

VARIOUS TYPES OF VIRTUAL ENDEAVORS
WITH CORRESPONDING KNOWLEDGE TRANSFER STRATEGIES

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ABSTRACT

This paper presents a framework for linking aspects of knowledge transfer with six distinct types of virtual organizing. This framework is offered as a basis for further research and examines connections between two rapidly growing areas of interest to both business leaders and organizational scientists: virtual organization and knowledge transfer. Analysis of the framework concludes that some types of virtual organizing are driven by needs for information. In these types, knowledge transfer emanates from sharing. Other types are driven by individual agendas or project deadlines with knowledge transfer requiring extraction or release of information. The linkages between knowledge transfer and virtual organizing suggest that additional research is needed to integrate the perspectives of information scientists and organizational scientists to more fully appreciate the dynamics of these two phenomena and their implications for development of management and organizational theories.

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1. INTRODUCTION

Organizational scientists and business executives considering decisions about global workforces, flexible organizations, and electronic communications are exploring the metaphoric ash can (March & Olsen, 1982). Here, they find virtual organizations and knowledge transfer are co-located. This paper purports that these two items share more than proximity. In fact, they co-exist and often cohabit work production and organizing forms. Accordingly, this paper presents a framework to enable integration of research on virtual organizing and knowledge transfer.

1.1 Purpose

In the past decade, virtual organizations arrived on the scene to replace other forms of working (Fisher & Fisher, 1998; Grenier & Metes, 1995; Lipnack & Stamps, 1997). Meanwhile, from a different route, knowledge management arrived as an organizing strategy (Brown & Duguid, 2000; Davenport & Prusak, 1998; Harvard Business Review, 1998; Wenger, 1998). While information scientists have been studying virtual work and knowledge management for their use of technologies, management scientists have investigated the impact of computing and related technologies on performance and learning.

Knowledge management (KM) is different from information management (Borghoff & Pareschi, 1998) in that it requires theories of action, theories that encompass the dynamics of sensemaking (Weick, 1995) and normative social processes. This is where organizational scientists can make a contribution to research on KM. This paper attempts to draw these research endeavors together by exploring the nexus of virtual organizing and knowledge transfer.

There are already linkages and similarities between research on virtual organizing and knowledge management. For example, literature on virtual organizations attempts to categorize different types of teams and organizing mechanisms (Duarte & Snyder, 1999; Grenier & Metes, 1995; Palmer & Speier, 1997). Likewise, research and theories on knowledge management (Davenport & Prusak, 1998; Dixon, 2000; Liebowitz, 2000; Nonaka & Takeuchi, 1995), attempt to categorize different knowledge processes and corresponding managerial issues (e.g. knowledge creation, innovation, transfer, access, retrieval, database development and management). Monsanto's Knowledge Map (Liebowitz, 2000), for example, suggests that Nonaka's (1995) four categories of knowledge conversion occur in virtual organizing environments.

In addition, literature on virtual organizations (Hedberg et al., 1994) implies that new approaches to work contribute to the knowledge bases and key competencies of the organization. Meanwhile, in similar fashion, the knowledge management literature assumes that considerable aspects of communication and coordination rely on electronic means (Davidow & Malone, 1992; Svelby, 1997). To date, there is no framework to explicitly link these two fields of inquiry. This paper attempts to make that framework and build upon other efforts at linkage (Jackson, 1999; Malhotra, 2000; Oravec, 1996; Schrage, 1990).

1.2 Significance

An integrated framework linking virtual organizing and knowledge transfer enables those researching and teaching management, leadership, information technologies, organization theory and organization learning, and those attempting to operate virtual, knowledge-based enterprises, to connect the disparate managerial approaches currently offered by the information sciences and the organizational sciences for both virtual work and knowledge transfer. A framework of types of virtual endeavors, with corresponding knowledge transfer strategies, provides a foundation for discussion of the managerial, cultural and organizational issues affecting knowledge management strategies (Borghoff & Pareschi, 1998).

The framework's evidence of specific types of virtual organizing and knowledge transfer contributes to the broader body of knowledge enterprise literature (Davidow & Malone, 1992; Fisher & Fisher, 1998; Leonard, 1998; Shapiro & Varian, 1999), and supports the growing recognition that new ways of working are emerging in response to technological developments and the quest for global markets. While seeking to simplify both growing fields of study with a linking framework, this paper illustrates how complex and contradictory the fields currently are for those who would know how to approach either the study or the implementation of knowledge transfer in virtual environments.

