comparing the self-reported familiar concepts of the environmental community and business community ( $p < .05$ , 18 df).

Concept	Significance	
	Most familiar	Least familiar
Attracting high quality candidates	•	•
Climate change	•	•
Cost reductions	•	•
Eco-efficiency	•	•
End-of-Pipe control		•

Concept	Significance	
	Most familiar	Least familiar
Energy efficiency		
Entrepreneurship	•	•
Green Design	•	•
Green supply chain management		•
Increased client loyalty	•	•
Increased sales	•	•
Life cycle analysis	•	•
Market opportunity	•	•
New markets		•
New product design	•	•
Pollution prevention	•	•
Profit	•	•
Sustainability	•	
Waste minimization	•	•

Table 2.3 also shows the significant differences found in the selection of least familiar field-specific concepts by the self-reported members of the environmental community when compared to the same selection made by the self-reported members of the business community. The selection showed 17 of 19 significant differences. Again, when the participants were grouped according to their program of study, the same analysis found 14 of the 19 field-specific concepts to be significantly different. Both these findings confirm our first hypothesis which proposed that there would be a difference in the familiarity of self-reported members of the environmental community and the self-reported business community regarding field-specific concepts and terms. In fact, the self-reported members of the two communities selected different sets of most and least familiar field-specific concepts with significant results for almost every concept offered. Members of each community thus have different sets of linguistic repertoires where different field-specific concepts are familiar.



These results show a very different familiar linguistic content. The concepts offered were meant to be field-specific for each of these communities of practice, but they were also selected because of their accessibility, implying that each was not so obscure that the community members could not have heard of them. Assuredly, the results presented in Table 2.3 show that the linguistic portion of the repertoire of each of the environmental and business communities of practice are different based on self-reported member's sets of familiar concepts.

Our second experimental task asked participants to select the most and least relevant terms for the business and environmental community of practice. The data confirm our second hypothesis that there would be a difference in the concepts that were found to be relevant to the business and environmental community of practice as perceived by the self-reported members of the communities. There were in fact significant differences in the selection of most relevant field-specific concepts of the environmental community of practice compared to the most relevant field-specific concepts of the business community of practice as selected by the self-reported members of the environmental community. Their selections showed 14 of 19 significant differences (Table 2.4). Again, when subjects were grouped by their environmental or business program of study, the analysis found 15 of the 19 field-specific concepts to be significantly different.

Table 2.4 Significantly different results when comparing the self-reported environmental community's selection of relevant concepts for the environmental community of practice compared to the business community of practice ( $p < .05$ , 18 df).

Concept	Significance	
	Most relevant	Least relevant
Attracting high quality candidates	•	•
Climate change	•	•
Cost reductions	•	•
Eco-efficiency	•	•
End-of-Pipe control		•
Energy efficiency		

Concept	Significance	
	Most relevant	Least relevant
Entrepreneurship	•	•
Green Design		•
Green supply chain management		•
Increased client loyalty	•	•
Increased sales	•	•
Life cycle analysis	•	•
Market opportunity	•	•
New markets	•	•
New product design		
Pollution prevention	•	•
Profit	•	•
Sustainability	•	•
Waste minimization	•	•

The selection of least relevant field-specific concepts also showed significant differences. Comparing the sets of least relevant field-specific concepts selected for the environmental community of practice and business community of practice as selected by the self-reported members of the environmental community showed 17 of 19 significant differences (Table 2.4). When the participants were grouped according to their program of study, 16 of the 19 field-specific concepts were found to be significantly different.

These results were also supported by the self-reported business community's selection of least and most relevant concepts for the business and environmental communities of practice. Significant differences were found in their selection of most relevant concepts of the environmental community of practice compared to the selection of most relevant concepts of the business community of practice providing 17 of 19 significant differences (Table 2.5). When the participants were grouped according to their environmental and business program of study, 15 of the 19 field-specific concepts were found to be significantly different.

Table 2.5 Significantly different results when comparing the self-reported business community's selection of relevant concepts for the environmental community of practice compared to the business community of practice ( $p < .05$ , 18 df).

Concept	Significance	
	Most relevant concepts	Least relevant concepts
Attracting high quality candidates	•	•
Climate change	•	•
Cost reductions	•	•
Eco-efficiency	•	•
End-of-Pipe control		•
Energy efficiency	•	•
Entrepreneurship	•	•
Green Design	•	•
Green supply chain management	•	•
Increased client loyalty	•	•
Increased sales	•	•
Life cycle analysis		•
Market opportunity	•	•
New markets	•	•
New product design	•	•
Pollution prevention	•	•
Profit	•	•
Sustainability	•	•
Waste minimization	•	•

In addition, for the same self-reported business community members, the selection of least relevant field-specific concepts for the environmental community of practice was significantly different from the selection for the business community of practice for all 19

field-specific concepts (Table 2.5). When again grouped according to the business program of study, the same comparison showed 18 of the 19 field-specific concepts to be significantly different.

The participants, who self-reported as members of either community, therefore showed a significant difference between those concepts which they believed were most or least relevant to the business community of practice compared to the environmental community of practice. This confirms Hypothesis 2, where members of the self-reported environmental and business communities chose significantly different sets of relevant linguistic-repertoires for each community. These two groups, beyond having shown previously that they have different sets of most and least familiar concepts, determined that the business and the environmental communities of practice have different sets of relevant concepts. We can thus assume that they can identify a community by its linguistic-repertoire of relevant concepts. If certain concepts are more relevant to the business community of practice, then we can expect that an observer, in our case the participants, would identify a member of that community through the use of these same concepts.

These results have important repercussions, not only in confirming the existence of communities of practice, but also supporting Iverson and McPhee's (2002) proposition suggesting that a shared repertoire can be a proof of membership. Participants used the written terminology of field-specific concepts in this study. By confirming that individuals identify and thus assign different sets of relevant concepts to the business community of practice in comparison to the environmental community of practice, we can confirm that linguistic repertoires do exist and are characteristic of a community of practice. This helps explain our tendency to display an ability to assign membership with various communities of practice based on the terminology we use. Given that membership implies colleagues and adversaries, much still needs to be studied in order to determine the role of our linguistic repertoires in selecting relevant information and collaborators.

The results of this study suggest that more research needs to be conducted to determine the existence of other communities of practice but also the presence of differences in linguistic repertoires. Determining the linguistic repertoires of most and least relevant concepts and terminology for various communities of practice would not only strengthen the theory and relevance of the community of practice theory, it would assist in finding more efficient means of communicating information to communities of practice and between them. In fact, further research addressing the concept of brokering would be welcome in determining avenues for information exchange. An article by Perron (submitted) attempts to provide insight into this very issue. This would greatly assist efforts to help different communities cooperate on complex or contentious issues such as those of climate change mitigation.

The disparity in the number of significant differences found when the subjects were grouped based on their self-reported community membership or by their program of study is not drastic, but still leaves a difference to note. Table 2.6 below shows a summary of the number of significant differences generated by the comparison analyses presented previously. The analysis by self-reported community membership showed a higher number of significant differences in all cases, except the comparison of the most relevant concepts to the communities of practice as selected by the environment community members and program students.

Table 2.6 Number of significant differences when comparing the sets of field-specific concepts where participants were grouped by self-reported membership or by program of study.

Comparisons	# significant differences	
	by self-reported community	by program of study
Most familiar concepts	18	15
Least familiar concepts	17	14
Most relevant concepts (Env)	14	15
Least relevant concepts (Env)	17	16
Most relevant concepts (Bus)	17	15

Comparisons	# significant differences	
	by self-reported community	by program of study
Least relevant concepts (Bus)	19	18

For the analysis comparing the sets of familiar concepts for each community, the data could suggest that belonging to a program of study is a less accurate predictor of community of practice membership than expected. The results in Table 2.6 for most and least familiar concepts show fewer significant differences in the way field-specific concepts were selected by the participants. This observation points to a greater consistency in the selections among participants from the same self-reported membership compared to a grouping by their program of study. Members of the environmental community of practice are not restricted to an environmental program of study as a consequence of their membership in the environmental community. They thus are not necessarily enrolled in an environmental program of study and may be enrolled in a business program of study. In fact, 3 self-reported members of the environmental community belonged to a business program of study and 1 self-reported member of the business community belonged to an environmental program of study. These few cross-over participants caused a drop from 18 and 17 significant differences in the comparison of familiar concepts by self-reported community membership to 15 and 14 significant differences in the comparison by program of study. This study does not offer a definitive answer to the observation, but rather suggests that more research should be conducted to shed some light as to why the numbers differ. It may be that using students in a specific program of study as proxies for a community of practice would have some validity generalization limitations. Graduate students may resemble a community of interest more than a community of practice. This issue needs further investigation.

#### 2.4.1 Content Analysis

The content analysis performed on the answers to the open-ended question allowed assessment of Hypothesis 3 enquiring whether exposure to the linguistic repertoire of another community of practice would increase the use of that community's terminology

in the solution of a problem. The answer units varied in length from nil to 39 words. The analysis showed that there was an increase in the use of business field-specific concepts by the self-reported environmental and business communities in the solution of a problem after exposure to the field-specific concepts of the environmental and business communities of practice. Table 2.7 shows the increase in the use of field-specific terminology by each self-reported communities. This data pattern shows that participants added more content when offered the option after the terminology exercise. The content provided was, for some, more extensive than others but nevertheless, additions were made by 50% and up to 70% of the participants.

Table 2.7 Percentage of self-reported business and environmental community participants providing additional content after exposure to field-specific terminology.

	Self-reported community	
	Environmental	Business
Environmental additions	70.00 %	59.38 %
Business additions	66.67 %	65.63 %

For those who added content after completing the terminology exercise, reported in Table 2.7, there was an increase in the field-centricity of environmental and business concepts by the self-reported communities after exposure to the field-specific concepts of the environmental and business CoP (Table 2.8).

Table 2.8 Percentage of participants who increased field-centricity after exposure to field-specific terminology.

	Self-reported communities	
	Environmental	Business
Increased environmental field-centricity	63.64 %	59.38 %
Increased business field-centricity	55.56 %	0.00 %

The results tend to confirm Hypothesis 3 in that more than 50% of participants provided additional environmental and business field-specific content to their initial solution after exposure to the field-specific concepts. More specifically, after exposure, more than 50% of both self-reported communities added field-specific concepts to their solution which belonged to the opposite community of practice. In addition, after exposure to field-specific concepts of both communities of practice, more than 50% of participants who provided additional content used concepts with a higher level of field-centricity that belonged to the opposite community of practice.

These results suggest that, when not stimulated, self-reported environmental community members will not provide solutions to problems that offer as many options belonging to the business community of practice and vice versa. With regard to the business community of practice, self-reported business community will provide solutions that address more field-centric environmental options if they are exposed to the linguistic repertoire of the environmental community of practice. Evidently, the participants understood the concepts enough to apply them to the proposed problem in retrospect. They thus showed enough familiarity with the linguistic repertoire of the other community of practice to assess its relevance to the problem. This finding further reinforces our assessment of the communities of practice showing that the difference in their familiar repertoires was not the result of a lack of knowledge, but rather of a disparity in the use of concepts given practice membership.

## **2.5 CONCLUSION**

The literature on communities of practice has been mostly speculative. We were able to confirm in our sample that there was a difference in the familiarity of self-reported members of the environmental community and the self-reported business community regarding field-specific concepts and terms; and, members of the self-reported environmental and business communities chose significantly different sets of relevant linguistic-repertoires for each community. There is much to be learned by conducting



similar research with different communities of practice to discover both more about communities of practice and their differences with regard to linguistic repertoires. In addition, our discussion raised some issues with reference to the use of graduate students as members of communities of practice which should be pursued in future studies. This study also revealed interesting information on the use of terminology and the effects of exposure to cross-community concepts on individual's decision-making. More research is required to assess how exposure to linguistic repertoires can be used to increase interdisciplinary decision-making in groups and limit the development of silos, whether in information management or communities of practice.

We recognize that some participant responses could have been inaccurate, including their reported membership with one of the two communities. This could have been the result of an impression that associating one's self with the business or environmental community may be a socially preferred option. This was not controlled for in this study. With these limits in mind, this study still brings an important source of support to the theory of communities of practice and its premise assuming particular and distinctive repertoires. We have shown that communities of practice exist in participants' minds, and that they use different linguistic repertoires. Clearly, more research is needed to further the theory development of the impact of communities of practice.

## 2.6 REFERENCES

- Barett, F. J., Thomas, G. F., & Hocevar, S. P. (1995). The central role of discourse in large-scale change: a social construction perspective. *Journal of Applied Behavioural Science*, 31(3), 352-372.
- Bernard, H.R. (2006). *Research methods in anthropology: Qualitative and quantitative approaches, Fourth edition*. AltaMira Press: Lanham, Maryland, U.S.
- Bucholtz, M. (1999). “Why be normal?”: Language and identity practices in a community of nerd girls. *Language in Society*, 28, 203-223.
- Bucholtz, M., & Hall, K. (2005). Identity and interaction: a sociocultural linguistic approach. *Discourse Studies*, 7(4–5), 585–614.
- Compas Inc. (2003). *Phase 3: Survey Findings: Energy Efficiency Programs for SMEs*. COMPAS Report submitted to Industry Canada. Natural Resources Canada: Government of Canada?
- Davies, B. L. (2005). Communities of Practice: Legitimacy not choice. *Journal of Sociolinguistics*, 9, 557-581.
- Eckert, P. (1992). Think practically and look locally: language and gender as community-based practice. *Annual Review of Anthropology*, 21, 461-490.
- Eckert, P., & Wenger, E. (2005). Communities of practice in sociolinguistics. *Journal of Sociolinguistics*, 9(4), 82-589.
- Gillard, H., Mitev, N., & Scott, S. (2007). ICT Inclusion and Gender: Tensions in Narratives of Network Engineer Training. *Information Society*, 23(1), 19-37.
- Gilley, A., & Kerno, S. J. (2010). Groups, Teams, and Communities of Practice: A Comparison. *Advances in Developing Human Resources*, 12(1), 46-60.
- Goldstein, B. E., & Butler, W. H. (2010). Expanding the Scope and Impact of Collaborative Planning: Combining Multi-Stakeholder Collaboration and Communities of Practice in a Learning Network. *Journal of the American Planning Association*, 76(2), 238-249.
- Guldberg, K., & Mackness, J. (2009). Foundations of communities of practice: enablers and barriers to participation. *Journal of Computer Assisted Learning*, 25(6), 528-538.

- Holmes, J., & Meyerhoff, M. (1999). The community of practice: Theories and methodologies in language and gender research. *Language in Society*, 28(2), 173–183.
- Iverson, J. O.; & McPhee, R. D. (2002). Knowledge management in communities of practice. *Management Communication Quarterly*, 16(2), 259-266.
- Kerno, S. J. (2008). Limitations of communities of practice: a consideration of unresolved issues and difficulties in the approach. *Journal of Leadership & Organizational Studies*, 15(1), 69-78
- Kerno, S. J., & Mace, S. L. (2010). Communities of Practice: Beyond Teams. *Advances in Developing Human Resources*, 12(1), 78-92.
- Koliba, C., & Gajda, R. (2009). "Communities of practice" as an analytical construct: implications for theory and practice. *International Journal of Public Administration*, 32, 97-135.
- Lave, J., & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.
- McBurney, D. H., & White, T. L. (2009). *Research Methods, 8th Ed.* USA: Wadsworth.
- Merritt, J. Q. (1998). EM into EMS won't go? Attitudes, awareness and practices in the London Borough of Croydon. *Business Strategy and the Environment*, 7, 90-100.
- Montgomery, C., & McDowell, L. (2009). Social Networks and the International Student Experience: An International Community of Practice? *Journal of Studies in International Education*, 13(4), 455-466.
- Natural Resources Canada. (2002). *Government of Canada Action Plan 2000 on Climate Change - Consultations on a Canadian Resource Recovery Strategy, Final Report*. Government of Canada Press.
- Oatley, K. G. (1996). Emotions, rationality, and informal reasoning. In Oakhil, J., & A. Granham (eds), *Mental Models in Cognitive Science: Essays in Honour of Phil Johnson-Laird*, 175-196. Exeter, UK: Psychology Press (Erlbaum (UK) Taylor and Francis).
- Ochs, E. (1993). Constructing social identity: a language socialization perspective. *Research on Language and Social Interaction*, 26(3), 287-306.

- Ostermann, A. C. (2003). Communities of practice at work: gender, facework and the power of habitus at an all-female police station and a feminist crisis intervention center in Brazil. *Discourse & Society, 14*(4), 473-505.
- Palmer, J. & France, C. (1998). Informing smaller organizations about environmental management: an assessment of government schemes. *Journal of Environmental Planning and Management, 41*(3), 355-374.
- Perron, G. M. (submitted). Apprenticeship in a modern age: a study of the use of language repertoires from communities of practice.
- Tajfel, H. and Turner, J.C. (1986). The social identity theory of inter-group behavior. In S. Worchel and L. W. Austin (eds.), *Psychology of Intergroup Relations*. Chicago: Nelson-Hall.
- Tilley, F. (1999). The gap between the environmental attitudes and the environmental behaviour of small firms. *Business Strategy and the Environment, 8*, 238-248.
- Vickers, D., & Fox, S. (2010). Towards practice-based studies of HRM: an actor-network and communities of practice informed approach. *The International Journal of Human Resource Management, 21*(6), 899-914.
- Wenger, E. (1998). *Communities of Practice — Learning, Meaning, and Identity*. Cambridge University Press, Cambridge, England.
- Wenger, E., McDermott, R., & Snyder, W. (2002). *Cultivating Communities of Practice: A Guide to Managing Knowledge*. Boston, Mass: Harvard Business School Press.
- Willard, B. (2005). *The Next Sustainability Wave: Building Boardroom Buy-in*. Gabriola Island, BC, Canada: New Society Publishers.
- Wong, S-S. (2008). Judgments about knowledge importance: The roles of social referents and network structure. *Human Relations, 61*(11), 1565-1591

### **CHAPTER 3      Apprenticeship in a Modern Age: A Study of the Use of Language Repertoires from Communities of Practice**

The following is the article submitted to the journal *Language in Society*.

Author:

Geneviève M. Perron

Dalhousie University

### **3.1 ABSTRACT**

Peripherality of membership with reference to communities of interest and communities of practice is explored through language. The study proposes that linguistic repertoire familiarity identifies graduate students as members of communities of interest rather than communities of practice. The business and environmental graduate programs of study were the selected communities. Each community's selection of familiar concepts was similar to their selection of relevant concepts for the equivalent community of practice but not identical. The results suggest a difference in the student's abilities to manipulate the studied community of practice's linguistic repertoire. It suggests that graduate students are a community of interest with interest in a field of practice for which membership in the community of practice is dependent on further experience and mentoring. A continuum of membership is offered to bridge the unattended gap between the two theories, and opens avenues for exploring various levels of membership.

