A systems-based dynamic knowledge transfer capacity model

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Abstract

Purpose – *The purpose of this paper is twofold: to understand how recent developments in systems thinking and social construction can influence understanding of knowledge transfer (KT); and to propose a new systems-based knowledge transfer model.*

Design/methodology/approach – *The paper is a review of the literature on knowledge transfer, systems thinking and social construction leads to the proposal of a new KT paradigm.*

Findings – *The Dynamic Knowledge Transfer Capacity model (DKTC) found in this paper identifies the components required for social systems to generate, disseminate and use new knowledge to meet their needs. The model includes pre-existing conditions, (need and prior knowledge) and four categories of capacities (generative, disseminative, absorptive and adaptive/responsive) that social systems must possess for KT to take place.*

Research limitations/implications – *The paper shows that the DKTC model is particularly well suited to analyzing complex systems with multiple stakeholders as opposed to small-scale knowledge transfer systems. Empirical analysis in complex systems environments will help verify, enrich and generalize the model.*

Practical implications – *The paper sees that in an increasingly knowledge-based economy, the ability to base decisions on the latest knowledge is vital for the success of organizations. The capacity for effective and sustained exchange between a system's stakeholders (researchers, government, practitioners, etc.); exchanges characterized by significant interactions reflected within the DKTC model, results in the appropriate use of the most recent discoveries in the decision making process.*

Originality/value – *The paper proposes a new knowledge transfer paradigm that views knowledge as a systemic, socially constructed, context-specific representation of reality. The proposed knowledge transfer model is in sharp contrast to past attempts, focusing attention on the capacities that must be present in organizations and social systems as a precondition for knowledge transfer to occur.*

Keywords *Knowledge transfer, Social systems, Systems analysis*

Paper type *General review*

Introduction

Knowledge is quickly becoming the prime source of wealth in the world, not only for corporations and individuals but also – and perhaps even more so – for nations and societies. As individuals, organizations and multinational corporations struggle to compete in the global economy, they need more than sound technology; they also must have the support of integrated national and societal structures to help them manage their constant demand for new knowledge. Such knowledge-intensive assets include value-creating networks, communities of practice, advisory committees, educational and teaching resources, and research and R&D capacities. An integrated framework of knowledge assets vastly different from the infrastructure of traditional agricultural and industrial societies, which relied heavily on tangible assets such as land, labor and machines. In knowledge-based societies, these resources remain important, but must be supported by equally robust intellectual, social and informational assets. Knowledge-based societies

need to manage the intangible assets that create knowledge, such as innovation, relationships, networks, and intellectual and informational capital.

It is well known, however, that knowledge is generally difficult to transfer. There are countless examples of sound academic research never making it to the practice community, and of organizations in need of solutions typically ignoring academic research findings in developing management strategies and practices (Rynes *et al.*, 2001). Susman and Evered (1978, p. 582), 25 years ago, went so far as to claim that:

> There is a crisis in the field of organizational science. The principal symptom of this crisis is that as our research methods and techniques have become more sophisticated, they have also become increasingly less useful for solving the practical problems that members of organizations face.

The existence of a large gap between academic research and managerial practice is not limited to organizational science but can be found in nearly all disciplines that have both researchers and practitioners (Glaser *et al.*, 1983; Leontief, 1982; Rogers, 1995). Beyer and Trice (1982, p. 608) conducted a literature review on research utilization and concluded that the: ''most persistent observation . . . is that researchers and users belong to separate communities with very different values and ideologies and that these differences impede utilization''. As recently as 2004, the central theme of the Academy of Management's annual conference, titled: ''Creating Actionable Knowledge'', indicated that the business and academic communities are beginning to realize that they can no longer expend so much energy and money on the development of new knowledge that either does not respond to their needs, or does not get absorbed by those parts of the system that need it most.

In recent years many research studies, including Nelson and Winter's (1982) treatise on organizational routines; Teece's (1977, 1982) analyses of technology transfer and proprietary knowledge; Nonaka's (1990, 1994) work on knowledge-creating companies; Prusak's (1997) work on knowledge in organizations; Davenport and Prusak's (1998) study of how organizations manage what they know; and Serban and Luan's (2002) overview of knowledge management all reinforce the idea that more and more organizational scientists and practitioners are turning their attention towards knowledge management to increase the competitive advantage of companies. In a survey conducted by Simmonds *et al.* (2001), management practitioners cited knowledge transfer (knowledge transfer/information flows) as the most familiar and useful idea among nine key concepts in strategic management.