1.3 Overview of the Literature

Virtual teams and virtual organizations are recommended as new ways of working (Grenier & Metes, 1995) which will replace other forms (Lipnack & Stamps, 1997). They are organizing structures to accomplish work and enhance competitive advantage through speed and agility. They require new approaches to organizational management (Duarte & Snyder, 1999; Fisher & Fisher, 1998; Grenier & Metes, 1995; Igarria & Tan, 1998; Lipnack & Stamps, 1997); and are of interest to organization scientists (Igarria & Tan, 1998), information scientists (Jarvanpaa & Leidner, 1998; Liebowitz, 2000; Palmer, 1998; Palmer & Speier, 1997), and communications theorists (Robins & Webster, 1999; Romm, 1999).

In a similar fashion, the study of knowledge management is also multi-disciplinary. Both information scientists (Borghoff & Pareschi, 1998; Roy, 2001; Thierauf, 1999) and organization scientists (Dixon, 2001; Davenport & Prusak, 1998; Ruggles, 1997) are providing information, examples, and cases about knowledge management. They view knowledge management as a business strategy, or a variety of strategies, (Dixon, 2001; Davenport & Prusak, 1998), that improves competitiveness and changes organizing structures and forms of communication and performance management.

Examples of knowledge transfer in the literature are not exclusively virtual or physical. They illustrate businesses combining face-to-face opportunities with electronic means of connecting with information and ideas in places such as Ameritech (Klein, 1998), British Petroleum, Chevron, Ford, Lockheed Martin, Motorola (Dixon, 2001), 3-M, NEC, BP Exploration

(Davenport & Prusak, 1998), Buckman Labs, Dow Chemical, Ericsson, HP Consulting, and IBM (Harryson, 2000), to name a few of the companies that have pioneered KM. And, even though the physical and the virtual are combined, the promising aspect of these new ways of working seems to be the virtual. Electronic means of knowledge storage and transfer promise that regardless of loss of employees, through down-sizing or job-hopping, companies can retain and re-use what they know.

The resulting paradigm shift for management and organization theory is that knowledge originates in people and creates networks, communities and routines whose life spans exceed that of the tenure of individual members (Czerniawska & Potter, 2001; Leibowitz, 2000). Thus, theories of management and organization are re-focused from people to processes in analysis of these networks and communities. This shift poses some dilemmas about transferring what theorists know from physical work environments to virtual ones. At the same time, theorists from different orientations (e.g. socio-technical systems, organizational learning, culture theory) suffer from a lack of consistent definitions of virtual organizing and knowledge transfer. This paper presents a framework to begin the process of consistently defining types of virtual organizing and examining the issues of culture, learning, and performance in these types.

1.3 Method, Limitations & Delimitations

The method employed in developing this framework was to review the literature and identify cases of virtual organizing with corresponding knowledge transfer activities or cases of knowledge transfer with corresponding virtual organizing. Then, these examples, cases and references were laid out in patterns based on shared organizing characteristics and organizing purposes. These patterns were given general description and definitions (Table 1).

Unfortunately, the literature on virtual organizing is focused on the characteristics of organizing and tends to ignore the details of what knowledge was transferred how, where, when, and for whom. Likewise, the knowledge management literature is focused on characteristics of knowledge management and tends to lack sufficient description of the virtual nature of any organizing approaches involved. Nevertheless, both categories were reviewed in a substantial, although not exhaustive, search of the literature for patterns and generic examples to compose a framework.

The structure of the framework derives initially from categorizations of types of virtual organizations. Various authors have applied names or types to characterizations emerging from surveys (Palmer & Speier, 1997) and to categories of cases or documented examples (Duarte & Snyder, 1999). In contrast, types of knowledge transfer are more resistant to categorization. They are inherently more dynamic because knowledge transfer involves taking action and includes techniques such as communicating databases, narratives, or patterns (Lyons, 2000).