*Keywords:* community of practice, community of interest, language, identity, environmental management, business

### **3.2 INTRODUCTION**

Language, terminology, concepts, words, jargon, lingo, however we put it, the means we use to communicate are not only fundamental to our interactive lives, they are saturated with information. By ‘saturated’ I here imply that there is more to the essence of a word than its definition. Terms, words, jargon carry with them properties linked to our experiences with them. We remember some words or expressions fondly because they were often used by a loved one, while we will be averse to a term because it is often uttered in a context that could be repulsive. More than their definition, words are laced with meaning, both in their own history and in our experience of them.

Language is of interest to this study because it is an important part of identifying ourselves. It is one of the main ways we share our interests and our identity (Ochs, 1993; Barrett et al., 1995; Bucholtz, 1999; Holmes & Meyerhoff, 1999; Bucholtz & Hall, 2005). The theory of communities of practice allows us to recognize this use of terminology as a means of capturing and assigning identity. Wenger et al. (2002) present communities of practice as groups of “people who share a concern, a set of problems, or a passion about a topic, and who deepen their understanding and knowledge of this area by interacting on an ongoing basis”. Wenger (1998) suggests that these communities are distinguished through three dimensions: mutual engagement, a joint enterprise, and a shared repertoire (see also Koliba & Gajda, 2009). Of these three dimensions, the repertoire holds various forms of information about one’s membership, including language, offering clues as to one’s identity.

In addition to refreshing our identities, an important concept renewed by the theory of communities of practice is that of apprenticeship (Lave & Wenger, 1991). In recent times, apprenticeship has evolved with the new forms and practices of learning as schools have brought masonry apprentices to engineering and structural design classrooms. It has changed the introduction to a practice and those with an interest in a field of practice typically find themselves with other potential members of a community of practice. I

propose that students, like other apprentices, form a community of interest as they learn to become part of the community of practice. Their position shows interest in the field but not expertise, much like the theory of communities of practice distinguishes between expert members and apprentices (Wenger, 1998). In fact, in discussing the use of language in cases of apprenticeship, Lave and Wenger (1991, p.105) suggest that “issues about language, like those about the role of masters, may well have more to do with legitimacy of participation and with access to peripherality than they do with knowledge transmission”. Using their linguistic repertoire, the following study attempts to determine whether students learning a field of study are more akin to a community of interest than a community of practice. I propose that these communities of interest, these communities of learning students, can recognize the repertoires of their target community of practice, but differ in their own familiar repertoire from these same communities and, as such, are a modern form of apprenticeship.

The fields of environmental studies and business studies were selected because of their often differing views (Macdonald, 2007). This difference should somewhat polarize the selection of familiar concepts by the participants. A previous article by Perron and Duffy (submitted) has showed that the linguistic repertoire of these two groups were significantly different. The current study suggests that the familiar repertoires of the students are different from those of the equivalent community of practice.

### 3.2.1 Background

The theory of communities of practice (CoP) has not gone idle. A number of fields of study such as sociolinguistics (Bucholtz, 1999; Bucholtz & Hall, 2005; Davies, 2005; de Fina, 2007), gender studies (Eckert, 1992; Holmes & Meyerhoff, 1999), network theory (Wong, 2008), and the field of learning (Wenger, 1998; Iverson & McPhee, 2002; Kerno, 2008), have used it in sometimes interdisciplinary contexts (Koliba & Gajda, 2009). This interest has however mostly produced qualitative research on CoP and their linguistic repertoire with few cases of network analysis was used (Koliba & Gajda, 2009).



The almost innate nature of the theory of communities of practice may be at cause for such broad interest. The theory seems to speak to a phenomenon that we have all recognized as a part of our nature in work. In introducing the theory of communities of practice, a number of examples are presented including non-drinking alcoholics, quartermasters, butchers, tailors in Goa, and midwives in the Yucatan, and guilds in the Middle Ages such as craftsmen, metalworkers, potters and masons (Lave & Wenger, 1991; Wenger & Snyder, 2000; Wenger et al., 2002; Kerno, 2008). Today, this can naturally translate to groups such as firemen, traders, nurses and waiters.

### 3.2.2 Language and Cop

As discussed in a previous article by Perron and Duffy (submitted), the role of language as a means of establishing and determining membership in communities of practice should not be neglected. The link lies in the repertoire of a community of practice. The repertoire takes a number of shapes, from terminology and concepts to stories and symbols. These make up a rich resource shaped by member interactions to facilitate the exchange of information and the creation of new meanings (Iverson & McPhee, 2002; Kerno, 2008). The linguistic portion of the repertoire has been of interest to studies of network analysis, speech communities, sociolinguistics, and gender analysis because it offers a source from which identity can be conceived, shaped, and shared. Regarding communities of practice, Wenger (1998, 152) suggests that the dimensions of competence, including the repertoire, “become dimensions of identity.”

Gaining membership in, and identity with, a social group entails learning the repertoire used by the group or community, including meaning, form, and content (Ochs, 1993; Bucholtz, 1999; Holmes & Meyerhoff, 1999; Bucholtz & Hall, 2005; de Fina, 2007). Charles Percy Snow (1969), in *The Two Cultures*, describes how common forms, symbols, repertoires, and standards will allow members of a community to understand and build on each other’s work, even when working on different venues within that

community. His observations highlight the role of language in communities of practice, to communicate ideas and identify those that understand and manipulate correctly a linguistic repertoire. Individuals, however, belong to more than one community or group. They have a diversified identity that joins roles such as father, professor, physicist, and curler, for example (Tajfel & Turner, 1986; de Fina, 2007). These roles, in practice, join individuals through experience into communities that each have their own linguistic characteristics attached to their identity.

We all manage and juggle the different linguistic repertoire of our various memberships. The use of a certain linguistic structure may include you as a member of a group as much as it can identify you as a member of a rival group (Bucholtz, 1999) and this can produce barriers to our interactions with other communities. Tajfel and Turner (1986) suggested that group membership creates a form of ‘ingroup’ self-identification. In their investigation of intergroup discrimination, and introduction to social identity theory, they showed that identification as a member of a particular group leads to displays of ingroup favouritism. Identifying with the ingroup boosted individual self-esteem through a differentiation with the outgroup. This is where language becomes a symbol for identity and a barrier to communication. A competent use of a group’s linguistic repertoire will put you inside or outside of that ingroup, of that favourable association. Interaction with a community requires a level of acceptance by the community, or the group (Bucholtz, 1999). In communities of practice, we expect that language, more specifically the manipulation of the linguistic repertoire, would mediate much of this ingroup and outgroup identification, at the boundaries between communities and allow or deny access to information and exchange. Basically, if you don’t know the lingo, you can’t play on the team.

### 3.2.3 Levels of Membership

There is a subtlety to manipulating the linguistic repertoire of a community of practice, like other groups of membership (Ochs, 1993). In reference to communities of practice,

to become a member, an individual must learn about the practice, including its repertoire. Learning implies that there is a gradient of competence and this should equally apply to knowing and manipulating the repertoire of a community of practice. Lave and Wenger (1991) discuss peripherality to address the varied depth of competence of different members of the same community of practice. The level of participation, from peripheral to full participation, would affect and be reflected in the ability an individual displays when manipulating the repertoire in question. The use of language would thus not only be used to identify ourselves in relation to our membership, it would hint at the peripherality of our membership. In a community of practice, not all members are equal and their linguistic shortcomings may give them away.

### 3.2.4 Apprenticeship

In attempting to place students in a continuum with regard to communities of practice, the concept of apprentices is of much relevance. Kerns (2008, p.69) defines apprentices as “those individuals new to a certain community of practice” and goes on to suggest that they have more to learn from the community than those members who have acquired a level of expertise in the relevant practice. This suggests that new members to a community are different than the rest of the community. Given that language, much like wearing the right colours, is a readily discernible feature, this difference may be apparent and assessed through their use of the community’s repertoire. Apprentices may not be proficient with the repertoire of the target community of practice and may show a lack of familiarity with this repertoire.

Students in a graduate program, who are learning about a community of practice, are similar to apprentices. They are learning about a community of practice, and thus are not yet full participants. In fact, I suggest that college and university level students are a modern form of apprenticeship. I also propose that they form communities of interest (see section below) as they come from various practices and specialties to learn the basics of a new common practice. The community of interest would find its place within the

spectrum of learning as discussed by Wenger (1998) before members are introduced to participation, different from the three identified types of membership he proposed (marginal membership, peripheral membership, and finally full participation). Even at a marginal state of membership, community of practice members may be fully versed in the community's repertoire and direction while their participation is not as central as that of a full member. I suggest that, before being assigned any form of membership, however limited, an individual must learn these basic tenets of the community once they have shown an interest in interacting with the community of practice. For this, college and university students are a good example of a community of interest seeking membership in a community of practice.

### 3.2.5 Communities of Interest

The concept of communities of interest is closely related to communities of practice while it suffers from even less certainty in its definition. Little literature can be found describing the parameters of communities of interest. Although they are said to be similar to communities of practice in that they involve individuals who share a concern (Flora & Flora, 1995; Pavey et al., 2007). They differ in that members can come from different backgrounds or communities of practice (Fischer, 2001). They may be short lived, when the issue that gave it life is resolved, and no longer requires the community's interaction, or they may be longer lived, where the issue is a common interest with continued relevance.

I am suggesting that the first phase of communities of practices, when forming, can be a community of interest. Individuals entering into a new programme of study could reflect such an early stage, that of a group of individuals learning of a community of practice's characteristics and standards of practice. They would form a community of interest in opposition to a community of practice if they can use the linguistic repertoire of that community of practice relatively fluently but are not highly familiar with the concepts as would be expected of a member of the community of practice. They would thus meet the

requirements of mutual engagement by being involved in a program of study. These graduate students come together as a community, for a period of time, with a shared interest in learning to become part of a community of practice. They would also meet the needs of a joint enterprise in studying a field with a particular mandate. They would, however, lack in their fluency with regard to the shared repertoire of a community of practice member.

Even, and maybe especially, at the stage of a graduate student, they are expected to be aware of the main characteristics of the related communities of practice. They would be able to distinguish them with regards to their linguistic repertoires. Perron and Duffy (submitted) have already assessed and confirmed a significant difference between the linguistic repertoires of the environmental and business community. By using language as an indicator, I here take the concept of communities of interest to assess whether students of a university graduate program can be considered peripheral to the community of practice whose field they study. As a community of interest, students in a graduate program of study are assumed to share an interest in the field of practice they study, as shown by their participation in a program. They are, however, expected to lack the comprehensive familiarity with the target community of practice's linguistic repertoire that a member of the community of practice would have.

I believe that students in graduate programs form a community of interest before entering into the relevant community of practice, being peripheral to the community of practice until they become members. I propose that, even at the early stages, individuals entering a community are already aware of the shared linguistic repertoire of the community of practice. I suggest that graduate students' familiarity with the repertoire of the community of practice which they are studying is different than their own assessment of the repertoire of that community of practice. The following hypotheses frame the above propositions:

Hypothesis 1: Nascent members of the business and environmental communities of practice will show a difference in their linguistic repertoire when compared to their equivalent community of practice.

Hypothesis 2: Students in a graduate course form a community of interest.

By differentiating communities of interest from communities of practice, this study also attempts to situate the concept of communities of interest and anchor it in a continuum of membership and competence. This would address the frequently mentioned but sparingly tested concepts of peripherality and core membership in the community of practice literature (see Lave & Wenger, 1991; Wenger, 1998; Bucholtz, 1999; Holmes and Meyerhoff, 1999).

### **3.3 METHOD**

I surveyed graduate students in two different professional program – Masters of Business Administration and Masters of Resource and Environmental Studies/Masters of Environmental Management. Participants were first asked to identify which of the environmental or business community of interest they identified with most. It is important to note that, when self-identifying as a community of interest, the participants most likely could not make the difference between a community of practice (CoP) and a community of interest (CoI). We could have used the terminology of ‘community of practice’ and suppose that the selection made by the participants would not have been affected. That is, it is expected that the participants simply responded to the word ‘community’ rather than address the issue of CoIs. Participants then provided their selection of most familiar and least familiar concepts, as well as a selection of most and least relevant concepts to each of the environmental and business communities.

Graduate students from environmental and business programs of study were selected for this study. These two groups were selected due to their frequently conflicting points of

view as observed in the mass media (Macdonald, 2007). Students from the Dalhousie Master of Business Administration program were approached as they were considered to be introduced to, or apprentices of, the business community of practice. Similarly, students from the Environmental Studies program were also approached with reference to the environmental community of practice. Given that statistical sample sizes under 43 tend to have low statistical power (Arvey, 1985), a sample of 64 students from the two programs of study was obtained.

Participants were greeted in their regular classrooms to ensure that they were in familiar surroundings to reduce stress as much as possible when choosing whether to participate. All class students were provided with the necessary documentation. They were informed that participation was optional and refraining from participation in any way would have no consequences. If they wished to participate, they were asked to read the Informed Consent form provided, and to sign it before answering the questionnaire. Participants were instructed to hand in their questionnaire and consent form at the front of the classroom as they exited the classroom, whether these documents were completed or not, so that those who declined participation could do so without fear of reprisal. The questionnaires were collected at the end of the exercise. They were assigned a random number as they were removed from the envelope to record the data in a computer for analysis.

For Hypotheses 1 and 2, addressing a difference between linguistic repertoires, a statistical analysis based on a two-tailed Student's t Test, was applied to the participant's responses to the terminology questions. Instead of calculating the level of significance for each comparison, the Student's t Test was aggregated across all items to find those comparisons that reached the desired level of significance: a 95% confidence interval. The mean of the number of times a concept was selected in the terminology exercise was determined. The difference between two means was calculated for 18 degrees of freedom. Thus any pair of mean differences that exceeded the selected confidence interval was declared significant. A list of 19 concepts, relevant to the business and

environmental communities of practice, was used for the terminology exercise. Inspired by a phenomenology approach, the concepts were selected based on experience with both communities and with care to include a variety of concepts that were not too obscure. The list used for the terminology exercise is set out below in Table 3.1.

Table 3.1 Field-specific concepts used in terminology exercise.

Field-Specific Concepts Used in Terminology Exercise	
Attracting high quality candidates	Eco-efficiency
Cost reductions	End-of-Pipe control
Entrepreneurship	Green Design
Increased client loyalty	Life cycle analysis
Increased sales	Pollution prevention
Climate change	Sustainability
New markets	Green Supply Chain Management
New product design	Energy efficiency
Profit	Waste minimization
Market opportunity (international/national/local)	

### 3.4 RESULTS AND DISCUSSION

The questionnaire was handed out to 2 graduate level environmental studies classrooms and one graduate level business studies classroom of students. The total number of participants was 64, with 31 participants from 2 environmental studies classes, and 33 participants from a business studies class. However, the responses from some participants were eliminated due to incomplete entries. These varied depending on the analysis and are identified where relevant.



Regarding Hypothesis 1, whether nascent members of the business and environmental CoP show a difference in their linguistic repertoire when compared to their equivalent CoP, there was no difference between the self-reported **environmental** CoI's selection of most familiar field-specific concepts and the selection of most relevant concepts for their equivalent environmental CoP (Table 3.2). There were 6 significant differences between the self-reported environmental CoI's selection of least familiar field-specific concepts and their selection of least relevant concepts to their equivalent environmental CoP.

Table 3.2 Comparing the self-reported **environmental** CoI selection of familiar concepts and of relevant concepts of the equivalent CoP ( $p < .05$ , 18 df).

Concept	Significance Concepts	
	Most familiar CoI vs most relevant CoP	Least familiar CoI vs least relevant CoP
Attracting high quality candidates		
Climate change		
Cost reductions		Significant
Eco-efficiency		
End-of-Pipe control		Significant
Energy efficiency		
Entrepreneurship		
Green Design		
Green supply chain management		Significant
Increased client loyalty		
Increased sales		Significant
Life cycle analysis		
Market opportunity		Significant
New markets		
New product design		
Pollution prevention		
Profit		Significant

Concept	Significance Concepts	
	Most familiar CoI vs most relevant CoP	Least familiar CoI vs least relevant CoP
Sustainability		
Waste minimization		

For the self-reported **business** CoI, there were 2 significant differences between the linguistic repertoire of most familiar field-specific concepts and the concepts identified as most relevant to their equivalent business CoP (Table 3.3). In addition, for the self-reported business CoI, there were 3 significant differences between the linguistic repertoire of least familiar field-specific language and the linguistic repertoire identified as least relevant to their equivalent business CoP.

Table 3.3 Comparing the self-reported **business** CoI selection of familiar concepts and relevant concepts of the equivalent CoP (p<.05, 18 df).

Concept	Significance Concepts	
	Most familiar CoI vs most relevant CoP	Least familiar CoI vs least relevant CoP
Attracting high quality candidates		
Climate change		Significant
Cost reductions		
Eco-efficiency		
End-of-Pipe control		Significant
Energy efficiency		Significant
Entrepreneurship	Significant	
Green Design		
Green supply chain management		
Increased client loyalty		
Increased sales		
Life cycle analysis		

Concept	Significance Concepts	
	Most familiar CoI vs most relevant CoP	Least familiar CoI vs least relevant CoP
Market opportunity	Significant	
New markets		
New product design		
Pollution prevention		
Profit		
Sustainability		
Waste minimization		

The results tend to confirm Hypothesis 1 in that the CoI selection of familiar concepts was similar to their selection of relevant concepts for the equivalent CoP but not identical. I assumed here that the set of most relevant concepts selected for a CoP is an indicator of the linguistic repertoire of that CoP. Therefore, if an individual selects a set of concepts that are most familiar that is consistent with their selection of concepts that are most relevant to a CoP, their proficiency with the CoP's linguistic repertoire is very likely, and therefore their membership. It seems that, in the case of the self-reported environmental CoI, the selection of most familiar concepts was better aligned with their identification of the most relevant concepts. Their selection of least familiar and least relevant were, however, not as consistent, as were the selections from the self-reported members of the business CoI.

Overall, the results suggest that the participants, who were students in a graduate program in either of the two subject CoP (environmental and business), may have identified with a specific community. Their own linguistic repertoire of familiar concepts, however, did not accurately match with their selection of concepts relevant to their equivalent CoP. This supports Hypothesis 2's assumption that students in a graduate program form a CoI. They are on the outskirts and learning about a CoP, but their limited proficiency with the linguistic repertoire of the CoP of study does not suggest complete membership.

