8-6-2011

An Integrated Framework for Effective Tacit Knowledge Transfer

Anitha Chennamaneni
Texas A&M University Central Texas, anitha.chennamaneni@ct.tamus.edu

James T. C . Teng
University of Texas at Arlington, jtteng@uta.edu

An Integrated Framework for Effective Tacit Knowledge Transfer

Anitha Chennamaneni
Texas A&M University Central Texas
anitha.chennamaneni@ct.tamus.edu

James T. C. Teng
University of Texas at Arlington
jtteng@uta.edu

ABSTRACT

Effective tacit knowledge transfer is very critical for organizations. However, despite concerted efforts, many organizations are finding it increasingly difficult to manage tacit knowledge transfer. This paper examines the characteristics of tacit knowledge and develops an integrated framework grounded in knowledge creation theory, social cognitive theory and media richness theory for transferring tacit knowledge effectively. The appropriateness and relevance of various knowledge transfer mechanisms and the communication media types for different degrees of tacitness is discussed. This framework can guide organizations in developing well suited knowledge transfer mechanisms to attain optimal tacit knowledge transfer.

Keywords

Knowledge Management, Tacit Knowledge, Tacit Knowledge Transfer, Mechanisms, Technologies & Media Richness Theory

INTRODUCTION

Tacit knowledge transfer is very critical for organizations. However, despite concerted efforts, many organizations are finding it increasingly difficult to manage tacit knowledge transfer. Citing the pivotal role tacit knowledge plays in providing organizations a competitive edge (Lubit, 2001), researchers and practitioners alike have called for the identification of effective tacit knowledge transfer mechanisms and technologies. Despite the call, extant research on the tacit knowledge transfer is currently fragmented and weaker. The works of Hansen et al., (1999), Busch et al., (2000), Ambrosini et. al, (2001), Stenmark, (2000) Leonardi et al., (2008) show some encouraging developments. However, even these works lack a profound discussion on the potential of various knowledge transfer mechanisms for transferring different types of tacit knowledge.

To better understand this issue, we examine the different characteristics of tacit knowledge and develop an integrated framework that maps ideal knowledge transfer mechanisms and communication media types to varied degrees of tacitness in knowledge. The theoretical foundations for the framework are based on knowledge creation theory (Nonaka, 1995), social cognitive theory (Bandura, 1971; Bandura, 1997) and media richness theory (Daft et al., 1986). Our future study will validate this frame work through an assessment by a panel of experts as well as by a lab experiment.

The rest of the paper is organized as follows. The next section explores the notion of tacit knowledge as described in extant literature. This is followed by the section degrees of tacitness which discusses the existence of tacit knowledge on a continuum. The section mechanisms for tacit knowledge transfer discusses various knowledge management mechanisms and develops a framework for mapping the mechanisms to varied degrees of tacitness in knowledge. The section mapping communication media to the degrees of tacitness emphasizes the need to fit the media type to different degrees of tacit knowledge and proposes a framework based on media richness theory. This is followed by discussion and implications. Finally the conclusion section summarizes the main points of the paper.

THE NOTION OF TACIT KNOWLEDGE

Ryle (1950) and Polanyi (1966), have discussed knowledge forms that are about "knowing how" and tacit. Polanyi (1966) summarizes the fundamental nature of tacit knowledge in the phrase "We know more than we can tell". He exemplifies tacit knowledge by providing everyday examples such as the ability to recognize the face of an acquaintance, riding a bicycle and

swimming. In all these examples, individuals can successfully complete a task, but have difficulty articulating precisely the decision rules for their actions. For instance, individuals can recognize a familiar face among a crowd of people by attending to the tacit details of the face, but have difficult time explaining how they know the face. Polanyi (1962) notes, "The aim of a skilful performance is achieved by the observance of a set of rules which are not known as such to the person following them". This, according to Polanyi (1966), is tacit knowing, which is the foundation for all knowledge.