At the nexus of the linkage between types of virtual organization and types of knowledge transfers is an inherent instability: relatively fixed virtual categories connecting to dynamic knowledge transfers. This instability from simultaneously linking both static and dynamic

phenomena makes operationalizing a framework a considerable challenge. Further, the framework may be biased by this author's experience working with and studying virtual teams for the past five years. However, the framework does offer a beginning for linking virtual and knowledge transfer phenomena for study.

2.0 A FRAMEWORK

In developing a framework based on definitions of virtual organizations, it was difficult to delineate each of the types. Researchers have developed no uniform categorization and these virtual organizing mechanisms are changing with the times and technology. Five years ago, virtual organizations were defined as temporal, even ephemeral. They were 'virtual' because they were dynamic, evolving, continuously innovating organizing strategies (Hale & Whitlam, 1997). More recently, virtual organizations are considered a more permanent fixture in the organizing toolkit.

2.1 Definition of Virtual Organizations

This paper defines virtual organizations as geographically dispersed groups of people who rely primarily on electronic communication to accomplish their common purpose (Lipnack & Stamps, 1997). They produce work from different locations (Palmer & Speier, 1997).

Virtual organizations share some characteristics with knowledge transfer. Both involve people and can occur electronically.

2.2 Definition of Knowledge Transfer

Knowledge transfer is an aspect of knowledge management (Davenport & Prusak, 1998; Liebowitz, 2000; Nonaka & Takeuchi, 1995). Knowledge management (KM) includes knowledge creation, innovation, access, retrieval, database development and transfer. Knowledge transfer occurs when knowledge, actionable information (Tiwana, 2001), is imported into and/or exchanged within a system and adds value.

For purposes of this paper, knowledge transfer combines 'access' and 'use,' two of the Gartner Group's five knowledge management activities which are: create, capture, organize, access and use (Uschold & Jasper, 2001). Knowledge transfer is a process by which information from one context is accessed and used in another context. Action is taken that adds value to the enterprise. While each of the Gartner Group's five KM activities can benefit from face-to-face interactions and physical libraries, the knowledge management literature often assumes that considerable aspects of communication and coordination rely on electronic means (Davidow & Malone, 1992; Svelby, 1997). Therefore, knowledge transfer may rely on virtual forms of organizing in some endeavors.

Knowledge transfer serves goals of both learning and performance because knowledge is a "matter of competence with respect to valued enterprise" (Wenger, 1998, p. 4). Some examples of 'competence adding value' in organizations are: having the information needed to make decisions;

improving coordination of performance through shared information and meaning; employing best practices widely to the benefit of the organization; efficiently accessing help and information; improving time to market; improving customer satisfaction with products or services; learning; and innovating products and services.

Knowledge transfer's combination of access and use differentiates it from standard operating procedures or routines. Consistently re-using information in new contexts without taking some sort of action on that information is a routine rather than a knowledge transfer. An example of a routine is a pre-flight checklist. Each time, the plane is different, but the situation is not. In contrast, an example of knowledge transfer is designing a new plane from evaluation and experience with another one (Karolak, 1998). Knowledge transfers, combined with practice and experience, create competence.

Increased competency is the goal of knowledge transfer (Broad, 2000) and is characterized by improvement in individual and/or group performance through increased competence. Consequently, knowledge transfer has the potential to contribute to organizational learning (Olivera & Argote, 1999), and to enhance the adaptive function of the organization (Schwandt & Marquardt, 2000). Because knowledge transfer is an organizing function, and the essence of knowledge work (Fisher & Fisher, 1998), it can occur at several levels – individual, team or group, organizational, industrial, and societal. Knowledge transfer can be as mechanical as data exchange, as social as information exchange, and as organic as competency development and strategy execution. It can even be self-organizing or a combination of self-organizing and 'husbanded' (Brown & Duguid, 2000) which is a combination of spontaneity and direction. Regardless of the organizing metaphor, knowledge transfer is implicitly purposeful.

Knowledge transfer is not moving the same files from one computer to another (Collins, 1997). It cannot rely exclusively on document management (Lyons, 2000). It is a process that involves organizing both information and work in a dynamic fashion. It has the potential to create corporate memory (Brooking, 1999).