I suggest a gradient of membership for practitioners and interested parties rather than the simple and somewhat blurred distinction between CoI and CoP. In fact, the difficulty one can find in discerning between the two concepts in their application may stem from their relationship being one of continuity rather than pure distinction. I suggest that there is a gradient in the structure of membership from a member of a community of interest to a member of a community of practice. When Lave and Wenger (1991) discuss the peripherality of different members of the same CoP, they already refer to a certain gradient in the level of participation. They suggest three levels: marginal, peripheral, and full participation. I suggest that this distinction is still within the realm of membership of a CoP. Although members may be more or less active in a community of practice, they have shown themselves to be worthy practitioners having accessed membership at all in the CoP. Thus, once membership is obtained, there can be a gradient describing how active a member is from marginal participant (e.g. an engineer working as a financial program oversight coordinator for a corporate environmental funding program) to expert (e.g. an engineer working at improving local buckling and member failure in industrial buildings).

In addition, I suggest that the CoI is a locale that allows for participants to learn of the field of practice without and before becoming practitioners. Figure 3.1 below shows the proposed gradient in participation and competence from the sphere of CoI to that of CoP. Apprentices, like graduate students, are found in the CoI sphere, close to the CoP. Within the CoP sphere, the gradient of membership participation runs from marginal members, to peripheral members, and then full participants as suggested by Lave and Wenger (1991) with the addition of an expert group whose work is entirely and deeply set in the CoP. This imbedded structure receives members of a CoI into the deeper competence of a CoP. Again, to become a member of a CoP, an individual would first show interest about a CoP and learn its way to competence that merits recognition as a CoP member.

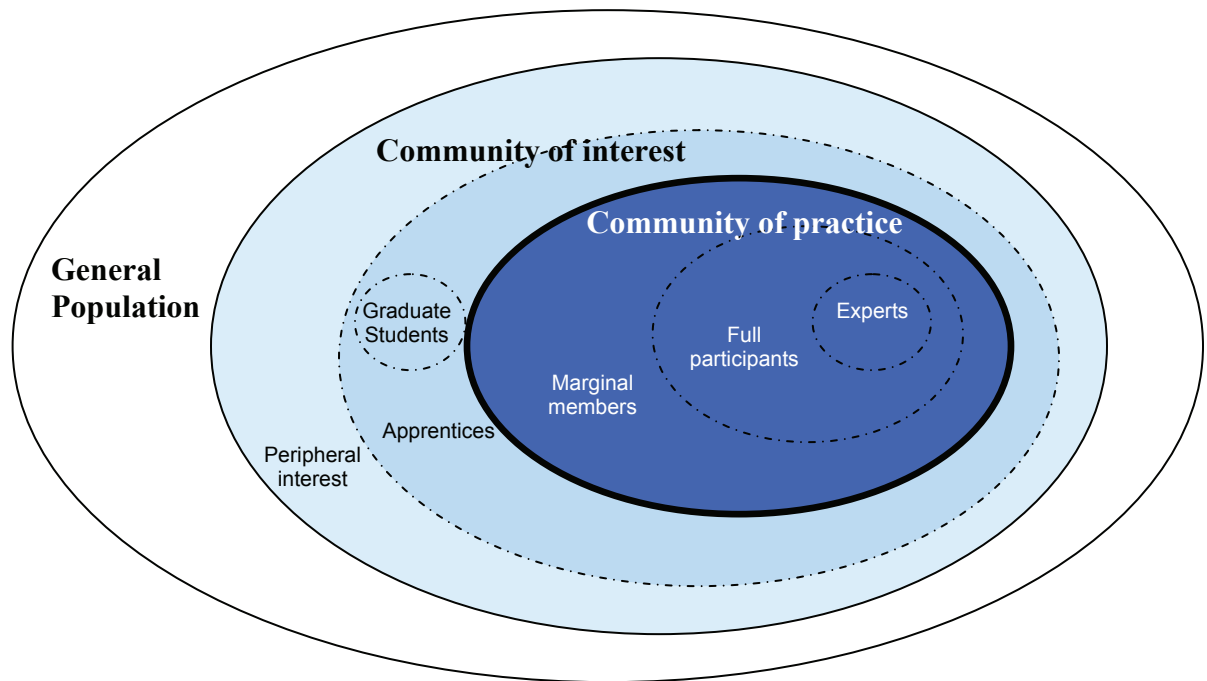


Figure 3.1 The Structure of Membership from Community of Interest to Community of Practice.

This structure could also describe the process by which communities of practice take form. Holmes and Meyerhoff (1999, p.176) offer that “the progressive nature of a CoP means that individual membership in a CoP will differ. Some people will be core members, and some peripheral members”. The above figure offers a place to that peripherality and expertise in offering a continuum of expertise for participants to distribute themselves. This would reflect our seeking the expertise of some in our own field while serving as an expert for others. Although focused on speech communities, Bucholtz, (1999, p.208) also hints to a distributed membership when suggesting that “the language of norms also presumes that some members of the speech community are central and others are marginal, [...]”

As I mentioned earlier, the first phase of CoPs, when forming, can be a CoI. A CoI is focused on individuals who come together to address a particular issue or tackle an interest and may come from different communities and backgrounds. If not dismantled

by a lack of relevance, a CoI could become a CoP. To grow into a CoP, a CoI then builds a CoP by continually interacting, sharing knowledge and views, building common experiences, learning new symbols, and, in the end, building a form of expertise. Once a community has started practicing with the mutual engagement, shared repertoire and with joint enterprise described by Wenger and Snyder (2000), they would create a CoP. They could use these traits to recognize each other and interact with greater ease using the same repertoire and shared direction. The rise of the environmental movement since Rachel Carson's igniting observations in *Silent Spring* (Carson, 1962) would be a fitting example of this process. This, obviously, would warrant further research.

This new suggested structure offers a number of lines of inquiries. The gradient does imply different levels of expertise and participation but other moderating factors may be at play. In particular, conflicts between membership identities may influence both the interest in and acceptance of communities. At the very least, this approach offers a first step in developing a typology of communities of practice and communities of interest while also suggesting a relationship between these concepts that is grounded in incremental learning and participation. The typology of community membership proposed in the figure above offers to distribute membership from general acquaintance with a community's repertoire and knowledge to a deep expertise in the field. Although the results of this study can not offer a clear distinction between the levels of familiarity of each type of member, Table 3.4 proposes characteristics and a distribution of levels of familiarity to help define the types of membership using information from Steven J. Kerno Jr. (2008).

Table 3.4 Typology of community of practice membership peripherality.

<i>Level</i>	Linguistic Repertoire Characteristic			
	Complex concepts	Core concepts	General concepts	Shortcuts
Expert	High familiarity	High familiarity	Medium familiarity	High familiarity
	Concept development	Concept development	Concept development	Shortcut development
Full participant	Medium familiarity	High familiarity	High familiarity	Medium familiarity
			Concept development	
Marginal member	Limited familiarity	Medium familiarity	High familiarity	Limited familiarity
Apprentice	Low familiarity	Medium familiarity	Medium familiarity	Low familiarity
Peripheral interest	No familiarity	Limited familiarity	Limited familiarity	No familiarity
General Population	No familiarity	No familiarity	Low familiarity	No familiarity

The description of levels of competence in each category in Table 3.4 illustrates a distribution of familiarity for a selection of linguistic repertoire characteristics. The distribution proposes a portrait of familiarity for expert members all the way to the general population. In order to assess this distribution, a characterization of linguistic concepts that belong to complex, core and general knowledge would need to be produced to then distribute members on this gradient of membership. As well, each of the high, medium, limited and low levels of familiarity will require some parameters to better distinguish between them and perhaps adjust the suggested distribution of familiarity proposed in Table 3.4. This is however beyond the reach of the present study. The table proposes that only experts and full participants have a role to play in creating linguistic repertoire content in communities of practice. Development implies that new linguistic references are conjured to represent new ideas, circumstances, methods and tenets. Further exploration of this typology will assist in developing the parameters of each level.

### 3.4.1 Additional Observations

Beyond the observations above, a number of additional observations of interest were made regarding the study's data. The two communities for the study were selected, as stated before, because of their frequently and publicly opposing views. The opposition in their views may be also reflected in the linguistic repertoire. It was unclear whether there was an antagonism between the participants' selection of relevant concepts for the environmental CoP compared to their selection of relevant concepts for the business CoP. Would members of either CoI consider the linguistic repertoire of least relevant concepts of the environmental CoP to be similar to the linguistic repertoire of most relevant concepts of the business CoP? Do members of the business CoI consider the most relevant concepts of the business CoP to be least relevant to the environmental CoP?

When compared, the selection of most relevant field-specific concepts of the environmental CoP as selected by the self-reported environmental CoI was partially significantly different from their selection of least relevant field-specific concepts of the business CoP. Of the 19 field-specific concepts, 9 concepts did not reach significance.

This was also the case, with a greater number of non-significant comparisons, for the least relevant field-specific concepts selected by the self-reported environmental CoI for the environmental CoP as compared to their selection of most relevant field-specific concepts of the business CoP. Of the 19 field-specific concepts, 11 concepts did not reach significance.

The business CoI offered an even more dramatic comparison of least and most relevant concepts for the opposing CoPs. The selection of most relevant field-specific concepts of the environmental CoP as selected by the self-reported business CoI was significantly different from their selection of least relevant field-specific concepts of the business CoP. Of the 19 field-specific concepts, 16 concepts did not reach significance and therefore



their selection was similar. The self-reported business CoI selection of least relevant field-specific concepts of the environmental CoP was not partially significantly different from their selection of most relevant field-specific concepts of the business CoP with 13 of 19 field-specific concepts not reaching significance.

These results suggest that the self-reported environmental and business CoIs find some similarities between the concepts most relevant to the environmental CoP and those that are least relevant to the business CoP, and vice versa. This observation in fact further supports Hypothesis 1 in assuming different linguistic repertoires of relevance for the environmental CoP and the business CoP as perceived by self-reported CoI members. Further to this, the results suggest that there is an opposition in linguistic repertoires between the business and environmental CoP as perceived by self-reported members of each CoI, with this opposition being more prevalent among the self-reported business CoI.

It is interesting that the business and environmental CoP are perceived by self-reported members of the business and environmental CoIs to have opposite relevant linguistic repertoires. We could expect that their ability to identify themselves and relevant information would be very polarized as a result, leading to even greater polarization in their interactions. It would be easy to assume that this would be reflected in their views and approaches as well as the solutions they entertain. We could assume that CoP members, with their significant commitment to the practice, would show similar if not stronger views regarding the relevance of other community repertoires and related information. In such a case, an organization belonging to the business CoP that engages in an environmental scan could be expected to ignore information that portrays concepts, or linguistic markers, of the environmental CoP. This could not only limit their view of an issue but also constrain their ability to make informed decisions and find comprehensive solutions.

In addition, the data suggested that the business CoI in their selection of relevant concepts was more polarized than the environmental CoI. It seems the polarization may be perceived more dramatically by one CoI over the other. The reason for this is not clear but this difference warrants further research. These results are particularly important in informing any attempts to engage both the environmental and business CoPs in addressing issues that cut across their respective fields. In reference to introducing environmental initiatives in business organizations, these results force us to consider the approach taken to communicate information of an environmental nature to business organizations. Attention to the language used to convey an environmental idea would likely affect the outcome of the communication. Although further research would help to shed light on the polar ends of the linguistic repertoires of relevant terminology for these and other CoPs, it seems clear that environmental concepts may not meet with much support from business CoP members. There is much to be gained from a better understanding of the role of language in organizational decision-making and the interaction between CoPs and the information they encounter.

### **3.5 CONCLUSION**

This study faced a number of limitations from self-selection, partly countered by the anonymity of participation, and mostly the limits posed by the questionnaire. It would be interesting to conduct the study once more while asking participants whether they consider themselves members of both communities to address the issue of familiarity with both sets of concepts. The results of the study did, however, show that language is indeed a useful tool and source of information for individuals intent on assigning and deciphering memberships, and manipulating information for decision-making.

In addition, the difference between communities of interest and communities of practice seems to apply to graduate students where graduate students seem more like a community of interest. It became clear, however, that the difference between the two types of

communities is not blunt, and may lend itself more to a continuum of expertise rather than two separate types of membership. This particularity provided support for a theory suggesting a gradient in the level of community membership. This issue would lend itself well to further research to better understand the meaning of apprenticeship in a modern age of practice as well as the relationship between learners and practitioners. Also, more work on developing a typology of communities of interest would assist in better understanding how they are related to communities of practice and where they are discontinuous or ephemeral. As for communities of practice, a typology of membership would better reflect and contribute to our understanding of social identity and how we navigate the various expectations of our various identities in different contexts, perspectives, and levels of dissonance.

Finally, the results revealed the duality of the two communities selected where the most relevant concepts of one were not foreign to the least relevant concepts of the other. This polarity was not equal in both communities of practice and revealing the distribution of this linguistic polarity in different communities would offer much to our ability to interact with them and help them interact amongst each other. This would have particular impacts on policy work and private sector partnerships in any attempt to develop new ways of addressing issues that affect a large cross-section of society. Overall, a better understanding of the repertoire of different communities of practice, and how these repertoires interact, would provide great opportunities for cooperation and understanding, to reduce time spent in conflict, money spent consulting, and energy spent on amendments, for everyone's benefit.

### 3.6 REFERENCES

- Arvey, R. D. (1985). Statistical Power of Training Evaluation Designs. *Personnel Psychology, 38*(3), 493-508.
- Barett, F. J., Thomas, G. F., & Hocevar, S. P. (1995). The central role of discourse in large-scale change: a social construction perspective. *Journal of Applied Behavioural Science, 31*(3), 352-372.
- Bucholtz, M. (1999). “Why be normal?”: Language and identity practices in a community of nerd girls. *Language in Society, 28*, 203-223.
- Bucholtz, M., & Hall, K. (2005). Identity and interaction: a sociocultural linguistic approach. *Discourse Studies, 7*(4–5), 585–614.
- Carson, R. (1962). *Silent spring*. Houghton Mifflin Company: Boston, U.S.
- Davies, B. L. (2005). Communities of Practice: Legitimacy not choice. *Journal of Sociolinguistics, 9*, 557-581.
- De Fina, A. (2007) Code-switching and the construction of ethnic identity in a community of practice. *Language in Society, 36*(3), 361-392.
- Eckert, P. (1992). Think practically and look locally: language and gender as community-based practice. *Annual Review of Anthropology, 21*, 461-490.
- Fischer, G. (2001). Communities of Interest: learning through the Interaction of Multiple Knowledge Systems. Proceedings from *24th Annual Information Systems Research Seminar In Scandinavia (IRIS'24)*, Ulvik, Norway. Department of Information Science, Bergen, Norway, 1-14.
- Flora, C.B., & Flora, J.L. (1995). The past and future: social contract, social policy, and social capital. *Increasing Understanding of Public Problems and Policies, 1995*, 53-64.
- Holmes, J., & Meyerhoff, M. (1999). The community of practice: Theories and methodologies in language and gender research. *Language in Society, 28*(2), 173-183.

- Iverson, J. O. & McPhee, R. D. (2002). Knowledge management in communities of practice. *Management Communication Quarterly*, 16(2), 259-266.
- Kerno, S. J. (2008). Limitations of communities of practice: a consideration of unresolved issues and difficulties in the approach. *Journal of Leadership & Organizational Studies*, 15(1), 69-78.
- Koliba, C., & Gajda, R. (2009). "Communities of practice" as an analytical construct: implications for theory and practice. *International Journal of Public Administration*, 32, 97-135.
- Lave J., & Wenger E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Macdonald, D. (2007). *Business and environmental politics in Canada*. Broadview Press: Peterborough, Ontario.
- Ochs, E. (1993). Constructing social identity: a language socialization perspective. *Research on Language and Social Interaction*, 26(3), 287-306.
- Pavey, J. L., Muth, A. B., Ostermeier, D., & Steiner Davis, M. L. E. (2007). Building Capacity for Local Governance: An Application of Interactional Theory to Developing a Community of Interest. *Rural Sociology*, 72(1), 90–110.
- Perron, G. M., & Duffy, J. F. (submitted). Documenting some speculations from the theory of communities of practice: assessing identity from linguistic repertoires.
- Tajfel, H. & Turner, J. C. (1986). The social identity theory of inter-group behavior. In S. Worchel and L. W. Austin (eds.), *Psychology of Intergroup Relations*. Chicago: Nelson-Hall.
- Wenger, E. (1998). *Communities of practice — Learning, meaning, and identity*. Cambridge, England: Cambridge University Press.
- Wenger, E., McDermott, R., & Snyder, W. S. (2002). *Cultivating communities of practice: a guide to managing knowledge*. Boston, Massachusetts: Harvard Business School Press.

- Wenger, E. C., & Snyder, W. S. (2000, January-February). Communities of practice: the organizational frontier. Boston, Massachusetts: *Harvard Business Review*.
- Wong, S-S. (2008). Judgments about knowledge importance: The roles of social referents and network structure. *Human Relations*, *61*(11), 1565–1591.

## **CHAPTER 4      Organizational Mental Models and Natural Resources: A Study of Change**

The following is the article submitted to the *Strategic Management Journal*.

Author:

Geneviève M. Perron

Dalhousie University

## **4.1 ABSTRACT**

Organizational change in the direction of improved performance with regard to the natural environment has seen some progress but barriers appear to prevent adoption of environmental practices in many organizations. This case study looks at the role and effect of experience on mental model change in organizations. Four case studies of business organizations were explored and suggest that the experience of initiatives focused on economic and natural-environment advantages induce change in the organization mental model of decision making. The study also proposes a model of information filtering in mental models and suggests implications for future research and management theory.

*Keywords:* mental models, organizational change, natural resources, environment



## 4.2 INTRODUCTION

Making decisions is only easy for those with nothing to lose. For individuals, decisions can mean surviving an attempt to cross the street or losing a source of income. For an organization, decisions are just as essential. True, not all decisions are as dramatic, but assessing their importance is just as riddled with hurdles and blind spots. In fact, it is the blind spots that challenge our institutions-organizational blind spots. The organizational mental models we use to make decisions limit our decision-making and thus the likelihood of meeting our goals. Organizational mental models, or more precisely those of the decision-makers in organizations, guide the identification of relevant information on which to base decisions. In a way, organizations make decisions on a swiss cheese equivalent of information. This could, and most likely does, lead to decisions that lack the breath required to effectively navigate the current organizational environment.

The current organizational environment is of particular relevance to this argument. While financial information almost always makes it through to the decision process, information pertaining to the natural environmental and natural resources all too seldomly finds its way through the filter (DeCanio, 1998; Muthulingam, 2009). On a global scale, natural-environment degradation can cause serious harm to our ecological resource banks, as well as destabilizing areas of the world, resulting in dramatic human/social conditions from food scarcity and deadly conflicts (Moyer, 2010; Thomas & Kerner, 2010). Closer to home, it is important to realize that natural-environment issues are relevant to organizations, especially business organizations, as they will result in financial consequences (Doskocch, 2007; Stern, 2007). The increased cost of water and energy, droughts, floods, extreme weather events, new legislation for ecological/human protection, ecological terrorism, and public perception issues are today relevant organizational concerns. Lack of implementation of eco-efficiency opportunities

suggests that the decision-making process of organizational mental models too rarely consider natural-environment information in decision-making to curtail these eventualities (DeCanio, 1998; Williams et al., 2000). As Swanson (2003, p.379) put it, “[...] for a person to change or expand their decision premises, they must change their mental model.”