Drawing on the work of Polanyi (1966), Nonaka (1994) characterized tacit knowledge as deeply rooted in individual's actions, experiences, ideals, values and involvement in a specific context. Building on these perspectives, Ambrosini et. al., (2001) contend that tacit knowledge is context-specific, personal, practical and procedural. Knowledge comprising these four aspects is so deeply embedded in individuals that it becomes entirely natural and very much part of the holder. This, according to the researchers, is the reason why tacit knowledge is not easily expressible and often is inferred from individual's actions or choices. Other definitions of tacit knowledge also exist. For example, tacit knowledge is referred as skills (Nelson et. al., 1982), "know-how" (Kogut et. al., 1992), competence (Badaracco, 1991), "not yet explicated" (Spender, 1996), uncodifiable (Hu, 1995), "difficult to articulate and express to others" (Bloodgood et. al., 1998), "difficult to codify"(Gupta et. al., 1999), personal, non-communicable (Baumard, 1999), communicable by personal contact only (Collins, 2001).

The above definitions indicate that, tacit knowledge comes in different kinds with several levels of knowing and not knowing. Certain kinds of tacit knowledge are entirely unconscious and inaccessible for introspection, while others are conscious and are accessible, if triggered properly. As such it would be a grave mistake to consider knowledge as strictly tacit or explicit. In reality, knowledge exists on a continuum from explicit to extremely tacit (Blackler, 1995 ; Busch et. al., 2000; Collins, 2001 ; Ambrosini et. al., 2001). The degree of tacitness determines whether a specific knowledge type is accessible or not. The closer the knowledge is to the extremely tacit, the more difficult it is to access.

DEGREE OF TACITNESS

Synthesis of the different terminology used by the researchers indicate that tacit knowledge comes in several guises. Skills with low degree of tacitness are those that are learnt explicitly, but have attained tacitness overtime because of extensive usage. These are the technical skills referred to as embedded knowledge (Blackler, 1995), concealed knowledge (Collins, 2001), articulable skills (Ambrosini et. al., 2001), internalized, tacit skills and routines (Hakanson, 2001). Low degree tacit skills can be learnt by trial and error or short period of apprenticeship. In contrast, skills with high degree of tacitness are those that have been individualized and are inaccessible for introspection. These are the creative skills referred to as embrained knowledge (Blackler, 1995), unrecognizable knowledge (Collins, 2001) and inarticulable skills (Ambrosini et. al., 2001; Hakanson, 2001). Skills with medium tacitness lie in between the low and high level tacit skills and are termed as embrained knowledge (Blackler, 1995), unrecognized knowledge (Collins, 2001), imperfectly articulable (Ambrosini et. al., 2001) and articulable skills (Hakanson, 2001). Most tacit skills with the exception of high degree tacit skills such as creative skills, entrepreneurship skills are potentially articulable if appropriate knowledge management mechanisms are employed (Busch et. al., 2000; Hakanson, 2001; Ambrosini et. al., 2001; Nonaka, 1994; Thomas, Rodhain, (1999) ; Carrico (1998)

MECHANISMS FOR TACIT KNOWLEDGE TRANSFER

With the developments in information technology and knowledge management, the last decade has seen a number of knowledge transfer mechanisms and technologies including Web 2.0 technologies, KM tools, organisational learning (OL) and Community of Practice (CoP) available for transferring tacit knowledge. We will list these mechanisms below and discuss their suitability and relevance for effective tacit knowledge transfer.

Observation

The social cognitive theory recognizes observation as a valuable form of learning. It states that much of the learning occurs by observing others (Bandura, 1971; Bandura, 1997). By observing the actions of an expert, as one explains how one is performing a critical task, the observer gains insights into expert's practices and builds his personal knowledgebase. Tacit knowledge is experiential and developed overtime (Leonard-Barton, 1992). Often, individuals with tacit knowledge are unaware of what they possess and how valuable it could be for others. Sobol & Lei(1994) observe that "'learning tacit knowledge and skills requires continuous day-to-day contact with the person, team, or organization possessing such knowledge through apprenticeship-like relationship where the skills are directly observed and practice". Bandura (1971) stresses the importance of reinforcement as a strategy to build expertise. According to him, reinforcement occurs, when an observer, after observing the experiences of an expert, modifies his own behavior to obtain the desired outcomes.

Apprenticeships

Apprenticeships are formal arrangements where specialized knowledge or skill from a domain expert is passed to a novice. The novice after extensively practicing the skill for a prescribed period of time acquires same level of competence as the expert (Collis and Winnips 2002).

Mentoring

Mentoring involves pairing a domain expert with lesser skilled person with the objective of taking the competencies of a lesser skilled person to the higher level (Engström, 2003).