Knowledge transfer is revolutionizing management theory and practice (Crandall & Wallace, 1998; Evans & Wurster, 2000; Fisher & Fisher, 1998; Goldman et al., 1994; Hackett, 2000; Harryson, 2000; Martin, 1996; Myers, 1996; Savage, 1996) because it is not amenable to traditional notions of management and control. Knowledge can be leaky (Brown & Duguid, 2000), and end up in unintended destinations. Or, knowledge can be sticky (Brown & Duguid, 2000), and unresponsive to strategies to transfer it. Despite the unmanageable nature of knowledge, various virtual endeavors attempt strategies for knowledge transfer, related to their organizing and membership strategies; and, because knowledge transfer is purposeful, the type of knowledge transferred varies with the organizing strategy and purpose of each type of virtual organizing.

2.3 Types of Virtual Organizing and Knowledge Transfer

Literature on virtual organizations attempts to categorize different types of teams and organizing mechanisms (Duarte & Snyder, 1999; Grenier & Metes, 1995; Hedberg et al., 1994; Lipnack & Stamps, 1997; Palmer & Speier, 1997). Palmer and Speier (1997), in a study of 55 organizations,

identified four types of virtual organizations. There is the unit, which includes the telecommuter (Crandall & Wallace, 1998); the project team (Lipnack & Stamps, 1997; Haywood, 1998); and temporary and permanent joint ventures (Grenier & Metes, 1995). These types are encompassed by a different, although compatible, classification developed by Duarte and Snyder (1999). To these four, add professional collaborations known as communities of practice (Wenger, 1998), and information or chat groups known as communities of interest (Brown & Duguid, 2000; Fisher & Fisher, 2000).

These six types span a variety of business purposes and organizational designs. Each has unique socialization, communications, and performance management strategies because each has a different focus, scope, life cycle, and use of technology (Table 1). Accordingly, knowledge management varies with each of these types. Some virtual forms or organizing exist primarily to get work done (Lipnack & Stamps, 1997) and some spring from a need to transfer information and knowledge (Wenger, 1998; Brown & Duguid, 2000). Some share tips, coordinate expertise, trouble shoot, and some exchange ideas and on-line conversation. The types of knowledge transfer vary in ways similar to the variance in virtual organizing.

There is considerable variety in virtual organizing. Some forms appear to be spontaneously self-organizing (Communities of Practice and Interest) and some are organized when management creates them to do work (e-commerce and virtual project teams). Some virtual forms of organizing are composed of members within an organization (Duarte & Snyder, 1999; Lipnack & Stamps, 1997), and some forms are recommended for their ability to move across organizational boundaries and form new, virtual entities (Grenier & Metes, 1995). Consequently, we can label virtual organizations as internal or external to a parent organization or some combination of internal and external in relationship to host organizations (Table 1).

2.3.1 The Virtual Project Team

The Virtual Project Team is recommended (Duarte & Snyder, 1999; Lipnack & Stamps, 1997) for its ability to transcend the barriers of space and time that are confronted by globally distributed work groups. Sometimes called networked teams (Duarte & Snyder, 1999), these cross cutting groups are primarily internal to a business but may include suppliers and customers. They are similar to the virtual learning groups that professors establish in distance classes and must balance task performance and socialization to achieve high performance (Jarvenpaa & Leidner, 1998). Their most obvious use is in global software development (Haywood, 1998; Karolak, 1998), where teams involve several businesses, time zones, and cultures. Virtual Project Teams often equip employees with home offices as Hewlett-Packard did for new product design team members (Fisher & Fisher, 1998).

This organizing mechanism is focused on a project and is united by commitment to the project's purpose. Virtual Project Teams are temporary in nature, dispersing when the project ends. Knowledge transfer in these groups focuses on who can do what when. As learning and performing systems, they privilege performance over learning. They are driven by deadlines and, accordingly, are challenged to share their learning outside the team's boundaries.

The challenge for these groups is how to transfer their learning as a team to the organization when knowledge may be embedded in the context of a specific project. They can engage in ‘near transfer’ (Dixon, 2001), a type of explicit knowledge transfer where the receiving team is engaged in a project or tasks similar to the source team. If they devise operating procedures or process norms that can be applied to future project teams, these forms of knowledge can be transferred as accepted approaches or project models, a concept called ‘far transfer’ (Dixon, 2001). This form of organizing also achieves ‘strategic transfer’ (Dixon, 2001) when the impact is greater and the organization learns and adopts new approaches. There may be a tradeoff between knowledge transfer within the teams and knowledge transfer throughout the organization (Olivera & Argote, 1999).