#### 4.2.1 Models for Action

Models are not just a fond childhood memory, they are our means of daily navigation and the bread and butter of research. They are what we build to understand our surroundings, and build on to better predict its behaviour. They are used to provide a clear and unobstructed, albeit simplified, representation of a theme. Models provide representations of phenomena, or data, or theories in the sense that they interpret the laws and axioms of that theory (Models in Science, 2006). Models are fundamental to our nature and pervasive in that we create and use mental models to navigate daily decisions. Our minds create them naturally and store them to use, adjust, or connect as we learn more information (Medin & Ross, 1997). They are thus very useful and necessary tools for thinking and for decision-making bringing structure and consistency to our information processing.

The internal, often anonymous, mental models we build are unavoidable. Our experiences lead us to build mental models of the world so that we may navigate through the quagmire of information available to us (Green, 1996; Chermack, 2003). In our era of technology, information is increasingly easy to acquire and, moreover, it is often difficult to avoid even for a moment's peace. We are truly bombarded by information of various quality and pertinence to our goals, and it is thus implausible to expect that we are capable of processing all the information available in order to act (Bettis & Prahalad, 1995; Simon, 1997; Davenport & Beck, 2001).

When it comes to information, Simon (1997, p.226) states that: “[t]he bottleneck is no longer the capacity of the electronic channels but the capacity of the human users.” The time and attention required to process information to allow a choice to be made between various options is a critical limiting factor (Simon, 1997; Davenport & Beck, 2001). Our mental models fill this decision-making failure in processing. We filter this plethora of information for relevance using criteria and logics to use only some of the information available, the information deemed most relevant, thus allowing us the luxury of decisions and subsequent action. Individuals – and organizations – therefore produce decisions based on information that is incomplete, but knowledge which is limited to be manageable. Our mental models are the setting for the criteria and logics that guide the selection and processing of information for timely decisions (Hill & Levenhagen, 1995).

#### 4.2.2 Mental Models and Decision-Making

The concept of mental models has raised much interest partly because of its simplicity and intuitive appeal. One general definition of mental models is offered by Langan-Fox et al. (2004, p.331), with reference to Wilson (2000), where mental models are “internal (mental) representations of objects, actions, situations or people, and are built on experience and observation, of both the world in general and the particular entity of interest.” The concept of mental models takes its roots from a number of authors, the most prominent of these being Phillip Johnson-Laird and colleagues (1998) who offered that mental model theory “extends in a natural way to inferring probabilities, to decision making, and to recursive reasoning about other people’s reasoning” (1998, p.17).

Mental models are thus structures used to navigate situations (Chermack, 2003; Langan-Fox et al., 2004) and allow decision-making that is relatively consistent

but intent on rapid action (Green, 1996). They are often a mental version of a rule of thumb or a set of assumptions by which we assess situations and make decisions. As mentioned previously, they are based on experience and on our internal ability to describe and process information (Anderson et al., 1996).

Although they are quite essential, these later characteristics of mental models suggest fundamental limitations to their use. They may be quick and necessary, but they depend on our inevitably limited experiences and offer, by their very nature, simplifications of cause and effect relationships. Senge (1992, p.5) proposes that “[t]he problems with mental models lie not in whether they are right or wrong--by definition, all models are simplifications. The problems with mental models arise when the models are tacit--when they exist below the level of awareness”. Once a mental model has been established, it becomes a form of perceptual filter for information (Hill & Levenhagen, 1995) and, through its beliefs, filters out information that is seen as contrary to assumptions (Simon, 1997; Willard, 2005; Senge, 2006). Intuitive models are problematic where they may result in faulty decisions based on models that are inaccurate, but lie outside our ability to adjust them.

We therefore need to recognize the role of mental models in our decision-making to bring to light and understand our decision-making processes, and the behaviours they produce. Without this understanding, we may be doomed to repeating patterns of decision-making which fall short of producing advantages in organizations or, at worst, doom our efforts. The risk lies not in what we used in making our decision, it is in what our mental decision process, our mental model, left out (Anderson et al., 1996; Johnson-Laird et al., 1998; Swanson, 2003).

In fact, mental models are one of the reported constraints to efficient decision-making (Swanson, 2003). Moreover, Chermack (2003, p.409) suggests that “[w]e construct mental models to convince ourselves that we understand various

phenomena and by doing so, allow ourselves to function in situations where we lack complete comprehension.” Mental models are therefore an important element requiring attention if decision-making practices are to be improved, even if changing such models may require considerable effort. Swanson (2003, p.379) states:

“It is argued by many that such premises are developed according to the mental model in use by the decision maker and that mental models house an individual’s knowledge, experiences, biases, values, and beliefs about how the world works. Thus, it would be logical to say that for a person to change or expand their decision premises, they must change their mental model.”

#### 4.2.3 Mental Models in Organizations

Mental models are a primary means by which people in organizations make predictions about their environment and make decisions based on those expectations (Hill & Levenhagen, 1995; Kurzinger, 2004; Willard, 2005). The intuitive assumptions and rules by which organizations function are often not stated and remain invisible in guiding business behaviour (Schein, 1985; Hill & Levenhagen, 1995). Moreover, these models form the foundations for initiating and organizing subsequent action (Nisbet & Ross, 1980).

In guiding our selection of information for decision-making, mental models may prevent the use of relevant but uncommon types of information in organizations. Unsolicited information that would improve the organization’s ability to reach its goals may include information on the natural environment that would assist in creating sustainable organizations in increasingly risky environments. Senge (2006, p.8) suggests that “many insights into new markets or outmoded organizational practices fail to get put into practice because they conflict with powerful, tacit mental models.” In fact, he argues for a ‘shift of mind’ or mindset,

to improve organizational learning (see also Stevense, 2003; Swanson, 2003). Two questions can be raised for organizations: what information is being left out and what would it take to change the mental model so that the information is used?

#### 4.2.4 Change for the Environmental Information Orphan

In business organizations, natural-environment information may suffer from being orphaned by the filtering criteria of their mental models. There is some evidence in the literature of such an orphaning effect of mental models with regard to decision-making. A number of studies have noted particular barriers to the use of natural-environment information in small and medium organizations related to internal attitude and perception. (Holland & Gibbon, 1997; Gerrans et al., 2000; Rutherford et al., 2000; Natural Resources Canada, 2002; Thompson, 2002; Revell & Rutherford, 2003; Vernon et al., 2003; Hillary, 2004). If efforts to change the perception of natural-environment information in organizations are so riddled with barriers, circumventing these barriers would be a significant advantage.

Testimonials obtained during a survey of participants in the Business Assistance Program of the Eco-Efficiency Centre (2006) suggest that a frame of mind, a mental model of the organization, existed and was then changed through experience to include natural-environment information. This change was said to have opened new perspectives and generated an alteration of the mental model of the organization. Now, what could change an organizational mental model which is imbedded in the organizational culture? It may be that the experience of natural environment information in organizational decision-making could change their mental model.

The following study explores changes in organizational mental models as an outcome of organizations' experience of eco-efficiency initiatives (initiatives that are both ecologically and economically advantageous). Organizational mental models are addressed through changes to their intrinsic perceptions of relevance in the use of information for decision-making with a focus on natural-environment information. The treatment of information in the organizational decision-making mental model, as a consequence of the experience of natural-environmental information in business organizations, is explored.

### **4.3 METHOD**

The questions favoured a case study approach to allow a better understanding of the issues in relation to changes in the mental model of the organizations with a single-participant approach focusing on the effect size with fewer participants (McBurney & White, 2004, p.312). This approach does not lend itself to significant extrapolation to the population, offering some challenges for external validity. It was assumed, however, that the first step in addressing the question of external validity of the change produced by participation in an eco-efficiency program was to measure whether a change has taken place in the exposed individual. In addition, a number of features were adopted to improve the meaning and value of participation in eco-efficiency programs.

The study was conducted using two different programs that offered the same core features with different wrappings. They both focused on small and medium-enterprises, and provided financial support for the development of eco-efficiency in the organization. Eco-efficiency initiatives are initiatives that would improve both the financial performance of the organization and its impact with regard to the natural environment. The financial support served to cover the cost of an approved consultant who could tailor a project to their particular circumstances,

and assist in carrying it through. In both cases, the participants were sought, brought together to learn the goals of the program, matched with a consultant, and assisted to complete the process.

Beside those core program commonalities, the two programs were different in a number of ways. They were conducted in two different provinces, two different languages, two different cultures, and under two different levels of government. The Business Assistance Program (BAP) of the Eco-Efficiency Centre in Halifax was conducted in Nova Scotia, in English, by a local-level organization with support from the provincial government. The Enviroclub program was conducted in Québec, in French, and was a Federal government initiative. The differences in the programs were welcome and intentional. I wanted to see if any change was the result of participation in an eco-initiative program, one of the particular programs, or a program's specific features, or variables such as language. By using such a variety of mismatched variables, the validity of a positive finding being linked to the type of program rather than to other variables such as marketing materials or culture was increased. This further isolated the eco-efficiency process and approaches found in common rather than individual characteristics of these programs.

High-ranking managers were interviewed in each organization in order to assess a change in their mental model of the organization. Participants self-reported changes in the way they perceived various aspects of the organization and its processes were used as an indicator of change in the mental model. The study focused on the organization's ability to identify resources, its choices and values, and its perception of the role of natural resources. These categories are expected to inform and guide decision-making with regard to natural-environment information. The study used a mixed qualitative and quantitative approach with a semi-structured interview questionnaire to assess changes in these areas. Once



background information on the participant was recorded, the participants were invited to answer the questions using a Likert scale (see Table 4.1).

Table 4.1 Interview Likert scale values.

Score	1	2	3	4	5
Value	Strongly agree	Agree	Indifferent	Disagree	Strongly disagree

Participants were then invited to provide additional clarifications or comments. Interviews were conducted over the phone by the investigator to ensure a level of consistency. The questions are found in Table 4.2.

Table 4.2 Interview questions.

Category	Question
Identifying Opportunities	In your opinion, your employees are better able to identify new initiatives that will be economically and environmentally advantageous You are better able to identify past initiatives undertaken which can be considered eco-initiatives (have produced environmental benefits) You are better able to identify new initiatives that will be economically and environmentally advantageous
Choices and Values	Participation in an environmental initiative has contributed to your organization's values Participation in an environmental initiative has influenced the choices you have made or will make in the future You believe environmental issues are more relevant to business since you participated in an environmental initiative
Role of Natural Resources	The role of natural resources in your business is more apparent  You have a better understanding of the impact of natural resources on your bottom-line

Category	Question
	You have a better understanding of where natural resources fit in your balance sheet

High-ranking managers were targeted as their mental model of the organization, and the decisions made based on this model, should be central to guiding and defining the organization and its courses of action. In addition, they were asked to respond for the organization not their own personal opinions and changes. Their responses on the Likert scales were analysed to provide a quantitative view of the change recorded as scored by the participants. The comments provided allowed for content analysis focusing on change statements and overall observations on the change process. The changes reported are limited by the biases of participants but have the benefit of being self-assessments. Self-assessments have the advantage of being conscious observation of one's experience of change.

#### 4.3.1 The Participants

Organization 1 (O1) was a fish processing plant and canning facility based in Nova Scotia. It had been in operation for 45 years at the time of the interview. It had 75 employees and, at the time of the interview, had completed the entire Business Assistance Program. The interview was conducted with its president, who had 20 years of management experience. Organization 2 (O2) was a medium size incorporated underground salt mining and refining facility in Nova Scotia. The organization had been in business for 59 years at the time of the interview, and had managed approximately 200 employees. It had also completed the Business Assistance program at the time of the interview. The interview was performed with the Engineering Superintendent who had 33 years of management experience.

Organization 3 (O3) was an agricultural cooperative producing cheese and dairy products in Québec. It had approximately 160 employees, and had operated for approximately 70 years at the time of the interview. The organization had completed the Enviroclub program at the time of the interview. The interview was performed with the factory superintendent, who had 15 years of management experience. Organization 4 (O4) was a family run manufacturer and installer of doors, windows and kitchen cabinets. It had 85 employees and had been in business for 58 years at the time of the interview. While it had started the Enviroclub program, it had not yet completed it at the time of the interview, but was planning on completing the projects. The interview was performed with the president of the organization, who had 30 years of management experience.

#### **4.4 RESULTS AND DISCUSSION**

The focus of the study was on mental model change and, as such, it was focused not on mapping the mental models of the participants and related organizations, but rather on self-reported observations of change in participants' perception of the organization. The area of interest for change focused on participants' perceptions, their conceptual 'view', or mental model, of the organization and the place that environmental resources have in it. Moreover, the questions focused on the organization's decision-making processes addressing change in the areas of the organization that would identify opportunities, the choices made by and for the organization, the values of the organization, and the role of natural resources. These areas would affect how the organization's mental model perceives environmental information, recognizes its value, and uses it. A change indicates that the relationship between the mental model and natural resources will have been adapted or reviewed. The model could have shifted to accommodate a new form of relevant information in its decision-making.

Participants reported important changes in their ability to identify environmental initiatives as a result of participation in an eco-efficiency program. All 4 participants agreed that the organization’s ability to identify new initiatives that were economically and environmentally advantageous improved after participation in the eco-efficiency program. On average, the 4 participants scored 1.83 on the Likert scale which would situate their opinion between agree and strongly agree ‘agree’ (Table 4.3).

Table 4.3 Participant scores on questions regarding the identification of opportunities by the organization.

Section	Question	Score				Mean
		O1	O2	O3	O4	
Identifying Opportunities	In your opinion, your employees are better able to identify new initiatives that will be economically and environmentally advantageous	2	2	2	2	2.00
	You are better able to identify past initiatives undertaken which can be considered eco-initiatives (have produced environmental benefits)	2	2	1	2	1.75
	You are better able to identify new initiatives that will be economically and environmentally advantageous	1	2	2	2	1.75
	Mean All					1.83

The scores are very consistent among all 4 participants, suggesting strong agreement among them. This also suggests that, as reported by participants in their self-assessment, the experience of the environmental program changed the participant’s perceived ability to identify new initiatives from which environmental and economic advantages can be found. The experience of the program improved their ability to identify opportunities that are simultaneously economically and environmentally beneficial. A change was perceived by participants with regard to the way they see their business as they moved to an

improved ability to see eco-initiatives in the same organizational environment. After participation, they reported a change to their model of organizationally relevant information accommodating eco-initiatives. This is no small feat, as information on the benefits of eco-initiatives has been available in the past but uptake from organizations has been poor (Smith & Kemp, 1998; Stone, 2000; Thorpe & Prakash-Mani, 2003; Simpson *et al.*, 2004).

Overall, participants were even more positive about the impact that participating in an environmental program made on their organizational values and the future choices they will make. The mean score provided for the three questions on choices and values was 1.41 which situates their opinion between ‘strongly agree’ and ‘agree’ (Table 4.4).

Table 4.4 Participant scores on questions regarding choices and values by the organization.

Section	Question	Score				Mean
		O1	O2	O3	O4	
Choices and Values	Participation in an environmental initiative has contributed to your organization’s values	1	1	2	2	1.50
	Participation in an environmental initiative has influenced the choices you have made or will make in the future	2	1	1	2	1.50
	You believe environmental issues are more relevant to business since you participated in an environmental initiative	1	1	2	1	1.25
	Mean All					1.41

Again, none of the participants provided a score greater than 2 which represented ‘agree’ with a majority of scores providing answers of 1, representing ‘strongly agree’. The participants were particularly positive about the self-assessment change in their perspective on the relevance of environmental issues in business. As shown in Table 4.4, overall, participants scored an average of 1.25 when asked

whether their participation has led to a greater belief that environmental issues are relevant to business. In fact, 3 of the 4 participants strongly agreed with the statement. Even if their participation in an environmental program could be motivated by an already existing interest in the natural environment, participants perceived an increase in the organizational relevance of environmental issues following their participation in the most recent eco-initiative program in question. These responses point to a change not only in their choices and values, but also to their perception of relevance with regard to environmental initiatives and their aspects. This again suggests that their internal model of their organization which houses relevance and values has been shifted.

This streak of self-reported change continued for the questions aimed at the role of natural resources in the organization where participants scored an average of 1.67 for the three questions (Table 4.5). All 4 businesses 'agreed' to 'strongly agreed' with the statements, pointing to a stronger perception of the role of resources in their organization. These results point to an important change in the way resources are perceived by the participant in his organizational mental model, where the roles of various elements and functions of the organization are adjusted to bring to light the contribution of natural resources. The results show a strong perceived change initiated by their experience of the eco-initiative program- to the extent of changing the way they see fundamental features of their organization, namely their balance-sheet and those aspects that affect their bottom-line. This further substantiates the suggestion that the participants' previous model of those aspects that affect their bottom-line did not predominantly show, if at all, the role of natural resources. Their mental model omitted those pieces of information when assessing influences on their profitability.

Table 4.5 Participant scores on questions regarding choices and values by the organization.

Section	Question	Score				Mean
		O1	O2	O3	O4	
Role of Resources	The role of natural resources in your business is more apparent	1	1	2	2	1.50
	You have a better understanding of the impact of natural resources on your bottom-line	1	1	2	2	1.50
	You have a better understanding of where natural resources fit in your balance sheet	2	1	2	3	2
	Mean All					1.67

The change participants noted in their ability to understand where natural resources fit in their balance sheet is a telling change in relation to mental models. In fact, the balance sheet can be perceived as one depiction of the mental model of a business organization. It is a model in the sense that it is a simplified means by which the organization interprets and thus experiences the most relevant information affecting its goal of profitability. The categories used in the balance sheet can be seen as a representation of the main aspects of the business. As a mental model, the categories may thus be seen as the list of aspects that are relevant to an organization’s success. Fluctuations in the balance sheet, if not located squarely in the depicted aspect, may be discarded to ‘unknown factors’.

It is then important that 3 of the 4 participants agreed or strongly agreed that the experience changed their understanding of where natural resources fit in the balance sheet for the better. This implies that, prior to the experience in question, fluctuations in the organizational performance that were a function of natural resources would not have been clearly attributed to that aspect of the organization. Natural resources, a link to the natural environment’s impacts on the organization, made its way from most likely an ‘unknown factor’ in organizational success to a main player on the organizational balance sheet.

Only one score of 'indifferent' was recorded for all questions in the interviews. The score was obtained from O4, an organization that produced cabinets. It reported no increase or decrease in their understanding of where natural resources fit in their balance sheet (Table 4.5). Given that their business is directly bound to natural resources, this was not surprising. What was surprising was that this same organization, like the other three, reported an increase in their understanding of the role of natural resources overall, and its impact on the bottom-line. It is particularly telling that an organization that already deals primarily with natural resources in their business scheme also experienced a positive change in their perspective regarding natural resources as a result of participating in an environmental program focused on eco-efficiency.