Metaphors

Metaphors are the ways of transferring meaning from a familiar domain to an unfamiliar domain (Tsoukas, 1991). Using metaphors, individuals can infer about things they know least on the basis of other familiar things. In the absence of formal language, metaphors communicate meaning (Srivatsava et al., 1988). By generating new meaning, metaphors help articulate things that are not expressible due to the lack of appropriate words.

Analogies

Analogies involves synthesizing diverse perception and images into a common expression. Analogies are used to compare and contrast messages to determine their similarities and differences

Storytelling

Storytelling is the process of narrating anecdotes to illustrate a point and to effectively transfer knowledge about organizational managerial systems, norms, values and culture. In storytelling, participants frame their experiences in stories in order to explain how things are done. Story telling is powerful tacit knowledge transformation tool since it uncovers tacit skills by adding meaning and context to the ideas, facts and so forth (Swap et al., 2001). Stories help listeners understand new experiences and develop general beliefs.

Concept Maps

Concept maps are very important techniques for representing individual's or several individual's mental models in graphical format (Carbonara & Scozzi, 2006). A knowledge graph has a network of nodes and links. Nodes symbolize concepts while links symbolize the relations between concepts. Most of the links are causal and can be non, uni or bi-directional. Concept maps help individuals visualize complex phenomenon and uncover their tacit skills. During the mapping process, respondents are continually asked to reflect on their behavior and on what they are doing that's causing success. The repeated questioning and reflection help elicit respondent's tacit skills, a process known as externalization (Nonaka, 1994). Some research on knowledge acquisition has successfully demonstrated the use of concept mapping in externalizing tacit knowledge (Kremer et. al., 1994; Busch et. al., 2000; Ambrosini et. al, 2001; Rodhain, 1999; Carrico et. al., 1998).

Repertory Grid

Repertory grid is used to elicit the conceptual model of domain experts by using their own language. The technique employs elements in a given context and elicits constructs by questioning the expert about the similarities and dissimilarities of the domain.

Fishbone

Fishbone diagrams are a structured way of thinking through all the possible causes of a problem. Teams using fishbone diagrams place the objective of the team on the main bone of the fish and causes and effects on the smaller connecting bones. Fishbone diagrams are extremely useful in visualizing the issues surrounding a problem.

Prototype

Prototyping is an iterative evaluation of the proposed system being built. It is extremely useful in eliciting tacit skills that are inexpressible in words but can be nevertheless be conveyed by pointing.

Expert Interviews

Expert interviews are a way of transforming tacit knowledge into explicit. In an expert interview, an apprentice interviews the domain expert regarding his expertise. The format of the interview can range from unstructured to structured. While

unstructured interviews provide a rough map of the domain expert's territory, semi-structured interviews provide a broad picture of the whole domain and structured interviews provide a clear picture of the specific part of the knowledge base.

Protocol Analysis

Unlike conventional interviews, where the interviewer steers the process, in protocol analysis, an expert leads the process. One talks loudly while working through a series of cases. The objective here is to produce in verbatim, the expert's explanation of his "know-how" associated with the task. Protocol analysis is extremely useful in bringing out the broad picture of the domain.

Best Practices

Best practices are the ways of performing tasks that produces excellent results. They are the processes that have been established and perfected over a period of time. Identification and sharing of best practices often result in generating innovative ideas for improving the effectiveness of organizational processes.

Lessons Learned

Lessons learned involves identification, analysis and capturing of processes that went well and the processes that need improvement. Results obtained are shared with other team members so they can learn from others experiences

Expert Systems

An expert system facilitates solving problems in a limited domain by drawing inference from a knowledge base developed from domain experts. This system is built by observing the specialist at work and by incorporating his knowledgebase into derivatives often in the form of if-then rules.

Case-based reasoning (CBR) systems

CBR systems embody expertise in a set of past cases rather than coding them in classical rules. For each case, description of the problem and the solution are documented. Users when faced with a problem, check the case base for analogous problems and solutions.

Neural Networks

Neural networks are intelligent systems that employ statistical instruments to deal with cause-effect examples and to study the evolved models. These systems are very flexible because they automatically reprogram and add new relations when ever an input changes.