2.3.2 The Virtual Unit

The Virtual Unit is similar to the Virtual Project Team in that its membership is usually within an organization. However, the Unit differs from the Project Team because its membership is not cross cutting and work is continuous in nature without re-assignment as projects are completed.

Virtual Units are also known as home-based entrepreneurs, telecommuters (Bredin, 1996), teleworkers (Nilles, 1998), or computer-mediated work groups. They are either independent operators (organizations of one with no chain of command), or they are out-stationed employees who share the same chain of command while doing the same or similar jobs in different locations.

Some examples of this type are sales representatives and manufacturers’ representatives but the type may also include office workers who are working from home temporarily or permanently. They may employ ‘hot desking’ at the central office location as at IBM and Digital Equipment Corporation where there is no permanent office for any employee (Hale & Whitlam, 1997).

The knowledge transfer challenge for this means of virtual organizing is to communicate priorities and best practices so that knowledge is extended geographically and consistency is maintained. This type of knowledge transfer is called ‘serial transfer’ (Dixon, 2001). There can also be ‘near transfer’ when separated units develop new business practices based on interpretations and applications of the experience of other units who have posted this information electronically as, for example, the case of Ford Vehicle Operations (Dixon, 2001).

2.3.3 Temporary Virtual Organizations

Temporary Virtual Organizations are referred to as new venture development or networked teams (Duarte & Snyder), like the virtual project team. Their purpose is to explore the feasibility of joint ventures (Grenier & Metes, 1995).

The Temporary Virtual Organization shares the project-based life cycle of the Virtual Project Team but its focus is to span organizations and produce a joint effort. Consequently, the membership of these organizations is external to any one organization and may include employees of several organizations who are not usually in an on-going business relationship. The knowledge

transfer challenge for this organization is whether an on-going business can be developed and the knowledge process is a 'near transfer' (Dixon, 2001) with an exchange of explicit information.

At the point where the exchange concludes with a deal, the Temporary Virtual Organization changes (morphs) into another form of organizing that may or may not be virtual. This process can include 'strategic transfers' of knowledge where collective knowledge accomplishes an infrequent, and non-routine, task of importance to an entire organization (Dixon, 2001).

This form poses considerable challenge for managerial and organizational cognition. The members of the Temporary Virtual Organization represent various organizing cultures and business functions and do not necessarily share an organizational allegiance, culture, schema, or value system.

2.3.4 Permanent Virtual Organizations

This type represents the *modus vivendi* of the virtual enterprise (Hale & Whitlam, 1997). While first introduced in the literature as a vehicle for on-going joint ventures such as Ameritech's cellular services (Grenier & Metes, 1995), or Sun Micro Systems and Alpha Laval Agri (Hedberg et al., 1994), this business model has changed over time into three distinct varieties, or clusters, of organizing types.

One cluster includes the essence of e-commerce and employs six different organizing models for virtual, electronic business: a web presence; partnerships; star alliances that are coordinated networks of relationships; value chain or supply chain models; market alliances such as Amazon.com, and virtual brokers (Burn & Ash, 2000).

Another cluster of this permanently virtual type focuses on creating agility (Goldman et al., 1994; Savage, 1996), and is an organizing model that forms in response to market opportunities. This can be the fragile 'dot com' business model or the heartier model of low overhead with contracted relationships and services such as those commonly found in the magazine publishing business.

The third cluster is what Jones (1999) calls a network of experts who organize quickly to design and produce a product or service while retaining their individual corporate affiliations and legal identities. The boundaries established in these low-overhead ventures, where considerable work is contracted-out, provide barriers to collective learning.

There is a lack of information on the relative 'virtualness' of documented success in knowledge transfer through joint ventures such as IBM Japan collaborating with NTT (Badaracco, 1996) to develop capabilities with large-scale computer networks. The same is true for IBM's work with Mitsubishi to create a joint satellite communications service, and, in the US, with MCI to get a stake in the telecommunications business (Badaracco, 1996).

2.3.5 Communities of Practice

Communities of Practice are being recommended as tools for knowledge transfer. Primary examples of Communities of Practice are the Xerox repairmen who use their interactions with each other in the employee break room to diagnose and troubleshoot problems and develop best practices (Brown & Duguid, 2000). Wenger's (1998) description of these communities is motivated by an appreciation of the social aspects of learning and the self-organizing production of knowledge.