Only one organization reported not having implemented an environmental initiative before participating in the environmental program (Table 4.6). This negative response, however, was later reversed by the participant in his comments. In fact, all 4 participants indicated that previous experience with environmental initiatives had increased their interest in involving their organization in more environmental initiatives. The average score provided on the Likert scale was 1.25, with 3 out of 4 participants strongly agreeing. We conclude that the experience was overall perceived to have benefited the organization enough to pursue more initiatives.



Table 4.6 Participant responses and scores on questions regarding past experience of the organization.

Section	Question	Score				Mean
		O1	O2	O3	O4	
Past Experience	Had your company implemented environmental initiatives prior to your participation in the X Program?	no	yes	yes	yes	-
	Past experience with environmental initiatives has increased your interest in engaging in more environmental initiatives	1	1	1	2	1.25

It is interesting to note that the participant who had reported not having previously engaged in environmental initiatives changed his initial response when asked if his organization engaged in a list of specific initiatives, when he recognized that the organization had purchased water-efficient equipment prior to participation in the eco-efficiency program in question. The participant added that he “could now see it as an environmental initiative, see the reduction of water use for the sustainability side of things.” He added that he could perceive the interest his consumers would have in this sustainability-related information.

#### 4.4.1 The Change Content of Comments

Participants provided numerous comments to add or clarify their scored responses and provide specifics about their experience. Comments were recorded and analyzed using content analysis where statements indicating change as a result of participation in the program were identified. Once the comments were read, I created 5 categories of change statements, as reported and self-assessed by participants, shown in Table 4.7: new perspective on the organization; increased attention to environmental aspects of the organization; modified work process; increased interest in environmental issues; and ability to see financial advantage

in environmental initiatives. All relevant change statements were allocated to these categories.

Table 4.7 Instances of change statements in participant commentary.

Clusters	# instances				Total
	O1	O2	O3	O4	
New perspective on the organization	4	3	1	3	11
Increased attention to environmental aspects of the organization	1	1	1	3	6
Modified work process	1	0	0	3	4
Increased interest in environmental issues	3	1	2	1	7
Ability to see financial advantage in environmental initiatives	3	3	0	1	7
Total	12	8	4	11	35

Participants made a high number of statements supporting a self-assessed change in their perception of the organization as a result of participating in an eco-efficiency program. A total of 11 such statements were made by participants (Table 4.7). Overall, participants provided additional statements of change as a result of their participation. This suggests that, in addition to the very positive results observed using the Likert scale scores, participation in an eco-efficiency program changes the way environmental issues and aspects are perceived by the organization.

It is particularly interesting to note the number of times additional comments were provided regarding a change in the participant's perspective on the organization. This adds to the strong agreement reported in the Likert scale scores to support significant changes to the way the organization is perceived, and to its implied mental model following participation. The multiple types of change reported support a shift in the organization's mental model to accommodate the role, and the contribution of environmental aspects on the organization's functioning. The reported increased attention to environmental issues suggests that decision-

making, and organizational scanning activities, have been modified to include natural-environment issues.

It is also interesting to note that the 2 larger organizations, O2 and O3, provided the least additional commentary beyond their scaled answers during the interview. Given that they were of similar size and larger than O1 and O4, The difference could be a function of their size. It may be that they had a more distant or detached experience of the actual initiative conducted in their organization, where other more operational members conducted the work directly. Experiencing change through reports would most likely provide a less personal reaction to the process. Their position as managers would however be expected to provide a closer experience of the balance sheet and the bottom-line. In fact, O2 did provide a change comment regarding their now improved understanding of where natural resources fit in the balance sheet since their participation in the eco-efficiency program. It provided a radiant, “Absolutely!”. On the other hand, it may be that the contrast is not between O1 and O4 versus O2 and O3 but rather between O3 and the other three organizations. O3 produced the least comments and this could be the result of their reported participation in previous environmental initiatives “d’envergure” (of significant size). Overall, the more parsimonious comments from some organizations could simply reflect the participants’ personalities, where the response to the Likert scales seemed encompassing enough to render their point of view and attitude on the matter. In fact, O3, the organization with the least comments, provided the second most positive approval of the change in overall relevance of the natural environment for their organization across all categories as a result of participation. The study, however, could not shed more light on the matter.

#### 4.4.2 On the Case Studies

A number of observations were made on the overall response from the participants. The analysis does not divide the issues along the lines of each case study specifically. Overall responses by participants are here discussed with reference to the change processes of interest.

##### 4.4.2.1 Identifying Environmentally Advantageous Opportunities

When addressing the identification of environmentally advantageous opportunities, O1, a fish processing plant and canning facility, made numerous statements regarding their change experience which they associated with participation in the environmental program. The participant stated many times in different words that participation “opened our eyes to change”. O1 also indicated that the self-assessed change had been a revelation of sorts, where the participant referred to having not been conscious of the fact that they were in “a rut” and doing business as usual until they participated in the program. This speaks well to the latent as well as manifest changes that participation in an eco-efficiency program can have on an organization. Upon completion, the participant was more open to not only eco-efficiency changes but also change in general. In a way, the mental model was expanded through experience which may have also opened the possibility that there is more ‘out there’ that is not being considered in their current mental model.

For O2, a large underground salt mining and refining facility, it was the difficulty they experienced with maintaining initiatives over time that stood out. The participant associated this issue with the lack of a designated employee for environmental initiatives in the organization. Still, the participant agreed that the organization was better able to identify environmental initiatives and opportunities, and the program was deemed useful in focusing their efforts on

environmental issues they were already aware of but considered “out there”. Unlike O1, it is interesting to note that O2 had perceived that there were potentially relevant issues outside their periphery of attention; however, they felt limited in their ability to approach and act on them by their understanding of natural-environment issues. O3 was not very forthcoming regarding their identification of environmentally advantageous opportunities after the organization’s participation in the program beyond agreeing or strongly agreeing to the Likert scale statements suggesting improved abilities. Nonetheless, the participant did report that the participation generated additional environmental initiatives (“ça a fait boule de neige”).

For O4, the change reported was less one of awareness of the issues than of realizing the benefits that could come from addressing them. O4, a manufacturer and installer of doors, windows and kitchen cabinets, also commented on the new attention they now pay to environmental issues inside their walls, and beyond their activities with reference to the attention they give to the products they use and the packaging from their suppliers. This extension of the organization’s perception of natural-environment impacts on their organization is notable. O4 added to this reported change that the experience has introduced a new environmental aspect to their decision-making. In addition to the existing issue of profitability they now try to see things in an environmental light (“Sur toutes les choses qu’on pense présentement, essaie de voir avec un oeil environnemental”). This is an interesting note hinting at changes in what the organization deems to be relevant information in their decision-making process.

#### 4.4.2.2 Organizational Choices and Values

When discussing organizational choices and values, participants reported an increase in public visibility due to their new environmental initiatives. For O1, participation has made them realize that they will increasingly be evaluated by

their environmental impacts. Also, not only did O2 report going beyond compliance as an organizational value since their participation, but they reported now recognizing that their environmental efforts are compatible with health and safety improvements as well as the bottom-line. The self-assessed change experience reported by participants in the study thus suggests a change with regard to their perception of those issues that stakeholders and shareholders pay attention to. It suggests an important modification to the set of values that the mental model holds and uses to guide organizational decisions.

Most surprisingly, O3 reported that their participation resulted in a “prise de conscience” (fundamental realization). Their prime motivation has remained economic but the environmental aspects are now considered in their decision-making. O3 was very animated about how participation opened the way to new opportunities. Not only are new opportunities now sought by O3, but a long term view of the organization and its decisions was also brought on by their experience. This suggests, again, a dramatic shift in the way an organization perceives itself, perceives the role of the natural environment, and perceives the form its success will take. Similarly, O4 found that participation increased their attention to the impact of environmental issues on the organization stating: “on était sensible, ça a été accrue avec la participation” (we were sensitive, it has been increased with our participation).

#### 4.4.2.3 Role of Natural Resources in the Organization

In addition to comments made by participants in previous sections, some participants provided more insight to highlight a change in perceptions on the role of natural resources in the organization. Referring to the role of natural resources in their business, O2 stated that “It’s been taken for granted in the past; now it’s the focus of a very significant part of our costs.” As reported earlier, O2 also ‘strongly agreed’ with the statement suggesting that ‘You have a better

understanding of where natural resources fit in your balance sheet' and added a strong "Absolutely!" O4, a manufacturer and installer of doors, windows and kitchen cabinets, also added that participation in the program increased their awareness of and efforts towards the economy of resources, although the participant noted that their perception of the location of natural resources on the balance sheet had not changed. This suggests that, even where natural resources are a fundamental part of the organization's processes and outputs, the role they play in the organization's profitability may be more manifest as a result of participation in an eco-efficiency program, as reported by participants.

#### 4.4.2.4 Past Environmental Experience

Overall, when discussing their organization's past experience, cutting costs was noted as the initiator of participation for most organizations. Participants suggested additional reasons including being more efficient, the bottom line, reducing energy costs, obtaining insightful analysis, and the opportunity to meet and exchange information? with other organizations. The environmental aspect, even as a marketing opportunity, was not a prime motivation for engaging with the program, and profitability remained a prime motivation and goal even after the program. Participation, however, led O2 to note that, for these organizations, "long-term profit sustainability is a significant part of our initiatives now". This suggests a change from the previous mental model perspective on the organization and its goal-seeking behavior.

When it comes to engaging in environmental initiatives, O2, O3, and O4 reported introducing an environmental initiative. O1 also corrected its initial negative response later in the interview to recall having engaged in eco-initiatives prior to participating in the program (though the participant had not thought of them when initially asked). Although they boasted past experience with environmental initiatives, O2 also confirmed that the relationship between environmental

initiatives and their financial benefits has been made more prominent by participating in the eco-efficiency program. In addition, it is interesting that O2 contrasted its motivation for engaging in environmental initiatives. After identifying a few environmental initiatives entertained by the organization in the past, O2 stated that the motivation for the past initiatives was solely financial, in contrast with initiatives engaged after participation which were also motivated by a reduced impact on the environment. This change in interests is also raised by participants in addressing their experience in an eco-efficiency program.

This suggests that the experience of combined financial, economic and ecological efficiency is hardly attained by simply introducing environmental initiatives in an organization. A structured program engaging the organization seems to provide the altering process required to prompt a change to their perception of the organization and the role of natural resources. Again, this suggests that some organizations may not see the link between environmental initiatives and their financial benefits. The experience of this relationship may be necessary in order to change their mental model of the organization. In fact, it could very well be that experience is the missing link. It may be the keystone to changing organizational perceptions of the natural environment as it is the substance from which we build our mental models.

#### 4.4.2.5 Experiencing an Eco-Efficiency Program

Last but not least, participants noted changes in the perception of the organization as a result of engaging in an eco-efficiency program. Overwhelmingly, participants reported that participating in environmental initiatives has increased their interest in engaging in more environmental initiatives. For example, O4 reported that participation in the program changed their way of assessing initiatives by bringing in a project evaluation approach (“amené une dynamique



d'évaluation de projet”) because of a greater awareness (“Donne une plus grande conscientisation”).

Participating in environmental programs in general, however, may not be as accessible as one would think. In addition to their previous comments, O2 noted that they had tried to participate in government-led environmental programs in the past, but had difficulty navigating the levels of government and internal divisions so that they “could not get through to anyone”. This suggests that, even when interest in participating in an environmental program is raised in an organization and they take the initiative to instigate participation without solicitation, organizations may not be able to take advantage of government-led business-targeted environmental initiatives due to the very structure of government.

The answers both from the Likert scale exercise, and the comments, suggest that an important change can come from participating in such structured eco-efficiency programs aimed at identifying initiatives offering both environmental and financial benefits. The study suggests that participation in such programs, even if the organization experienced environmental initiatives previously, results in a significant transformation in the way the organization interacts with its environment. Comments such as O1’s statement that participation “opened our eyes to change” and O3’s “prise de conscience” (fundamental realization) show that, in two different programs, two different provinces, two different cultures, and two different languages, this transformation was reported by participants.

We can speculate as to how these two programs could provoke such changes in organizational perceptions. Less their differences, the programs offer, at their core, a common format and goal. In both programs, organizations are assisted by experienced consultants to find opportunities for environmental improvements that specifically result in financial benefits. Also, in both programs, participants are guided to identify and understand the organizational impact of natural-

environment and its resources. This approach seems to be instrumental in engendering changes in the organization's perception of natural-environment factors and their relevance to organizational goals. Readers should note that there is no control group to verify this conclusion. The study suggests that the changes noted by participants throughout are indicative of the introduction of natural-environment aspects in the list of issues that the mental model considers relevant in organizational decision-making.

Although it was noted that this approach does not lend itself to significant extrapolation to the population given that the cause-effect relationship is only that reported by participants, challenging its external validity, the approach does present two forms of data collection with semi-quantitative and qualitative forms of data. This approach helped to confirm the responses to provide greater external validity where convergence was found. The results discussed suggest such convergence where the Likert scale responses were confirmed by the open comments from participants with clarifications and examples. Combined with the sampling of two different programs in two different cultures and languages, this design improves the external validity of the findings.

#### 4.4.3 Changing the Organizational Mental Model

The study thus points to a shift in the organization's decision-making mental model, to a change in the information used by the organizational for decision-making. The participant-reported change suggests that the list of items that the mental model considers relevant to decision-making adopted a new function, that of natural-environment issues. Figures 4.1 and 4.2 offer an illustration of the filtering of information for use in decision-making. It illustrates how a change in the mental model would move from using a set of information sources (Figure 4.1) to adding another source, namely natural-environment information (Figure 4.2).

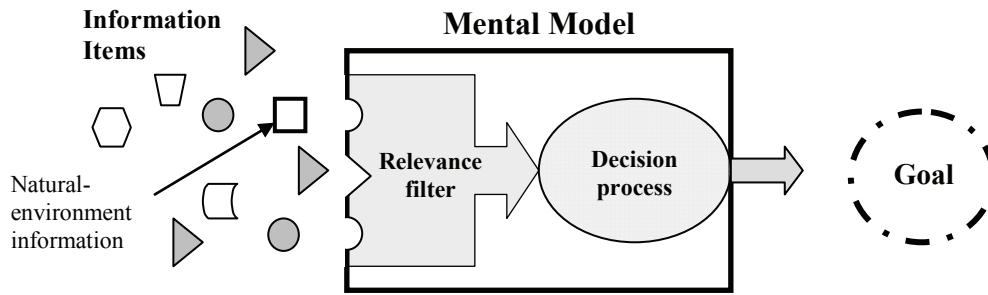


Figure 4.1 Limited processing of natural environment information for decision-making. Illustration of the filtering function of mental models for decision-making.

In Figure 4.1, information items are available in the organizational environment to be used by the mental model to produce decisions aimed at an organizational goal. The mental model, however, uses only some of the numerous types of information that are available as it perceives them as relevant. The relevance filter illustrates this segregation of information to be used on producing decisions with the intent of meeting organizational goals. With such a limited use of information, the goal is a smaller target and harder to attain, given that other pieces of information from the organizational environment may sway the organization in its efforts to attain it.

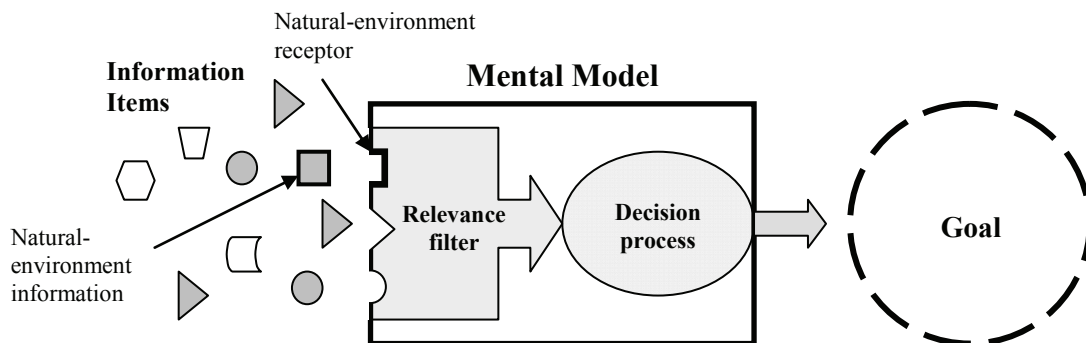


Figure 4.2 Addition of natural environment information in decision-making. Illustration of the inclusion of ‘environment’ in the mental model filter for decision-making.

In Figure 4.2, natural-environment information has been recognized as a relevant source of information. The mental model has thus been modified to include a receptor for information about the natural environment in the relevance filter. The information items are then used to produce decisions that are better informed, and therefore have an improved likelihood of meeting the organizational goal. The goal is now portrayed as a larger target as there is an improved probability to attain it, given that more of the organizationally relevant issues have been considered in the organization's decisions. There is thus a lesser probability that natural-environment issues will divert, block, or impede the organization's efforts to attain its goal. This interpretation responds to the participant responses and comments regarding changes affecting their perspective on the organization, including increases in the level of attention they pay to environmental issues, modified work processes, and increased interest in environmental issues.

This interpretation has much to offer management theory. It contributes to other fundamental organizational theories linking mental models to other decision-making and change management paradigms. The processing of information through filters marries well to the use of dominant logics in information-rich environments (Bettis & Prahalad, 1995). Changes in organizational mental models also find their place in the study of institutional logics in its attempts to uncover the structures, patterns and rules governing behaviour and decision-making in institutional contexts. Institutional logics suggests that "the interests, identities, values, and assumptions of individuals and organizations are embedded within prevailing institutional logics" (Thornton & Ocasio, 2008, p.103) or, in other words, in organizational mental models. In fact, the cultural-cognitive elements of institutional logics employed by organizations are said to "rest on more deeply set beliefs and assumptions" (Scott, 2005, p. 469), providing support for this perspective and context for the present study.

Ultimately, due to their very human nature, institutions are shaped by the members that inhabit them. Institutional decisions are thus fashioned to reflect the assumptions and beliefs held by their members. Individual and group-based experiences shape the tacit mental models of assumptions and logics that guide organizational behaviour. It seems the decision-making processes in institutions, whether in planning, risk management, or hiring policies, should consider the limits posed by these mental models. Most likely, the influence of new experiences would be a most powerful tool for organizational change for the reshaping of beliefs and assumptions.