Brainstorming

Brainstorming is an excellent way of generating creative solutions to the problems. During the brainstorming process, participants are given free rein and are asked to produce any or all possible solutions to a given problem. Since everyone in the team is involved, brainstorming usually results in generating a large number of ideas (Brassard & Ritter, 1994). Brainstorming helps participants break out of their thinking patterns and look at things in a new way

THE FRAMEWORK FOR MAPPING KNOLWEDGE TRANSFER MECHANISMS TO DEGREE OF TACITNESS

Based on the definition and theoretical conceptualization of the varied degrees of tacitness in knowledge, we have conducted an assessment of the potential of the various knowledge transfer mechanisms and developed a framework to identify appropriate knowledge transfer mechanisms for different degrees of tacit skills. This classification is tentative and presented as theoretical propositions in table1. Our future study will validate the framework by a lab experiment

Knowledge Transfer Mechanisms	
Cell 1 - High Degree of Tacitness	• Observation • Apprenticeship • Mentoring
Cell 2 - Medium Degree of Tacitness	• Metaphor • Analogies • Story Telling • Concept Mapping • Process Mapping • Repertory Grid • Fish Bone • Prototype • Brainstorming • Mentoring • Apprenticeship
Cell 3 – Low Degree of Tacitness	• Expert Systems • Case Based Systems • Neural Networks • Brain Storming • Expert Interviews(Structured) • Protocol Analysis • Lessons learned • Best Practices

Table1. Mapping Knowledge Transfer Mechanisms to Degree of Tacitness

Cell 1 comprises high degree tacit skills that are deeply embedded in individual's cognitive and conceptual abilities. These skills are inaccessible for introspection and therefore are difficult to articulate. Even if individuals attempt to articulate, the articulation will be incomplete as some of the richness of the intended message is lost in the process. As such, these skills can only be learnt by observing behavior modeled by others (Bandura, 1971). Sobol & Lei (1994) note "'learning tacit knowledge and skills requires continuous day-to-day contact with the person, team, or organization possessing such knowledge through apprenticeship-like relationship where the skills are directly observed and practice". By observing the expert and by modifying one's own behavior accordingly, individuals can gain expertise (Johannessen et al.). Mentoring and

apprenticeship are appropriate techniques for these type of skills since they teach tacitly through observation and imitation of expert's behavior.

Cell 2 refers to that component of tacit knowledge that is inexpressible through words, but is, however amenable to articulation through mechanisms such as metaphors, storytelling, concept mapping etc. In situations where individuals have difficulty articulating through words, the use of imagination and symbols allows them to understand intuitively, form impressions and organize their thoughts, of what they are trying to verbalize. For instance, metaphors can be used to infer about least familiar concepts on the basis of other familiar concepts. Metaphors help in bringing out tacit knowledge because metaphorical language gives tacit knowledge a voice (Munby, 1986). Similarly, storytelling, uncovers tacit skills. It allows participants frame their experiences in stories and adds meaning to the context (Swap et al., 2001). Modeling techniques such as concept mapping, repertory grid etc also elicit tacit skills by helping participants reflect on their behaviors and by representing their mental models in graphical format (Kremer et. al., 1994; Busch et. al., 2000; Ambrosini et. al, 2001; Rodhain, 1999; Carrico et. al., 1998). Representation of mental models in graphical format results in clear explanation and articulation of ill-structured problems. Some other mechanisms that are appropriate for eliciting medium degree tacit skills include process mapping, fishbone, prototype, brainstorming etc. These mechanisms can be employed individually or in combination with other mechanisms.

Cell 3 deals with low degree tacit skills. These are the skills that have been acquired explicitly and internalized (Nonaka, 1994; Nonaka et. al., 1995). They can be articulated by posing the right questions. Structured expert interviews, protocol analysis etc can be extremely useful in triggering the right dialogue and eliciting these type of skills. These type of skills can be learnt by trial and error.

THE FRAMEWORK FOR MAPPING COMMUNICATION MEDIA TO DEGREE OF TACITNESS

A communication channel is a medium through which individuals interact and share knowledge. Some of the common communication channels include face to face interaction, video conferencing, telephone, Web 2.0 technologies, e-mail and so forth. According to media richness theory, each of these channels has its own advantages and disadvantages and are therefore more suitable than others for different situations (Daft et al.,1986).