The distinctions between inside and outside the organization, already fuzzy in the first four types, decidedly blur for this type and the next type, Communities of Interest. Further, Communities of Practice are face-to-face as well as electronic. Electronic Communities of Practice can organize members both within and without a specific organization. Their only limits are the nature of the topic and access to electronic communications. Computer access is a necessary but not a sufficient condition for the development and nourishment of these communities.

Their knowledge transfer challenge is pertinence. When members find information and exchange useful, they participate; if not, they do not. Although companies are investing in the hardware and software that will enable these electronic communities, they are struggling with how to 'manage' to make this happen when these constellations of communities are spontaneous and self-organizing. While vendors of electronic groupware state that their products enable electronic collaboration, organizations cannot control knowledge transfer in virtual environments, despite attempts to create sharing cultures. In addition, knowledge transfer outside these communities to the rest of the organization is problematic when participation in these communities suffers from marginalities of competence (not everyone fully participates) and experience (some learning is not remembered or ignored) (Wenger, 1998).

2.3.6 Communities of Interest

Communities of Interest are similar to Communities of Practice except that the members do not share a profession or an allegiance. Members of these list serves or chat rooms share an interest in an issue, cluster of issues, or an idea. They are not necessarily organizing for any collective learning or action. They are accessing or providing information or comment. Sometimes they may post a calendar or upcoming events but collective action is not deliberately coordinated (e.g. Philapeace.org). Knowledge transfer in these groups is primarily information exchange. Action is dependent on an individual member's level of interest. Indeed, when interest is very high, Lotus Development at IBM calls these groups 'Communities of Passion.'

The knowledge transfer challenge here is to extend the reach of information sharing, to expand involvement and awareness. Communities of Interest most commonly occur on the Internet and involve people who do not share a profession or an employer. Inside companies, these communities are constrained by the Information Technology Department's audits of computer use and Internet activities.

3.0 ANALYSIS

Table 1 lays out each of these six types of virtual organization with the corresponding knowledge transfer challenges. There are some aggregate similarities and differences.

3.1 Need to Share – Cooperative Knowledge Transfer

Both the Virtual Unit and the Community of Practice are driven by a need to share. They are organized for purposes of sharing information and engage in benchmarking best practices and exchanging tips.

These two types rely on peer-to-peer transfer of information and create cultures of non-competitive information sharing where meaning is negotiated through a social learning process (Wenger, 1998). For the virtual unit, this is encouraged when all members report to the same management. For the Community of Practice, peers may or may not report to the same management, but the sharing is an expression of collegiality wherein the members share a profession, a practice.

In both these cases, the communal bond is a tacit one. Members share a profession and, therefore, a mental schema. Explicit knowledge may be encapsulated in insider language, lingo, or acronyms.

3.2 Event Driven Organizations – Knowledge Transfer by Extraction

In contrast to the Virtual Unit and the Community of Practice, the Community of Interest and the Virtual Project Team are both driven by events. Their needs for information revolve around who knows what or who can do what when. Therefore, project needs, deadlines, individual interests, or agendas drive the action to extract information.

In these virtual organizations, members may use queries, database searches, expert locators, emails, list serves, groupware and chat rooms in order to transfer knowledge. Accordingly, there may be a social hierarchy within these groups based on apparent expertise and/or ability to secure useful information quickly. Consequently, the culture of these groups can be relatively more competitive and less collegial than the culture of Virtual Units or Communities of Practice.

Explicit information may form the basis of knowledge transfers unless and until the members know each other. Tacit information is extremely hard to transfer because the members of these organizations do not necessarily share a mental schema or professional association.

3.3 Transaction Driven Organizations

The Temporary and Permanent Virtual Organizations exchange information pertinent to their business transactions. While electronic exchanges may be enhanced by socialization and sharing of expertise, such exchanges are ancillary to the purposes of these organizations. Knowledge transfer

in these two types is closer to information or data exchange and document management than in the other four types.