#### **4.5 CONCLUSIONS**

This study brought to light important aspects of mental models and the experience of eco-efficiency initiatives in organizations. Significant changes were reported by the participants with regard to their organizational considerations, use and integration of information on the natural environment. The self-assessed changes in their perspective of the organization, and its future use of natural-environment information in the aftermath of participating in programs focused on eco-efficiency initiatives, were indicative of an important shift in the organizational mental model. The results suggest that the mental model changed, according to participants, to recognize the organizational relevance of such information for various aspects of their organization. This study supports a potential cause and effect relationship between experience and the cognitive orientation of institutional logics for organizations though a true experimental approach would be required to confirm such a relationship. If experience trumps information, then our change efforts need to lead organizations by the hand.

Clearly, more research to further assess the impact of such programs would be beneficial to improving organizational impacts on the natural environment and

related efficiencies. Further research to identify the process by which mental model changes occur would help describe the barriers to change with reference to decision-making. Furthermore, a better understanding of the relationship between institutional logics and cognitive structures, such as mental models, could be attained by delving further into the role of experience in building and changing such structures and their outputs in behaviors, norms, and values.

Given the increasing organizational pressures emanating from the natural environment, from climate change to depleting natural resources (Doskoch, 2007; Stern, 2007, Moyer, 2010; Thomas & Kerner, 2010), organizations will need to be introduced to the necessity of eco-efficiency to maintain their long term viability. Eco-efficiency programs may be central to changing their perceptions of relevance of these issues to their success. What is undeniable is that the wealth of information can be an overwhelming environment to navigate, and a little assistance may go a long way towards changing our minds and improving our decisions. We need our mental models, but we can strive to ensure that we structure them to work towards our goals rather than let them guide us to our biases.

## 4.6 REFERENCES

- Anderson, T., Howe, C. & A. Tolmie. (1996). Interaction and mental models of physics phenomena: evidence from dialogues between learners. In J. Oakhil & A. Granham (Eds.), *Mental models in cognitive science - Essays in honour of Phil Johnson-Laird* (247-273). Exeter, UK: Psychology Press (Erlbaum (UK) Taylor and Francis).
- Bettis, R. A. & Prahalad, C. K. (1995). The dominant logic: retrospective and extension. *Strategic Management Journal*, 16(1), 5-14.
- Chermack, T. J. (2003). Mental models in decision making and implications for human resource development. *Advances in Developing Human Resources*, 5(4), 408-422.
- Davenport, T. H., & Beck, J. C. (2001). *The attention economy*. Boston: Harvard Business School Press.
- DeCanio, S. J. (1998). The efficiency paradox: bureaucratic and organizational barriers to profitable energy saving investments. *Energy Policy*, 26(5), 441-454.
- Doskoch, B. (2007, February 19). Kyoto and Canada: Questions and answers. CTV.ca News. Retrieved from [http://www.ctv.ca/servlet/ArticleNews/story/CTVNews/20070214/kyoto\\_faq\\_070214/20070219?hub=Specials&pr=showAll](http://www.ctv.ca/servlet/ArticleNews/story/CTVNews/20070214/kyoto_faq_070214/20070219?hub=Specials&pr=showAll).
- Eco-Efficiency Centre (2006). *Follow-up survey of the business assistance program pilot*. Halifax, Nova Scotia, Canada: Eco-Efficiency Centre.
- Gerrans, P., Cowan, E., & Hutchinson, B. (2000). Sustainable development and small to medium-sized enterprises: a long way to go. In R. Hillary (Ed.), *Small and medium-sized enterprises and the environment: Business imperatives* (75-81). Greenleaf: Sheffield.
- Green, D. W. (1996). Models, arguments, and decisions. In J. Oakhil, & A. Granham (Eds.), *Mental models in cognitive science - Essays in honour of Phil Johnson-Laird* (247-273). Exeter, UK: Psychology Press (Erlbaum (UK) Taylor and Francis).

- Hill, R.C., & Levenhagen, M. (1995). Metaphors and mental models: sensemaking and sensegiving in innovative and entrepreneurial activities. *Journal of Management*, 21(6), 1057-1074.
- Hillary, R. (2004). Natural-environment management systems and the smaller enterprise. *Journal of Cleaner Production*, 12, 561-569.
- Holland, L., & Gibbon, J. (1997). SMEs in the metal manufacturing, construction and contracting service sectors: environmental, awareness and actions. *Eco-Management and Auditing*, 4, 7-14.
- Johnson-Laird, P. N., Girotto, V., & Legrenzi, P. (1998, April 7). *Mental models: A gentle guide for outsiders*. Retrieved from <http://icos.groups.si.umich.edu/gentleintro.html>
- Kurzinger, E. (2004). Capacity building for profitable environmental management. *Journal of Cleaner Production*, 12, 237-248.
- Langan-Fox, J., Anglim, J., & Wilson, J. R. (2004). Mental models, team mental models, and performance: process, development, and future directions. *Human Factors and Ergonomics in Manufacturing*, 14(4), 331-352.
- McBurney, D. H., & White, T. L. (2009). *Research Methods, 8th Ed.* USA: Wadsworth.
- Medin, D. L., Ross, B. H. (1997). *Cognitive Psychology, Second Edition*. Harcourt Brace College Publishers: Fort Worth, Texas.
- Models in Science. (2006). In *Stanford Encyclopedia of Philosophy*. Retrieved from <http://plato.stanford.edu/entries/models-science/>
- Moyer, M. (2010, September). How much is left? *Scientific American, Special Issue*, 74-81.
- Muthulingam, S. (2009). Environmental Issues in Operations Management. (Doctoral dissertation). Retrieved January 30, 2011, from ProQuest Digital Dissertations database. Publication No. AAT 3410455.
- Natural Resources Canada. (2002). *Government of Canada Action Plan 2000 on Climate Change - Consultations on a Canadian Resource Recovery Strategy - Final Report*. Ottawa, Canada: Natural Resources Canada.
- Nisbet, R. E., & Ross, L. (1980). *Human Inference*. Englewood Cliffs, NJ: Prentice-Hall



- Revell, A, & Rutherford, R. (2003). UK environmental policy and the small firm: broadening the focus. *Business Strategy and the Environment*, 12, 26-35.
- Rutherford, R, Blackburn, R, & Spence, L. J. (2000). Environmental and the small firm: an international comparison. *International Journal of Environmental Behaviour and Research*, 6(6), 310-325.
- Schein, E. H. (1985). *Organizational Culture and Leadership*. San Francisco, CA: Jossey-Bass.
- Scott, W. R. (2005). Institutional theory: contributing to a theoretical research program. In K. G. Smith & M. A. Hitt (Eds), *Great minds in management: the process of theory development* (460-484). Oxford, UK: Oxford University Press.
- Senge, P. (1992). Mental models: putting strategic ideas into practice. *Planning Review*, 20(2), 4-8.
- Senge, P. (2006). *The fifth discipline: The art & practice of the learning organization*. New York: Doubleday/Currency.
- Simon, H. A. (1997). *Administrative behavior: a study of decision-making processes in administrative organizations*. New York, US: Free Press.
- Simpson, M., Taylor, N., & Barker, K. (2004). Environmental responsibility in SMEs: does it deliver competitive advantage? *Business Strategy and the Environment*, 13, 156-171.
- Smith, A., Kemp, R. (1998). *Small firms and the environment*. Birmingham, UK: The Groundwork Foundation.
- Stern, N. (2007). *The economics of climate change – The Stern review*. New York, US: Cambridge University Press.
- Stevenson, W. B. (2003). Introduction: planned organizational change and organizational networks. *Journal of Applied Behavioural Science*, 39(3), 238-242.
- Stone, L. (2000). When case studies are not enough: the influence of corporate culture and employee attitudes on the success of cleaner production initiatives. *Journal of Cleaner Production*, 8, 353-359.
- Swanson, R. A. (2003). Decision premises and their implications for developing decision-making expertise. *Advances in Developing Human Resources*, 5(40), 378-392.

- Thomas, S., & Kerner, D. (2010). *Defense energy resilience: lessons from ecology - The Letort papers*. Carlisle, PA: U.S. Army War College.
- Thompson, D. (2002). *Tools for natural-environment management: A practical introduction and guide*. Gabriola Island, BC: New Society Publishers.
- Thornton, P. H., & Ocasio, W. (2008). Institutional logics. In K. Sahlin-Andersson, R. Greenwood, C. Oliver, & R Suddaby (Eds.). *The Sage Handbook of Organizational Institutionalism* (99-129). London, UK: SAGE Publications.
- Thorpe, J., & Prakash-Mani, K. (2003). Developing value: the business case for sustainability in emerging markets. *Greener Management International*, 44, 17-33.
- Vernon, J., Essex, S., Pinder, D., & Curry, K. (2003). The ‘greening’ of tourism micro-businesses: outcomes of focus group investigations in South East Cornwall. *Business Strategy and the Environment*, 12, 49–69.
- Willard, B. (2005). *The next sustainability wave: Building boardroom buy-in*. Gabriola Island, BC, Canada: New Society Publishers.
- Williams, H., van Hooydonk, A., Dingle, P., Annandale, D. (2000). Developing tailored environmental management systems for small businesses. *Eco-Management and Auditing*, 7, 106-113.
- Wilson, J. R. (2000). Mental models. In W. Karwowski (Ed.), *International Encyclopedia of Ergonomics and Human Factors* (493– 496). London, UK: Taylor and Francis.

## **CHAPTER 5      Conclusions**

The studies provide promising results and fundamental information in order to determine the relationship between language and barriers to environmental change in organizations. Here are described a number of aspects where the results of these studies have made contributions. In fact, a number of inferences can be drawn from the overall research effort

### **5.1 ON THE FIRST STUDY**

The first study provides significant support for the existence of linguistic differences between communities of practice. It focused on the environmental and business communities to determine whether the repertoire of concepts used by either community was actually as different as much previous research assumed. As mentioned in the introductory chapter, research in fields such as socio-linguistics, network theory and gender studies looked at the linguistic characteristics of various types of communities, but primarily qualitative approaches were used, with the rare exception of network analysis. The study therefore brings quantitative support to the assumptions showing that the environmental and business communities have significantly different linguistic repertoires of concepts.

The study was particularly inspiring in confirming anecdotal observations of language-based community identification. It addresses these differences in communications, learning and decision-making as proposed in my interaction theory. The theory suggested that information is filtered by mental models, so that only information items considered relevant are used. It also suggested that linguistic relevance is assigned by the community of practice to be used by the mental model. If, as proposed by interaction theory, language can be used to determine whether information items are relevant to the organizational mental model, I needed to first determine whether different levels of

relevance are assigned to linguistic concepts in relation to communities of practice. I wanted to determine whether communities of practice could have different repertoires of relevant linguistic concepts.

The study was successful in showing that the environment and business communities were considered to have significantly different linguistic repertoires of concepts as participants assigned different sets of relevant linguistic concepts to the two communities. This is the first step in identifying the role of linguistic repertoires in information filtering and organizational decision-making. It also provided grounds to assume that language could then potentially be used to identify which community of practice individuals belong to, or which community of practice information belongs to. The results also provide much needed quantitative support for other areas of research that assume different community linguistic repertoires.

The suggestion that community of practice membership can be identified using language brings much to our knowledge of social interactions. Our ability to assign membership, consciously or not, is a significant contribution to social identity theory and the study of group discrimination. It also brings questions as to how the community aspect of our interaction truly comes into play. As mentioned previously, to consider oneself a member of a community is dependent on whether or not this identity has meaning to us. This would likely affect the interaction with that community of practice and the level of competence that one holds given the level of interaction to better one's skills and knowledge. The study suggests however that our language can betray us. Whether or not community membership is sought, our practice-based experience may mark our words for much longer than our self-proclaimed identity membership assumes. The lingering linguistic aspects of the language I use to communicate in many ways betray my biologist roots. From personal experience, I have been 'outed' frequently by my words in discussing issues when the examples I used to illustrate my thoughts settled on ecology-based processes, once suggesting that change can work at the speed of evolution. The results suggest that we assign membership, no matter how the individual in question feels about it. Shedding our practice may be more of an illusion than we assume.

With regards to policy, the results are eye-opening. They highlight the importance of finding and using common linguistic-ground in attempts to interact with various communities of practice in efforts to develop policies. It also highlights the importance of bringing these differences to light in consultations with multiple communities to ensure that linguistic group discrimination is minimized and constructive interactions can be achieved. Focusing on a common goal while clearly identifying how the various community of practice concepts are relevant to its achievement should prove useful in instilling collaboration to produce common solutions.

### 5.1.1 First Study Limitations

The findings of the first study, although very promising, involved a number of limits. Chief among these is the communities selected. The study does show significant differences between two communities of practice, but this could be very specific to these communities. Although we could assume that other communities would find the same results, more studies would need to be conducted to establish differences between other communities of practice. In addition, the very act of differentiating communities of practice requires further attention. Some may practice in the same general field but find differences between themselves forming sub-communities. We could expect that, among environmental practitioners, those applying their skills to advocacy for international action on climate change would perceive themselves as different from those applying themselves to wildlife biology conservation.

We may also be dealing with a community of communities. Differences between sub-groups could produce a complex categorization of communities, with various levels of interaction and affinity. We could also expect these to be differentiated in their use of more field-specific language where different sub-identities would manage different sets of most relevant linguistic repertoires. Although, for example, all environmental practitioners would understand and use the concept of ‘sustainability’, they may differ in their use and familiarity with other concepts such as ‘green washing’ or ‘carrying

capacity'. This would be similar to the way members of a same nationality may have significant mutual affinities when compared to other nationalities, but will also raise differences related to their location within that nationality based on provinces or cities. Although both wildlife biologists and environmental advocates can be considered members of the environmental community of practice, their particular set of linguistic repertoires may show familiarity overlaps and differences. The landscape of communities of practice thus remains considerably uncharted beyond the existence of these communities. Much more work is still needed to understand how communities are structured, and how they behave within that structure.

## **5.2 ON THE SECOND STUDY**

The second study suggested that the familiarity of graduate students, with regards to the linguistic repertoire of the community of practice they are studying, is not a match to their own assessment of the most relevant concepts of that community of practice. The study thus suggested that, even in self-assessment, graduate students are not particularly familiar with the concepts they recognized as most relevant to a member of the community of practice they study. Using their familiarity with language, it was thus suggested that graduate students form a community of interest, defined more broadly by authors as a group of people who come together with a common interest (Flora & Flora, 1995; Fischer, 2001; Pavey et al., 2007). Graduate students share in their interest without having acquired fully the repertoire of the community of practice. They would therefore come together as a community developing an interest, but were not yet practicing members.

Over all, the study showed that graduate students from two different fields of study are able to identify concepts that are most relevant to the community of practice they are studying. The students, however, did not report being most familiar with that same set of concepts they designated as most relevant to the community of practice they are studying. Assuming frequent use of concepts would create high familiarity; this suggests that the

students have yet to master the most relevant repertoire of concepts of the community they are attempting to enter. In fact, there was rather a partial familiarity with the set of most relevant community of practice concepts, and thus a peripheral membership was suggested. The graduate students were designated to be modern apprentices, acquiring the knowledge of a community of practice without being yet established members.

Further investigation in this second study provided interesting information regarding the perceptions of participants with regard to the relevant linguistic repertoire of other communities of practice. The results suggested that the environmental and business communities had opposing sets of relevant concepts where the most relevant concepts of one community were perceived as least relevant to the other community. This opposition in relevance suggests that information using the linguistic repertoire of the environmental community would likely be perceived as less than relevant to the business community. This finding leaves much to be discovered regarding the interaction of community repertoires and information acquisition for decision-making.

This middle-ground level of familiarity with the community of practice linguistic repertoire agreed comfortably with the state of competence of a graduate student which has yet to meet full practitioner knowledge. To address this occurrence, a gradient of categories was proposed. Future studies are needed to further describe and differentiate different levels or types of membership. This differentiation would go a long way to understanding participation in communities of practice and thus participation in the commerce of knowledge. It would add to Lave and Wenger's (1991, p.105) suggestion that "issues about language, like those about the role of masters, may well have more to do with legitimacy of participation and with access to peripherality than they do with knowledge transmission." This quote reminds us of outgroup behaviour and the limitations imposed on interaction.

These results will also be of use to studies of other types of communities. Research on the integration in and adaptation into communities, whether for immigration or other situations, should pay particular attention to linguistic categorization and potential for

discrimination. In addition, attempts to build communities of interest for movements and advocacy would benefit from attention to the language they use, and try to find identity in common understanding and use. The power of words has long been known to move crowds. We can see here how it also binds and defines them. As for communities of interest specifically, attention to language in education, noting here undergraduate and graduate education, should influence the perspectives new practitioners have on language.

Peripherality and core membership, like central and marginal membership, have been mentioned frequently but stand as extremes in types of membership (Lave & Wenger, 1991; Wenger 1998; Bucholtz, 1999; Holmes & Meyerhoff, 1999). In practice, we suggest that more research needs to be conducted to identify different types of membership between those polar ends. Language may be a predominant attribute to assist in characterizing the different types where, for a known linguistic repertoire of field concepts, a level of expertise could be associated with concepts considered less accessible to those less deeply immersed in the practice. Access to information, or to the community itself, may be restricted to peripheral members. This would further define the typology provided previously, shown again here as Figure 5.1.



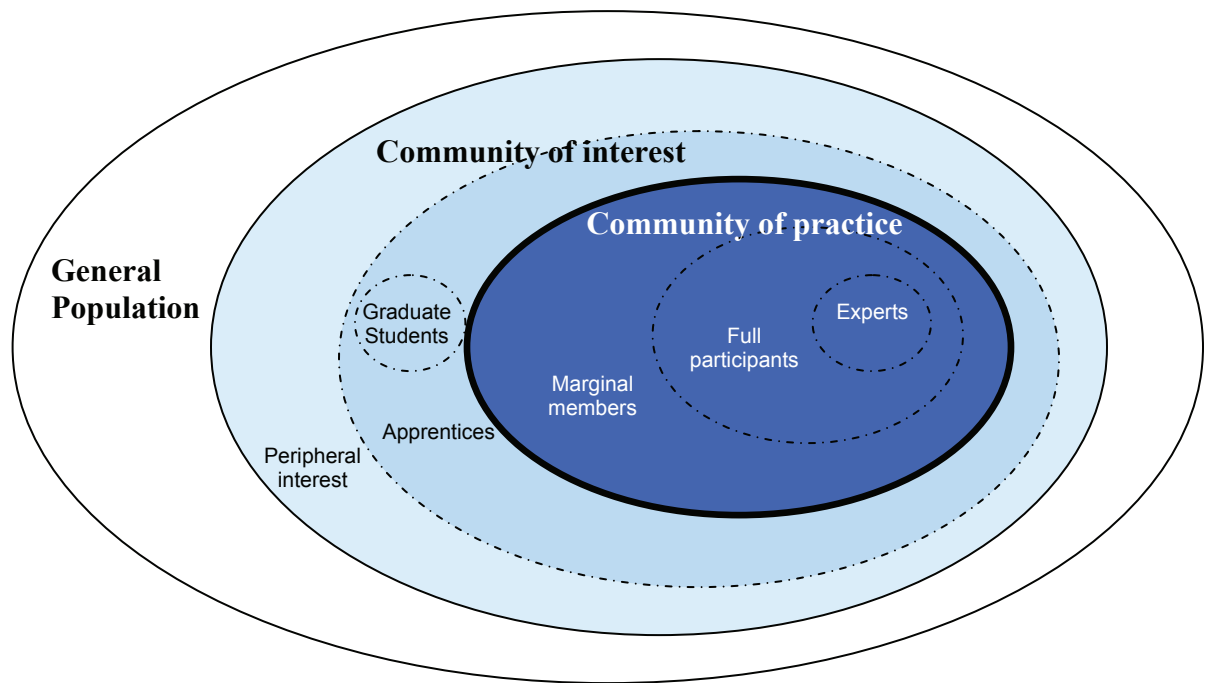


Figure 5.1 The Structure of Membership from Community of Interest to Community of Practice.