Media Richness Theory

Media richness theory argues that task performance can be improved by matching media characteristics to the task needs (Daft & Lengel, 1986). Daft & Lengel, characterize tasks based on uncertainty and equivocality. Uncertainty tasks are tasks that have inadequate information while equivocal tasks are tasks that have conflicting interpretation. In order to overcome uncertainty and equivocality, it is important that individuals choose proper media to transmit information. Daft and Lengel use four factors to describe media richness hierarchy. These are 1) conveyance of multiple cues (facial expressions, body language, general appearance, voice tone etc); (2) availability of immediate feedback; (3) personalization and (4) language variety. Richer media according to researchers are those that have a greater multiplicity of cues, rapid feedback, greater personalization and language variety. Given these characteristics, face-to-face communication is the richest communication medium in the hierarchy while other media such as e-mail, voice-mail, letter, note etc that send fewer cues and has slower feedback are leaner. The theory asserts that richer media are better suited to equivocal tasks while leaner media are better suited to less equivocal tasks (Daft and Lengel, 1986). Richer media allows users communicate effectively and facilitates better understanding of ambiguous and equivocal messages, resulting in improved performance of equivocal messages. On the other hand, leaner media, by avoiding communicating too much information, results in improved performance of less equivocal tasks.

Based on the media richness theory of Daft and Lengel (1986) and the theoretical conceptualization of the tacitness in knowledge, we have conducted an assessment of the potential for the various communication media type and developed a framework for mapping appropriate communication media for different degrees of tacit skills. This classification is tentative and presented as theoretical propositions in table 2. The vertical axis of the table represents tacit knowledge on a continuum from low to extremely tacitness and the horizontal axis represents the media richness dimension from lean media to rich media. The ideal media to transfer high degree tacit skills is through face to face meetings since transference of high degree tacit skills require trust and sharing of experiences through observation and imitation. However, a number of tools that support real time online meetings such as groupware and Web 2.0 technologies can also be used to supplement face to face meetings or in some cases replace them. Groupware is a mix of synchronous, asynchronous and community-focused groups(e-groups). It facilitates communication, coordination and collaboration among members of a group. By permitting

collaboration and exchange of shared experiences and non-structured messages in terms of fast, focused feedback, certain applications of groupware and web 2.0 technologies, help transmit high degree tacit skills efficiently. In conjunction with communication technologies, transformation technologies should be often employed for effectively creating, viewing, modifying, and analyzing a large range of knowledge artifacts (Leonardi & Bailey, 2008).

Transfer of medium degree tacit skills deal with sharing mental models through transfer mechanisms such as metaphors, storytelling, concept mapping etc. This kind of interaction can be supported by collaboration systems such as online chat, concept mapping systems, telephone and other groupware. Low level tacit skills can be acquired by triggering the appropriate dialogue with the expert. Lean communication media such as e-mail, voice-mail and some applications of groupware can efficiently and accurately convey these kind of skills.

	Communication Media			
		Low	Medium	High
Degree of Tacitness	Low	1 • Asynchronous Groupware • Written Mail • Voice-Mail • E-mail	2 • Synchronous Groupware • Telephone	3 • Video Conferencing • Web 2.0 technologies • Chat Rooms
	Medium	4 • Synchronous Groupware • Telephone • Online Chat	5 • Synchronous Groupware • Video Conferencing • Groupware Concept Mapping	6 • Video Conferencing • Web 2.0 technologies • Face to Face
	High	7 • Video Conferencing	8 • Video Conferencing	9 • Face to Face

Table2. Mapping Communication Media to Degree of Tacitness

DISCUSSION AND IMPLICATIONS

Traditional knowledge transfer mechanisms have limited ability for exploiting tacit knowledge. This is because these mechanisms fail to take into account the intrinsic origin and composition of tacit knowledge. Nonaka et. al., 1995 in explaining the modes of knowledge creation in their SECI model recommend that organizations find new ways to capture and communicate tacit knowledge. They assert that tacit knowledge can be transferred in many ways and observe that effective tacit knowledge requires mapping knowledge content with transfer mechanisms. A similar view point is expressed by other researchers (Hansen et. al., 1999; Busch et al., 2000; Hakanson, 2001; Ambrosini et. al, 2001 ; Rodhain, 1999, Carrico, 1998; Johannessen et. al., 2001, Leonardi & Bailey, 2008). We developed an integrated knowledge transfer framework for classifying and mapping appropriate knowledge transfer mechanisms and communication media type for different degrees of tacit skills. Classification and mapping schema are grounded in knowledge creation theory of Nonaka and media richness theory of Daft and Lengel. Our framework contends that effective tacit knowledge transfer is dependent on selecting appropriate knowledge transfer mechanism and the communication media type. For instance, skills with high degree of tacitness which can only be transferred through observation and imitation of expert's behavior require a rich, broad communication medium such as face to face communication to ensure a greater chance of success. In contrast, some low degree tacit skills, that can be acquired by posing the right questions, may only need an asynchronous and fairly lean medium such as e-mail to transfer the skills effectively. As such it is vital that organizations choose knowledge transfer mechanism and media type that fits with the characteristics of the tacit skills.