3.4 Discussion

The Virtual Project Teams and the Communities of Interest extract information to achieve an individual purpose. The Communities of Practice and the Virtual Units share information to achieve shared purpose. The Temporary and Permanent Virtual Organizations exchange information to execute a business operation that is delineated, not shared. In these ways, knowledge transfer strategies vary with type and purpose of virtual organization. Additional research may determine how these differences in approach – extracting, sharing, or exchanging – affect theorizing about organizing cultures, performance, learning, knowledge management and change management.

4.0 IMPLICATIONS

There are several implications for research and theory development from linking knowledge transfer and virtual organizing. Each of the knowledge transfer challenges of various virtual forms of organizing indicates a need for focused research on that type. If virtual organizing requires new forms of management, as most authors have suggested, then those forms and theories need to reflect the diversity of types. Further, research needs to address the feasibility of extending traditional theories to virtual environments when virtual environments show evidence of being more complex and less capable of learning.

4.1 Increased Complexity

Virtual organizing may be more complex than traditional organizing because it lacks the efficiencies of span of control and chain of command hierarchies (Czernaiwska & Potter, 2001). Also, virtual communication lacks rich context and is more conflicted than face-to-face environments (Hightower et al., 1998). Further, sharing knowledge in a distributed organization is more difficult (Burn & Ash, 2000) and the relatively impoverished context of virtual communication necessarily limits the social aspect of learning (Brown & Duguid, 2000). And, finally, perhaps the most complex aspect of research, theory building, and practice in this area is that one company may simultaneously engage in many, if not all, of these forms of organizing.

4.2 Not Designed for Learning

There is little evidence that these virtual organizations are designed for individual, group or organizational learning. Each is designed to transcend physical and temporal limitations and achieve some purpose. Further, virtual organizing impoverishes learning through asynchronicity and reliance on text-based communications.

A challenge for knowledge management strategists is to consider how virtual organization design and management might include learning to enhance organizational adaptability, determining

what lessons can be applied from other settings (Argote, et al. 1998; Brooks, 1994). Further, the leaky / sticky nature of knowledge suggests that managers of virtual enterprises will be challenged to implement communications, socialization and performance strategies that can simultaneously encompass the ambiguous nature of virtual organizing and the ephemeral characteristics of knowledge transfer. Knowledge management requires problem-centered managers, not territory-centered (Zand, 1981). However, organizations still rely on departmentalization for resource allocation and career development.

4.3 Analysis of Implications

Both knowledge transfer and virtual organizing are experiential, invisible phenomena and trends for both are ambitious. There is some evidence that virtual organizations can perform well (Jarvenpaa & Leidner, 1998). However, the potential for collective learning when both virtual organizing and knowledge transfer are combined is weakened by diminished socialization and impoverished information exchange. In what ways can knowledge transfer strategies offset these vulnerabilities? Most of the recommendations for knowledge transfer involve actions and interactions of people in physical space (Davenport & Prusak, 1998; Mankin, et al., 1996), not cyberspace, particularly at British Petroleum (Davenport & Prusak, 1998) where face-to-face moments were more memorable (Gorelick, 2000). The evidence that virtual organizing supports knowledge transfer is mixed.

The current state of theory building suggests that new ways of organizing and learning provide foundations for successful enterprise strategies (Schwandt & Marquardt, 2000) and require collective enterprises (Brooks, 1994; Jones, 1995; Mankin, Cohen & Bikson, 1996; Schrage, 1990; Thompson, Levine & Messick, 1999), employing knowledge transfer processes that are primarily social (Brown & Duguid, 2000) and eliminate hierarchies (Fukuyama & Shulsky, 1997). There is even some evidence that new ways of organizing and learning will alter the individualistic and hierarchical nature of compensation systems (Crandall & Wallace, 1998; Hollensbe & Guthrie, 2000). However, there is also evidence that electronic organizing and communicating may contribute to dysfunction and lack of consensus building (Romm, 1999). The 'virtualness' of organizing may thwart achievement of learning potential. In any event, the expectation is that managers and organizations will structure and communicate differently in virtual environments (Hedberg et al., 1994) but we have little evidence of the nature of knowledge transfer in those environments in the absence of an integration of research on both virtual organizing and knowledge transfer.