With regard to peripherality, and in reference again to Figure 5.1, the study proposed that graduate students are a form of apprenticeship. This offers interesting avenues for research in communities of practice to determine how new members are acquired in a practice. The study only looked at the fields of environmental and business studies but various fields may assign more or less value to a graduate education in order to accept members. We can assume a graduate degree in business has value in large organizations, but that would hardly apply to brick layers. Graduate students and even undergraduate students may in essence be a new form of apprenticeship that fulfills a new requirement in the modern structures of work and products.

In addition to the results regarding familiarity with the target community of practice's linguistic repertoire, the study found interesting results when comparing the least and most relevant concepts for the opposing communities of practice. The study showed that communities of practice could be perceived as having opposing repertoires when the most relevant concepts of one community are the least relevant for the other. It was

particularly the case for those participants that self-identified with the business community, but the results from the self-identified environmental community were less conclusive. The different results suggest that such opposition may be one-sided, or that the meaning assigned to a concept may vary between communities. Still, this type of opposition has the potential for antagonism. When one community's most important concepts are considered irrelevant to the other, the exchange of ideas may suffer as well as the willingness to collaborate. This may explain some of the challenges in cooperation as well as provide promising avenues for solutions, especially with regards to public policy development and implementation. Addressing the linguistic aspects of community interactions could bring the source of conflicts and divergent decisions to light in order to be addressed and facilitated.

### 5.2.1 Second Study Limitations

This study was in many ways limited by definitions. The definition of a community of practice provides some parameters based on joint enterprise, mutuality and shared repertoires, but this leaves much to the observer's interpretation. A group of graduate students could be thought to work on a shared goal, to increase the number of practitioners in a field, but the very act of learning suggests that they are not yet a community of practice. There is a lack of information as to how and when groups are not considered communities of practice. This issue particularly applies to the concept of communities of interest. The term is ill defined at best, leading us to propose a definition in order to oppose it to a community of practice. More research needs to be conducted in order to provide parameters for the concepts of communities of practice and, especially, communities of interest. Although I offer some avenues for defining the typology of membership in a community of practice from general interest to expert member, these categories require much work to define them in contrast to each other in order to better understand the type and level of participation of members and what they bring to the practice.

In addition to a need for more attention in defining communities of practice and communities of interest, the study assumed that graduate students were interested in entering the community of practice in the field they studied. This assumption took for granted that a graduate degree provides a level of mastery in a field of study. Although this may be true of many, it may not be the reason for participation for all graduate students.

### **5.3 ON THE THIRD STUDY**

For the third study, it is change that is at the heart of the issue. This study identified gaps in the mental model of the organization leaders with regard to natural-environment aspects by identifying instances where these issues were introduced in their mental model, where they were previously chiefly absent. This introduction is an important change in the way these organization leaders are perceived by the member. As reported by the participants, as a result of participation in an eco-efficiency initiative, the mental model included new information shown to be relevant to the organization. With regards to decision-making, the case studies confirmed that the participants, high-level decision-makers in the organizations, included this new aspect to their future decision-making process.

The study thus brought to light important aspects of mental models and the experience of eco-efficiency initiatives in organizations by focusing on the change experienced and reported by participants with regards to natural-environment aspects of their organization. Not intent on mapping the mental model of the participants, the study rather looked for self-reported instances of change in the participant perception of the organization that point to parts of their internal model having shifted. The study thus found some telling support for the assumption that organizational mental models include aspects perceived as relevant to the organization and use them in their decision-making. It also found some support for the introduction of new information in the list of aspects relevant to the organization.

The important contributions of the study lie not only in the self-reported instances of change, but in their vector. The study suggests the presence of a potential cause and effect relationship between experience and the cognitive orientation of institutional logics for organizations that needs to be further assessed. The study presented an opportunity for change in institutional logics, and significant hope for improved organizational environmental performance.

With regards to policy, the results suggest that eco-efficiency programs are potentially crucial change instruments. While the previous studies pointed to the role of language in forming our perceptions of relevance in practice, the case studies suggest that, even where discrimination based on language may be well engrained after years of experience, the manipulation of language to achieve goals can bring significant opportunities for change. Experience may be a much more effective approach to changing the business perception of the relevance of natural resources than mass information would be, especially if focused on environmental language. In fact, focusing on goals rather than the language we are attached or use to would go a long way to effecting change.

### 5.3.1 Third Study Limitations

Case studies are inherently limited in their external validity and measures were taken in the study's design to improve the effect size. The retrospective pre-test / post-test approach only provided a limited and non-objective account of the relationship between program participation and the change in the mental model. Promising results were found, and future research would benefit from addressing a number of the residual limitations of the study.

## 5.4 CONTRIBUTION TO OTHER RELATED THEORIES

The research conducted here is fundamentally interdisciplinary. Using multiple theories relevant to organizations, it offers opportunities to understand the interaction between the different theories and their impact on organizational decision-making and described again in figure 5.2 below. In addition to this contribution, the results obtained regarding language, communities of practice, and mental models can contribute to research related to other theories relevant to organizational studies.

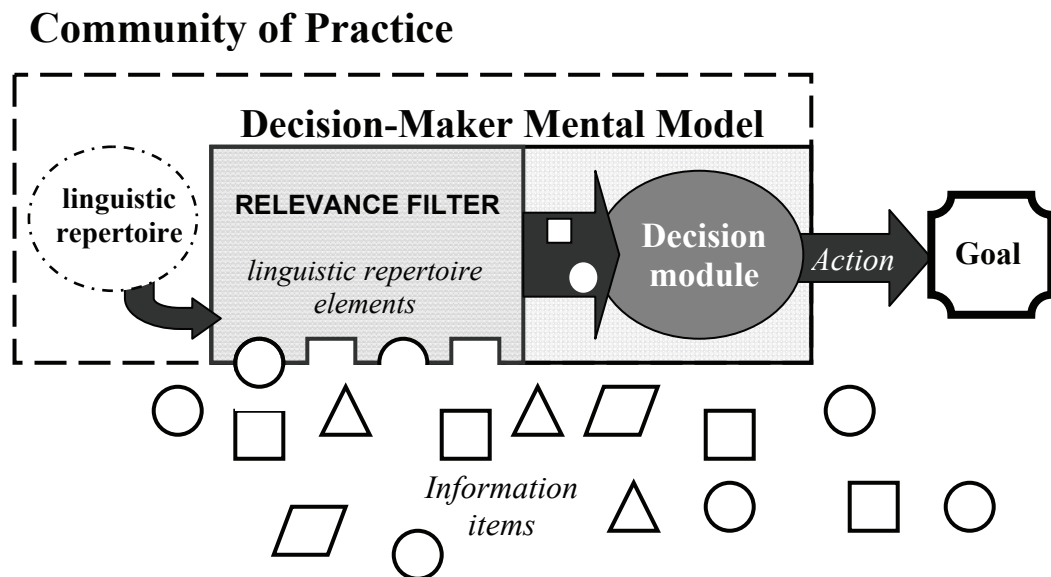


Figure 5.2 Communities of practice, language, and mental model interaction with organizational decision-making.

The interaction on the model of figure 5.2 describes an interaction between elements of multiple theories but is intent on change. The issue of change underlying the research at hand can be framed in the context of social identity theory by referring to the process of *reinterpretation*, where groups may reinterpret group characteristics favourably in the face of insecurity (where there is a change in the *status quo* that brings instability) (Brown & Ross, 1982). I suggest that, through experience, a group difference that was once characterized as an unfavourable trait can be reinterpreted favourably. This represents is an additional case where the *status quo* is broken and insecurity can be

provoked to produce change in social identity. This new form of challenge comes from inside the group, from experience, to force a change in the assessment of a characteristic. This creates insecurity given that it requires a redefinition of the group's characteristics and therefore its differences in the face of other groups.

This is a significant contribution to social identity theory. I suggest here that experiences from inside the group can cause insecurity, where previous sources of insecurity discussed in reference to social identity theory, like changes in status and power, originate from outside the group. In this scenario, a group characteristic that was previously used to differentiate one's group and identify another group can be reinterpreted as a favourable characteristic for both groups once experience has shown the relevance of that characteristic. The social status of natural environment issues has not changed, nor has the power of the group. The relevance assigned to the issue has changed as assessed by members of the group. I suggest this is the case for the value of natural-environment issues to business. Through experience, attending to and managing natural environment issues can thus become a favourable and relevant group characteristic of the business community where it was once seen as an unfavourable and irrelevant group characteristic.

Symbolic interactionism can also benefit from this interdisciplinary research. The meaning held by language is an important assumption when using language to identify membership in communities of practice and mental models. That assumption finds its argument in the theory of symbolic interactionism. The theory offers support to an emphasis on language as a key player in displaying and assigning identity (Lal, 1995). In symbolic interactionism, symbols are at the forefront of social interactions and language is a fundamental vehicle to convey symbolic value. Symbolic interactionism argues that meaning in language is produced through interaction, while considering the contribution of context in the establishment of meaning (Cossette, 1998). It asserts that language holds a symbolic value and is thus a common source of meaning readily available to identify its user. It forms part of the means we use to make sense of our surroundings. Many authors

have supported this role of language as an important source and tool for identity (Ochs, 1993; Barrett, et al, 1995; Bucholtz, 1999; Bucholtz & Hall, 2005).

The studies offer much support for the symbolic and meaning-charged role of language. Symbolic interactionism suggests that meaning is produced through interaction in context, such as that of a community of practice engaged in joint enterprise and mutuality. This environment would present suitable ground to produce meaning embedded in language, represented by community repertoires. The first study shows that community of practice identity can be assigned by linguistic repertoires. It showed that different sets of linguistic concepts were associated with, and thus carried meaning for, the identity of groups. The second study proposed that identity within communities of practice and communities of interest can be distributed as reflected in the level of familiarity with the linguistic repertoire. It also suggested that an opposition may be found in the linguistic repertoires of different communities of practice. The relevance assigned to various concepts in relation to communities of practice holds meaning with regard to membership identity. It is that symbolic value of language that may have a role to play in the exclusion of individuals and of information based on membership identity.

Overall, the results have much to offer to our understanding of organizational decision-making, as well as the role of language in mental models and communities of practice. They highlight social aspects of organizations where meaning plays a role in our transactions and decisions. This may not reflect the most effective form of decision-making but rather the reality of decision-making for organizations. Revealing this factor not only contributes to our understanding of the process of decision-making, but also provides avenues to become more effective decision-makers and more effective communicators.

Meaning was central to the studies presented, and its relationship with language was undeniable. The studies of communities looked at the meaning of language for different practice identities. The case studies explored what the natural environment meant to the organization and how this meaning changed. Above all, the three studies showed that

meaning was as much a barrier as an opportunity for change. Manipulating meaning through our choice of language or through the transformation of experience offers powerful approaches to changing communications, choices, and cooperation for individuals, communities and organizations. Cossette (1998) states that “such skills are generally considered to be essential for anyone wishing to become a true leader”, and leadership will be a necessity for both private and public organizations tackling an age of climate change, globalization and resource scarcities.

## **5.5 FUTURE RESEARCH**

There is, however, much work left to be done if this relationship is to be described, understood, and changed to improve organizational resource efficiencies and their impact on the natural environment. This implies that much still remains to be assessed, defined, and scoped in the tapestry of dynamics I offered in theory, with research opportunities to better understand the barriers found and changes suggested. Though these studies have contributed much in terms of quantitative support to theories, potential interactions between theories, and barriers to decision-making, the research only pushed and grounded the questions in many ways. The following is in no way an exhaustive list of studies that could follow from this research. It is however a strong list of avenues to engage in order to improve our understanding of the role of language in community or practice interactions and decision-making.

Concerning the study on communities of practice and the use of linguistic repertoires, the differences found raise questions about the impact the differences would bring. They were linked to community identities but the possible consequences on interactions, exclusions and other barriers suggested by intergroup relations have yet to be assessed. More research must be engaged to determine the role of language in excluding individuals from the communities and in selecting information for decision-making. The model presented in the introductory chapter suggested that mental models of work are using the community of practice language (linguistic repertoire) to determine relevance



of information in decision-making. Determining whether there are actually differences between linguistic repertoires of communities of practice was a fundamental piece for the theory. From there, more research needs to identify if and how the language is used in filtering information. From that point on, a world of questions opens up to the consequences of decisions and the means to influence that process.

Attention should also be paid to how communities of practice form in a modern context. Lave and Wenger (1991) make reference to many communities of practice, or trades, over the ages, such as masons and midwives. The process by which we acquire competence in a practice, however, has changed with technologies affecting things such as travel and communications. New opportunities have been created for encountering and acquiring knowledge. The second study attempts to lay some foundations for research on this issue.

The results were very telling and suggest that more research should be conducted to identify how community members select information based on the use of the linguistic repertoire. There would be much to gain from a better understanding of what a community of practice considers relevant language and what it considers irrelevant. Also, insight into how such information is used in or discarded from decision-making would assist those attempting to inform such communities of relevant information. The study was limited to the environmental and business communities. Other communities of practice should be assessed to better map the difference and oppositions in repertoires to identify conflicting repertoires and opportunities for improved communication and learning among various practices.

The issue of peripherality suggests that more research needs to be conducted to identify different types of membership between those polar ends. There is room for much work to characterize the different types of the community of practice and community of interest gradient suggested. Levels of expertise associated with linguistic concepts could help locate various depths of expertise reflecting how immersed in the practice a member may

be. In fact, as mentioned previously, access to information, or to the community itself, may be restricted to peripheral members.

With regard to the conflicting linguistic repertoires, future studies would benefit from using participants from various parts of the communities of practice selected. The use of graduate students only gave the view on relevance of those learning of the field. Identifying members from various parts of the community would be beneficial in obtaining a more comprehensive repertoire of relevance. In such studies, the existence of a typology of community of practice membership would be of much assistance in identifying groups that should be surveyed.

The information from the case studies raises many questions and avenues for further research in order to more thoroughly substantiate the change and the vector for change identified. The eco-efficiency approach, common to both programs involved in the study, succeeded in producing a change in the way the participants perceived the organization in relation to the natural environment, often in the wake of having taken part in previous environmental initiatives that failed to produce such a change. The study suggested that the natural environment was introduced in the organizational mental model of relevant issues; that it was thus lacking from the organizational mental model prior to participation in an accompanied eco-initiative; and that such eco-initiatives are potentially a vector for this change.

In addition to identifying self-reported instances of change, the case studies raise numerous questions. Regarding process, future studies will need to determine how the change occurs, at which point in the experience does it occur, how the mental model came to change and adopt the aspect, and what relationships were created in the mental model as a result of the introduction. As for decision-making, further research on the impacts on the decision-making process, the long-term effects of the change on organizational behaviour, and future organizational success will bring light to the outcomes of the change.

Overall, there are many opportunities for further research to improve our understanding of organizational mental models, decision-making, and change processes. The case studies brought some substance to the assumption. They were, however, only the beginning, opening the door to more research and more questions. Of all the opportunities, the link between the previously discussed studies on the role of language in information acquisition and the mental model change should not be underestimated. The earlier research identified linguistic differences as potential sources of barriers; the latter may have identified an opportunity for overcoming those barriers.

Addressing the residual limitations of the case studies could begin with a more comprehensive version of the study with a large number of organizations to improve the external validity. The limited availability of eco-efficiency programs that present the features of interest in the study (focus on small and medium-enterprises, financial support, eco-efficiency approach, and consultant accompaniment) will however make larger scale studies difficult.

Also, longitudinal studies of organizations participating in environmental programs of various types with control groups would address both the lack of pre-test and more sturdily determine the presence of a cause-effect relationship. Such studies would help identify variations in types of change, as well as the effectiveness of various program characteristics on mental models. It would thus be valuable in validating both the change and the vector of experience proposed. The exposure from the pretest may, however, pose problems if it influences the experience of the program and thus the change outcome. Also, there is the constant limit posed by the variations that are hardly avoidable from one organization to another.

Overall, a programmatic approach to future research should be welcome. There are a two principle streams of research that would further our understanding. A series of studies on linguistic repertoires of communities of practice and communicates of interest would go beyond the fundamental results shown here to provide:

- Further quantitative evidence of communities of practice that show linguistic repertoire difference
- Descriptions of community of practice repertoires to use in membership identification
- Identification of sub-repertoires associated with various depths of competence in membership
- Longitudinal studies of membership acquisition to further differentiate communities of interest from communities of practice and develop an operational definition for communities of interest
- Insight into the process by which communities of practice linguistic repertoires are acquired by apprentices and students
- Insight into the creation and modification of community linguistic repertoires
- Linguistic repertoire conflicts and opposition between various communities of practice
- Case studies of linguistic adaptation for greater participation and assimilation of eco-initiatives

A second stream of research could focus on the mental model change of organizations in relation to their experience in eco-efficiency programs. The research could provide:

- Confirmation of the presence of a cause-effect relationship between experience and a change in the mental model of the organization through an experimental approach (pre-test, post-test with control groups)
- Longitudinal assessments of the change process to identify the main triggers
- The impact of the change in topic-relevance on decision-making processes
- Changes to the social identity and membership self-perception of participants as a result of their experience of another community of practice's relevant issues

These research streams would deepen our understanding of linguistic repertoires, their use in membership, and the process that could change the decision-making. In many ways, the present studies grew from my experience of any issue to produce a theory of how it functioned. It was clear that foundational research was required to set the stage for the research to come. We can now move to creating the accumulation of findings that can

frame the change and provide the momentum we need to generate environmental management and organizational change.