CONCLUSION

The transfer of tacit knowledge is very critical for organizations. However, despite concerted efforts, many organizations are finding it increasingly difficult to manage it. To better understand this issue and to manage optimal tacit knowledge transfer, we examined the varied characteristics of tacit knowledge and developed an integrated framework grounded in knowledge creation theory, social cognitive theory and media richness theory for effective tacit knowledge transfer. We believe that this is an important step toward deepening our understanding of tacit knowledge transfer. Our framework should prove useful to organizations in developing well suited knowledge transfer mechanisms for transferring different degrees of tacit knowledge. We plan to enhance the validity of this framework through an assessment by a panel of experts as well as by lab experiments in near future.

REFERENCES

1. Ambrosini, V. and Bowman, C. (2001) Tacit Knowledge: Some Suggestions for Operationalization. Journal of Management Studies, 38,6, 811-829.
2. Badaracco, J.L.(1991). The Knowledge Link. Boston: Harvard Business School Press.
3. Bandura, A. (1971) Social Learning Theory, General Learning Press, New York.
4. Bandura, A. (1997) Self Efficacy: The Exercise of Control, W H Freeman, New York.
5. Baumard, P. (1999) Tacit Knowledge in Organizations, London & Thousand Oaks: Sage
6. Blackler, F. (1995) Knowledge, Knowledge Work and Organizations: An Overview and Interpretation. Organization Studies, 16, 6, 1021-1046
7. Bloodgood, J.M. and Salisbury, W. D. What You Don't Know You Know Can Hurt You: Considerations in Using IT to Transmit Tacit Knowledge in Organizations. Proceedings of the Americas Conference of Information Systems, 1998.
8. Brassard, M., and Ritter, D. (1994). The memory jogger II. Methuen, MA:Goal/qpc
9. Busch, P., and Dampney, C., 2000 Tacit Knowledge Acquisition and Processing within the Computing Domain: An Exploratory Study, Information Resources Management Association International Conference May Anchorage, AK, U.S.A. 1014 –1015
10. Busch, P. and Richards, D. (2000). Graphically defining articulable Tacit Knowledge VIP2000 Pan – Sydney Area workshop on visual information processing December 1st. University of Sydney
11. Busch, P., Richards, D. and Dampney, C., (2001).Visual mapping of articulable tacit knowledge Information Visualisation 2001: Proceedings of the Australian Symposium on Information Visualisation Vol. 9 Sydney Australia December 2001. 37 – 47
12. Byounggu, Choi. and Heeseok, Lee (2003). An Empirical Investigation of KM styles and Their Effect on Corporate Performance, Information & Management, 40:5, 403-417
13. Carbonara & Scozzi. Cognitive Maps to analyze new product development processes: A case study. Technovation, Nov2006, Vol. 26 Issue 11, p1233-1243, 11p
14. Carrico, L., and Guimaraes, Nuno.,(1998). Enhancing visual interaction: Manipulating concept maps with constrained regions, May, 1998 Proceedings of the working conference on advanced visual interfaces