5.0 SUMMARY & CONCLUSIONS

This paper provides a set of conclusions based on examples and cases rather than a set of facts based on extensive, longitudinal research. Further work is needed to develop clarity about the variety of types of organizing and knowledge transfer and their nexus, and the implications for organization and management theories. Particular areas of interest for further research include socio-technical systems theories and connections between knowledge transfer and action theories of cognition in individuals, groups, and organizations.

Pursuing a research agenda based on this framework will be challenging because virtual organizing is changing and knowledge transfer is difficult to concretize, objectify and quantify. This framework distinguishes the various types so that empirical work (Brown, 1998) can focus on the dynamics of each type and build our knowledge of each of these new forms of organizing and the implications of each for knowledge transfer and corresponding theories of managerial and organizational cognition.

Knowledge transfer and organizational design are linked (Liebowitz, 2000; Myers, 1996), and together they constitute a strategic imperative in the new economy (Klein, 1998). A research agenda linking types of virtual organizations with types of knowledge transfer can provide direction.

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Table 1. SIX TYPES OF VIRTUAL ORGANIZATIONS

Location:	<i>internal</i>	<i>internal</i>	<i>external &</i>	<i>external &</i>	<i>external</i>	<i>external</i>
Title:	Virtual Project Teams	Virtual Units	Communities of Practice	Communities of Interest	Temporary Virtual	Permanent Virtual
Also Known As:	Virtual Teams. Networked Teams.	Telecommuters. Computer-mediated work groups.	List Serves. Communities of Purpose.	On-line Groups	Networked teams.	Joint Ventures e-commerce some dot coms
Examples:	Cross-cutting project team for product launch. Virtual Learning Groups in on-line classes.	Remote workers; sales reps. Hoteling. Telecommuting. Free-lance consultants.	Professional associations.	On-line communities. Chat rooms.	Exploratory venture development project team. Due diligence.	One sells another's product. Multi-contracts, low-overhead venture.
Focus and Scope:	Across functions. Across organizations when vendors & suppliers are included.	Independent or internal to an organizational function or departmental unit.	Individuals with same or similar profession, usually from different locations.	Diverse individuals with a shared interest in an issue or recreation.	Across organizations.	Across corporations.
Life Cycle:	Temporary. When work is done, members go on to something else.	Membership varies, but form is permanent.	Continuous – not project-based. Length of stay in community varies.	Based on life of a shared interest. Length of stay in community variable.	Temporary.	Permanent form.
Membership Strategy:	Indeterminate, dependent on project needs.	Small number; internal members.	Size & distribution vary with area of practice.	Size & distribution vary with scope of issues.	Relatively diverse; members from several places.	Relatively diverse, but scaleable; focus on two or more memberships.
Organizing Strategy:	Multiple organizational representatives working on specific team-based projects.	Some teamwork, mostly on-going tasks. Unit holds/shares goals.	Come together to share insights, tips, mutual problem solving.	Exchange information to empower individual action on shared interest.	Multiple functions responding to a market opportunity.	Full functionality as a working organization with a mission.
Uses of Information Technology:	Repository of shared data (databases, groupware). Project management software. Electronic calendars and scheduling.	Connectivity, sharing embedded knowledge (e-mail, groupware, LAN).	Often develop through face-to-face – can be nurtured through on-line collaboration. List serves. Postings. Usually internet-based may include corporate community with proprietary system.	Often develop through on-line information exchange. Can be nurtured through face-to-face opportunities. Chat rooms. Threaded discussions. Usually internet-based - no limits to access.	Shared infrastructure (groupware, WANs, remote computing). Faxes and UPS or FedEx. Shared repository is time-limited.	Channel for marketing and distribution, replacing physical infrastructure; e-business . Need reporting & retrieval. Limits to shared repository – security and fire wall issues.
Knowledge Transfer (KT) Challenge:	Assignment and acceptance of project roles & responsibilities. Design development. Progress document management. KT to rest of organization – lessons learned.	Tips; best practices. Priorities. Forms & reports management.	Peer to peer transfer of know-how (technology). Usually episodic. May utilize capabilities for searching out experts by topic or by type of problem or equipment	Opinion posting. Opinion exchanging. Opinion matching. Connecting opinions with events to take action and then evaluating the action.	Capabilities assessment and fit. Document exchange. Assessment of joint venture desirability.	Evaluation of learned experience. Identification of strategic venture competencies. Re-evaluation of mutual advantage. Develop repository of shared knowledge.

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