## 5.6 REFERENCES

- Barett, F. J., Thomas, G. F., & Hocevar, S. P. (1995). The central role of discourse in large-scale change: a social construction perspective. *Journal of Applied Behavioural Science*, 31(3), 352-372.
- Bucholtz, M. (1999). "Why be normal?": language and identity practices in a community of nerd girls. *Language in Society*, 28, 203-223.
- Bucholtz, M., & Hall, K. (2005). Identity and interaction: a sociocultural linguistic approach. *Discourse Studies*, 7(4-5), 585-614.
- Cossette, P. (1998). The study of language in organizations: a symbolic interactionist stance. *Human Relations*, 51(1): 1355-1377.
- Fischer, G. (2001). Communities of Interest: learning through the Interaction of Multiple Knowledge Systems. Proceedings from 24th Annual Information Systems Research Seminar In Scandinavia (IRIS'24), Ulvik, Norway. Department of Information Science, Bergen, Norway, 1-14.
- Flora, C. B., & Flora, J. L. (1995). The past and future: social contract, social policy, and social capital. *Increasing Understanding of Public Problems and Policies, 1995*, 53-64.
- Holmes, J., & Meyerhoff, M. (1999). The community of practice: theories and methodologies in language and gender research. *Language in Society*, 28(2), 173-183.
- Lal, B. B. (1995). Symbolic interaction theories. *American Behavioural Scientist*, 38(3): 421-441.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Ochs, E. (1993). Constructing social identity: a language socialization perspective. *Research on Language and Social Interaction*, 26(3), 287-306.
- Pavey, J. L., Muth, A. B., Ostermeier, D., & Steiner Davis, M. L. E. (2007). Building Capacity for Local Governance: An Application of Interactional Theory to Developing a Community of Interest. *Rural Sociology* 72(1), 90-110.

- Senge, P. (2006). *The fifth discipline: The art & practice of the learning organization*. New York: Doubleday/Currency.
- Stevenson, W. B. (2003). Introduction: planned organizational change and organizational networks. *Journal of Applied Behavioural Science*, 39(3), 238-242.
- Swanson, R. A. (2003). Decision premises and their implications for developing decision-making expertise. *Advances in Developing Human Resources*, 5(40): 378-392.
- Thornton, P. H., & Ocasio, W. (2008). Institutional logics. In K. Sahlin-Andersson, R. Greenwood, C. Oliver, & R. Suddaby (Eds.). *The Sage Handbook of Organizational Institutionalism* (99-129). London, UK: SAGE Publications.
- Wenger, E. (1998). *Communities of practice — Learning, meaning, and identity*. Cambridge: Cambridge University Press.

## Bibliography

- Anderson, T., Howe, C. & A. Tolmie. (1996). Interaction and mental models of physics phenomena: evidence from dialogues between learners. In J. Oakhil & A. Granham (Eds.), *Mental models in cognitive science - Essays in honour of Phil Johnson-Laird* (247-273). Exeter, UK: Psychology Press (Erlbaum (UK) Taylor and Francis).
- Arvey, R. D. (1985). Statistical Power of Training Evaluation Designs. *Personnel Psychology*, 38(3), 493-508.
- Barett, F. J., Thomas, G. F., & Hocevar, S. P. (1995). The central role of discourse in large-scale change: a social construction perspective. *Journal of Applied Behavioural Science*, 31(3), 352-372.
- Bernard, H. R. (2006). *Research methods in anthropology: Qualitative and quantitative approaches, Fourth edition*. AltaMira Press: Lanham, Maryland, U.S.
- Bettis, R. A. & Prahalad, C. K. (1995). The dominant logic: retrospective and extension. *Strategic Management Journal*, 16(1), 5-14.
- Blumer, H. (1969). *Symbolic interactionism: Perspective and method*. Berkeley: University of California Press.
- Brewer, M. B. (2001). Ingroup identification and intergroup conflict. In R.D. Ashmore, L. Jussim, D. Wilder (eds), *Social identity, intergroup conflict, and conflict reduction* (17-41). Oxford, New York: Oxford University Press.
- Bucholtz, M. (1999). "Why be normal?": language and identity practices in a community of nerd girls. *Language in Society*, 28, 203-223.
- Bucholtz, M., & Hall, K. (2005). Identity and interaction: a sociocultural linguistic approach. *Discourse Studies*, 7(4-5), 585-614.
- Carson, R. (1962). *Silent spring*. Houghton Mifflin Company: Boston, U.S.
- Chermack, T. J. (2003). Mental models in decision making and implications for human resource development. *Advances in Developing Human Resources*, 5(4), 408-422.
- Compas Inc. (2003). *Phase 3: Survey Findings: Energy Efficiency Programs for SMEs*. COMPAS Report submitted to Industry Canada. Natural Resources Canada: Government of Canada?



- Cossette, P. (1998). The study of language in organizations: a symbolic interactionist stance. *Human Relations*, 51(1): 1355-1377.
- Crotty, M. (1998). *Foundations of social research: Meaning and perspective in the research process*. Thousand Oaks, Calif: Sage Publications
- Davenport, T. H., & Beck, J. C. (2001). *The attention economy*. Boston: Harvard Business School Press.
- Davies, B. L. (2005). Communities of practice: legitimacy not choice. *Journal of Sociolinguistics*, 9, 557-581.
- DeCanio, S. J. (1998). The efficiency paradox: bureaucratic and organizational barriers to profitable energy saving investments. *Energy Policy*, 26(5), 441-454.
- De Fina, A. (2007) Code-switching and the construction of ethnic identity in a community of practice. *Language in Society*, 36 (3), 361-392.
- Doskoch, B. (2007, February 19). Kyoto and Canada: Questions and answers. CTV.ca News. Retrieved from [http://www.ctv.ca/servlet/ArticleNews/story/CTVNews/20070214/kyoto\\_faq\\_070214/20070219?hub=Specials&pr=showAll](http://www.ctv.ca/servlet/ArticleNews/story/CTVNews/20070214/kyoto_faq_070214/20070219?hub=Specials&pr=showAll).
- Eckert, P. (1992). Think practically and look locally: language and gender as community-based practice. *Annual Review of Anthropology*, 21, 461-490.
- Eckert, P., & Wenger, E. (2005). Communities of practice in sociolinguistics. *Journal of Sociolinguistics*, 9(4), 82-589.
- Eco-Efficiency Centre (2006). *Follow-up survey of the business assistance program pilot*. Halifax, Nova Scotia, Canada: Eco-Efficiency Centre.
- Fischer, G. (2001). Communities of Interest: learning through the Interaction of Multiple Knowledge Systems. Proceedings from *24th Annual Information Systems Research Seminar In Scandinavia (IRIS'24)*, Ulvik, Norway. Department of Information Science, Bergen, Norway, 1-14.
- Flora, C. B., & Flora, J. L. (1995). The past and future: social contract, social policy, and social capital. *Increasing Understanding of Public Problems and Policies, 1995*, 53-64.

- Gerrans, P., Cowan, E., & Hutchinson, B. (2000). Sustainable development and small to medium-sized enterprises: a long way to go. In R. Hillary (ed.), *Small and medium-sized enterprises and the environment: Business imperatives* (75-81). Sheffield: Greenleaf.
- Gillard, H., Mitev, N., & Scott, S. 2007. ICT Inclusion and Gender: Tensions in Narratives of Network Engineer Training. *Information Society*, 23 (1), 19-37.
- Gilley, A., & Kerno, S. J. (2010). Groups, Teams, and Communities of Practice: A Comparison. *Advances in Developing Human Resources*, 12(1), 46-60.
- Goldstein, B. E., & Butler, W. H. (2010). Expanding the Scope and Impact of Collaborative Planning: Combining Multi-Stakeholder Collaboration and Communities of Practice in a Learning Network. *Journal of the American Planning Association*, 76(2), 238-249.
- Green, D. W. (1996). Models, arguments, and decisions. In J. Oakhill and A. Granham (eds), *Mental models in cognitive science: Essays in honour of Phil Johnson-Laird* (119-137). Exeter, UK: Psychology Press (Erlbaum (UK) Taylor and Francis).
- Guldberg, K., & Mackness, J. (2009). Foundations of communities of practice: enablers and barriers to participation. *Journal of Computer Assisted Learning*, 25 (6), 528-538.
- Hansson, H., & van de Bunt-Kokhuis, S. (2004). E-learning and language change: observations, tendencies and reflections. *First Monday*, volume 9, number 8 (August 2004), URL: [http://firstmonday.org/issues/issue9\\_8/hansson/index.html](http://firstmonday.org/issues/issue9_8/hansson/index.html)
- Hill, R. C., & Levenhagen, M. (1995). Metaphors and mental models: sensemaking and sensegiving in innovative and entrepreneurial activities. *Journal of Management*, 21(6), 1057-1074.
- Hillary, R. (2004). Natural-environment management systems and the smaller enterprise. *Journal of Cleaner Production*, 12, 561-569.
- Holland, L., & Gibbon, J. (1997). SMEs in the metal manufacturing, construction and contracting service sectors: environmental, awareness and actions. *Eco-Management and Auditing*, 4, 7-14.

- Holmes, J., & Meyerhoff, M. (1999). The community of practice: theories and methodologies in language and gender research. *Language in Society*, 28(2), 173–183.
- Iverson, J. O; & McPhee, R. D. (2002). Knowledge management in communities of practice. *Management Communication Quarterly*, 16(2), 259-266.
- Johnson-Laird, P. N., Girotto, V., & Legrenzi, P. (1998, April 7). *Mental models: A gentle guide for outsiders*. Retrieved from <http://icos.groups.si.umich.edu/gentleintro.html>
- Kerno, S. J. (2008). Limitations of communities of practice: a consideration of unresolved issues and difficulties in the approach. *Journal of Leadership & Organizational Studies*, 15 (1), 69-78.
- Kerno, S. J., & Mace, S. L. (2010). Communities of Practice: Beyond Teams. *Advances in Developing Human Resources*, 12(1), 78-92.
- Koliba, C., & Gajda, R. (2009). "Communities of practice" as an analytical construct: implications for theory and practice. *International Journal of Public Administration*, 32, 97-135.
- Kurzinger, E. (2004). Capacity building for profitable environmental management. *Journal of Cleaner Production*, 12, 237-248.
- Lal, B. B. (1995). Symbolic interaction theories. *American Behavioural Scientist*, 38(3): 421-441.
- Lambert, A. J. D.; Boons, F. A. (2002). Eco-industrial parks: stimulating sustainable development in mixed industrial parks. *Journal of Cleaner Production*, 22: 471-484.
- Langan-Fox, J., Anglim, J., & Wilson, J. R. (2004). Mental models, team mental models, and performance: process, development, and future directions. *Human Factors and Ergonomics in Manufacturing*, 14(4), 331–352.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Macdonald, D. (2007). *Business and environmental politics in Canada*. Broadview Press: Peterborough, Ontario.
- McBurney, D. H., & White, T. L. (2009). *Research Methods, 8th Ed.* USA: Wadsworth.

- Medin, D. L., Ross, B. H. (1997). *Cognitive Psychology, Second Edition*. Harcourt Brace College Publishers: Fort Worth, Texas.
- Merritt, J. Q. (1998). EM into EMS won't go? Attitudes, awareness and practices in the London Borough of Croydon. *Business Strategy and the Environment*, 7, 90-100.
- Metz, B., Davidson, O. R., Bosch, P. R., Dave, R., and Meyer, L. A. (eds) (2007). *Contribution of working group III to the fourth assessment report of the Intergovernmental Panel on Climate Change*. Cambridge: Cambridge University Press.
- Models in Science. (2006). In *Stanford Encyclopedia of Philosophy*. Retrieved from <http://plato.stanford.edu/entries/models-science/>
- Montgomery, C., & McDowell, L. (2009). Social Networks and the International Student Experience: An International Community of Practice? *Journal of Studies in International Education*, 13(4), 455-466.
- Moyer, M. (2010, September). How much is left? *Scientific American, Special Issue*, 74-81.
- Muthulingam, S. (2009). Environmental Issues in Operations Management. (Doctoral dissertation). Retrieved January 30, 2011, from ProQuest Digital Dissertations database. Publication No. AAT 3410455.
- Natural Resources Canada. (2002). *Government of Canada Action Plan 2000 on Climate Change - Consultations on a Canadian Resource Recovery Strategy, Final Report*. Government of Canada Press.
- Nisbet, R. E., & Ross, L. (1980). *Human Inference*. Englewood Cliffs, NJ: Prentice-Hall
- Oatley, K. G. (1996). Emotions, rationality, and informal reasoning. In Oakhil, J., & A. Granham (eds), *Mental Models in Cognitive Science: Essays in Honour of Phil Johnson-Laird*, 175-196. Exeter, UK: Psychology Press (Erlbaum (UK) Taylor and Francis).
- Ochs, E. (1993). Constructing social identity: a language socialization perspective. *Research on Language and Social Interaction*, 26(3), 287-306.
- Ostermann, A. C. (2003). Communities of practice at work: gender, facework and the power of habitus at an all-female police station and a feminist crisis intervention center in Brazil. *Discourse & Society*, 14 (4), 473-505.

- Palmer, J. & France, C. (1998). Informing smaller organizations about environmental management: an assessment of government schemes. *Journal of Environmental Planning and Management*, 41(3), 355-374.
- Pavey, J. L., Muth, A. B., Ostermeier, D., & Steiner Davis, M. L. E. (2007). Building Capacity for Local Governance: An Application of Interactional Theory to Developing a Community of Interest. *Rural Sociology* 72(1), 90–110.
- Perron, G. M. (submitted). Apprenticeship in a modern age: a study of the use of language repertoires from communities of practice.
- Perron, G. M. (2006) Environmental changes and the business mental model. *The International Journal of Knowledge, Culture and Change Management*, 6(6): 55-64.
- Perron, G. M., & Duffy, J. F. (submitted). Documenting some speculations from the theory of communities of practice: assessing identity from linguistic repertoires.
- Peters, M., & Turner, R. K. (2004). SME environmental attitudes and participation in local-scale voluntary initiatives: some practical applications. *Journal of Environmental Planning and Management*, 47(3): 449-473.
- Revell, A, & Rutherford, R. (2003). UK environmental policy and the small firm: broadening the focus. *Business Strategy and the Environment*, 12, 26-35.
- Russell, C. (2005). Energy management pathfinding: understanding manufacturers' ability and desire to implement energy efficiency. *2005 ACEEE Summer Study on Energy Efficiency in Industry*, 3: 141-152.
- Rutherford, R, Blackburn, R, & Spence, L. J. (2000). Environmental and the small firm: an international comparison. *International Journal of Environmental Behaviour and Research*, 6(6), 310-325.
- Schein, E. H. (1985). *Organizational Culture and Leadership*. San Francisco, CA: Jossey-Bass.
- Scott, W. R. (2005). Institutional theory: contributing to a theoretical research program. In K. G. Smith & M. A. Hitt (Eds), *Great minds in management: the process of theory development* (460-484). Oxford, UK: Oxford University Press.
- Senge, P. (1992). Mental models: putting strategic ideas into practice. *Planning Review*, 20(2), 4-8.

- Senge, P. (2006). *The fifth discipline: The art & practice of the learning organization*. New York: Doubleday/Currency.
- Silverstein, M. (1998). Contemporary transformations of local linguistic communities. *Annual Review of Anthropology*, 27: 401-426.
- Simon, H. A. (1997). *Administrative behavior: A study of decision-making processes in administrative organizations*. New York, US: Free Press.
- Simpson, M., Taylor, N., & Barker, K. (2004). Environmental responsibility in SMEs: does it deliver competitive advantage? *Business Strategy and the Environment*, 13, 156-171.
- Smith, A., & Kemp, R. (1998). *Small firms and the environment*. Birmingham, UK: The Groundwork Foundation.
- Stern, N. (2007). *The economics of climate change – The Stern review*. New York, US: Cambridge University Press.
- Stevenson, W. B. (2003). Introduction: planned organizational change and organizational networks. *Journal of Applied Behavioural Science*, 39(3), 238-242.
- Stone, L. (2000). When case studies are not enough: the influence of corporate culture and employee attitudes on the success of cleaner production initiatives. *Journal of Cleaner Production*, 8, 353-359.
- Swanson, R. A. (2003). Decision premises and their implications for developing decision-making expertise. *Advances in Developing Human Resources*, 5(40), 378-392.
- Tajfel, H., Billig, M. G., Bundy, R. P., & Flament, C. (1971). Social categorization and intergroup behaviour. *Journal of Social Psychology*, 1(2): 149-178.
- Tajfel, H. & Turner, J. C. (1986). The social identity theory of inter-group behavior. In S. Worchel and L. W. Austin (eds.), *Psychology of Intergroup Relations* (7-25). Chicago: Nelson-Hall.
- Thomas, S., & Kerner, D. (2010). *Defense energy resilience: lessons from ecology - The Letort papers*. Carlisle, PA: U.S. Army War College.
- Thompson, D. (2002). *Tools for natural-environment management: A practical introduction and guide*. Gabriola Island, BC: New Society Publishers.

- Thornton, P. H., & Ocasio, W. (2008). Institutional logics. In K. Sahlin-Andersson, R. Greenwood, C. Oliver, & R Suddaby (Eds.). *The Sage Handbook of Organizational Institutionalism* (99-129). London, UK: SAGE Publications.
- Thorpe, J., & Prakash-Mani, K. (2003). Developing value: the business case for sustainability in emerging markets. *Greener Management International*, 44, 17-33.
- Tilley, F. (1999). The gap between the environmental attitudes and the environmental behaviour of small firms. *Business Strategy and the Environment*, 8: 238-248.
- Turner, B. S. (2000). *The Blackwell Companion to Social Theory* (Second Edition). Malden, Mass: Blackwell.
- US EPA. (2010) *Future climate change*.  
<http://www.epa.gov/climatechange/science/futurecc.html>
- Vernon, J., Essex, S., Pinder, D., & Curry, K. (2003). The ‘greening’ of tourism micro-businesses: outcomes of focus group investigations in South East Cornwall. *Business Strategy and the Environment*, 12, 49–69.
- Vickers, D., & Fox, S. (2010). Towards practice-based studies of HRM: an actor-network and communities of practice informed approach. *The International Journal of Human Resource Management*, 21(6), 899–914.
- Wenger, E. (1998). *Communities of practice — Learning, meaning, and identity*. Cambridge: Cambridge University Press.
- Wenger, E., McDermott, R., & Snyder, W. S. (2002). *Cultivating communities of practice: A guide to managing knowledge*. Boston, Massachusetts: Harvard Business School Press.
- Wenger, E. C., & Snyder, W. S. (2000, January-February). Communities of practice: the organizational frontier. Boston, Massachusetts: *Harvard Business Review*, 78, 139-145.
- Williams, H., van Hooydonk, A., Dingle, P., Annandale, D. (2000). Developing tailored environmental management systems for small businesses. *Eco-Management and Auditing*, 7, 106-113.
- Willard, B. (2005). *The Next Sustainability Wave: Building Boardroom Buy-in*. Gabriola Island, BC, Canada: New Society Publishers.

- Wilson, J. R. (2000). Mental models. In W. Karwowski, (ed.), *International encyclopedia of ergonomics and human factors* (493– 496). London: Taylor and Francis.
- Wong, S-S. (2008). Judgments about knowledge importance: the roles of social referents and network structure. *Human Relations*, 61(11), 1565–1591.