15. Collins, H.M., (2001). Tacit knowledge, Trust, and the Q of the Sapphire., Social Studies of the Science.31:1, pp.71-85
16. Collis, B., and Winnips, K (2002). Two Scenarios for Productive Learning Environments in the Workplace. British Journal of Educational Technology 33, 2, 133-148.
17. Daft, R.L. and Lengel, R.H. (1986). Organizational information requirements, media richness and structural design, Management Science 32:5, pp.554-571.
18. Daft, R.L., Lengel, R.H., and Trevino, L.K. (1987). Message equivocality, media selection, and manager performance: Implications for information systems. MIS Quarterly, 355-366.
19. Engström, T. E. J. (2003), Sharing knowledge through mentoring. Performance Improvement, 42: 36–42.
20. Gupta, B., L.S. Iyer, and J.E. Aronson.(1999). An Exploration of Knowledge Management Techniques, Americas Conference on Information Systems, August 1999.
21. Hakanson, Lars. 2001, Tacit Knowledge, Articulation and Competitive Advantage, Paper prepared for the annual LINK conference Copenhagen, September 7-8, 2001
22. Hansen MT, Nohria N, Tierney T. 1999. What's your strategy for managing knowledge, Harvard Business Review 77:2 106-116
23. Hu, Y.S.(1995), The international transferability of the firm's advantages, California Management Review, 37:4, pp.73-88
24. Johannessen, J., Olaisen, J.and Olsen, B., (2001) Mismanagement of tacit knowledge: The importance of tacit knowledge, the danger of information technology and what to do about it, International journal of information management Vol 21. 3 – 20
25. Kogut, B. and Zander, U.(1992). Knowledge of the firm, combinative capabilities, and the replication of technology. Organisation Science, Vol.3, pp.383-96
26. Kremer, Rob., and Gaines, Brian., (1994) Groupware Concept Mapping Techniques, Proceedings SIGDOC'94: ACM 12th Annual International Conference on Systems Documentation.
27. Leonard-Barton, D. (1992). Core capabiliites and core rigidities: a paradox in managing new product development. Strategic Management Journal, Vol.13, pp.111-26.
28. Leonardi, Paul M.& Bailey, Diane E.., Transformational technologies and the creation of new work practices: making implicit knowledge explicit in task-based offshoring, MIS Quarterly, Jun2008, 32, 2, 411-436.
29. Lubit, R. (2001), Tacit Knowledge and Knowledge Management: The Keys to Sustainable Competitive Advantage, Organizational Dynamics, 29, 3,164-178.
30. Munby, H.(1986). Metaphor is the thinking of teachers: an exploratory study. Journal of Curriculam Studies, 18,2, 197-209.
31. Nelson, R.R. and Winter, S,G.(1982). An Evolutionary Theory of Economic Change. Cambridge, MA: The Belknap Press.
32. Nidumolu, Sarma. , Subramani, Mani., and Aldrich, Alan.(2001) Situated Learning and the Situated Knowledge Web: Exploring the Ground Beneath Knowledge Management, Journal of Management Information Systems, 18:1, 115-150
33. Nonaka, I. 1991, The knowledge-creating company. Harvard Business Review. 96-104
34. Nonaka, I. 1994, A dynamic theory of organizational knowledge creation, Organization Science. 5,1, 14-37
35. Nonaka, I. and Takeuchi, H. 1995, The knowledge-creating company, Oxford;Oxford University Press.
36. Polanyi, M. 1966 – The Tacit Dimension. Routledge and Kegan Paul, London, UK
37. Ryle G., (1950), The Concept of Mind, Hutchinson´s University Library, London
38. Rodhain, F.,(1999) Tacit to Explicit: Transforming knowledge through cognitive mapping – an experiment, www.crego.univ-montp2.fr/~crego/cahiers/11.pdf
39. Sobol, M. G. and Lei, D.(1994). Environment, manufaturing technology and embedded knowledge. International Journal of Human Factors in Manufacturing, 4:2, pp.167-89
40. Spender, J.C.(1996). Organizational knowledge, learning and memory: three concepts in search of a theory, Journal of Organizational Change Management, 9:1, pp.63-78
41. Srivatsava, S. and Barrett, F.J.(1988). The Transforming nature of metaphors in group development: a study in group theory. Human Relations, 41:1, 31-64.
42. Stenmark, Dick. 2000, Turning Tacit Knowledge Tangible, In Proceedings of the 33rd Hawaii International Conference on System Sciences, Maui, Hawaii January, 4-7, 2000
43. Swap, W., Leonard M. Shields., and Abrams, L.(2001): "Using Mentoring and Storytelling to Transfer Knowledge in the Workplace", Journal of Management Information Systems 19:1, pp. 95 – 114

44. Tsoukas, H.(1991). "The missing link: a transformational view of metaphors in organizational science'. Academy of Management Review, 16:3, pp.566-585
45. Zack, M.(1999), “Managing Codified Knowledge”, Sloan Management Review, 40:4, pp 45-58