Many researchers have focused on the importance of knowledge transfer to an organization's competitive advantage (Cavusgil *et al.*, 2003; Dayasindhu, 2002; Lynn *et al.*, 1999; Szulanski, 1996). Other researchers provide numerous examples of organizations that have significantly improved their performance by instituting knowledge transfer programs (Buckman, 1998; O'Dell and Grayson, 1999; Büchel and Raub, 2002). Hoopes and Postrel (1999) take a different tack by demonstrating instances when the lack of information sharing by employees has increased production costs significantly. Blumentritt and Johnston (1999, p. 287) suggest, on a more macro level, that: ''the ability to identify, locate and deliver information and knowledge to a point of valuable application is transforming existing industries, and facilitating the emergence of entirely new industries''.

But the task of transferring knowledge successfully is far from straightforward. O'Dell and Grayson (1999) report on research suggesting that the transfer of ''best practices'' between two divisions of the same organization takes, on average, 27 months to complete. Both Argote (1999) and Szulanski (1996) determined that the effectiveness of knowledge transfer initiatives varies significantly among organizations, and Argote *et al.* (2000) note that knowledge transfer initiatives often fall far short of delivering on all the sought-after results.

A brief history of knowledge transfer theory

Different models or paradigms of organizational knowledge transfer advance various theories as to why it often remains difficult. Early organizational knowledge transfer models viewed knowledge as an object that could be passed on mechanistically from the creator to a translator who would adapt it in order to transmit the information to the user (Dissanayake, 1986). Within this process, the user was generally viewed as a passive actor or receptacle of

knowledge, and the context within which the transfer occurred was typically ignored. These classical models (see Figure 1) implied a hierarchical top-down relationship between the generator of knowledge who holds the resource (knowledge) and the user (receptacle) who is locked into a dependency stance (Roling, 1992; Boggs, 1992).

Numerous authors have criticized this linear model of knowledge transfer for ignoring the reality of both the context in which the new knowledge was generated, and the one within which it will be used (Inkpen and Dinur, 1998; Frambach, 1993; Johnston and Leenders, 1990). Other models of knowledge transfer and adult learning, such as Bouchard and Gelinas's spiral model (Roy *et al.*, 1995); Lewin's (1951) cycle of adult learning; Kolb and Fry's (1975) model of experiential learning; and Honey and Mumford's (1982) typology of learners, all focused on the experiential process of transferring theoretical knowledge to practical knowledge by using knowledge in a real-life setting.

The latest models to capture the imagination of the research and practice communities are the communities-of-practice model and the knowledge network model. The communities-of-practice model has been described as ''groups of people informally bound together by shared expertise and passion for a joint enterprise'' (Wenger and Snyder, 2000, p. 139). Communities of practice cannot be mandated, but they can be encouraged, supported and promoted. They are generally motivated by people realizing that they could benefit by sharing knowledge, insights and experiences with others with similar goals; they typically form around best practices or common pursuits. Because communities of practice generally focus on informal, voluntary gatherings of individuals based on shared interests, they are sometimes seen by organizations as ''unmanageable'' endeavors. Best-practice and business-opportunity networks, on the other hand, which have more organizational support, are believed to contribute directly to the bottom line. For example, Büchel and Raub (2002, p. 587) believe that ''the most valuable activities in knowledge management focus on creating knowledge networks that extend beyond the traditional concept of communities of practice. ''Business Opportunity'' and ''Best Practice Transfer'' networks have been shown to directly contribute to the creation of value within firms''.

Most of the attention on knowledge transfer has focused on it as a process. Szulanski (1996) empirically investigated both the context of transfer and the characteristics of the knowledge being transferred. He concentrated his attention on what he referred to as the ''stickiness'' of knowledge to characterize the challenges involved in the transfer and found that most of the difficulties with knowledge transfer emanated primarily from the receiving unit. The authors' experience in a broad variety of organizational settings, ranging from highly creative research organizations to more practical manufacturing settings, supports Szulanski's view of the importance of context. However, in addition to context, the authors' current research also indicates that knowledge transfer capacity within the entire social system can pose significant challenges to effective knowledge transfer. This article argues that understanding how social systems transfer knowledge requires an understanding of the capacities associated with knowledge transfer within those systems. In that sense, knowledge transfer capacities are a prerequisite for effective knowledge transfer, regardless of the process used.

The social construction view of reality

The social construction view of reality, introduced into sociology by Berger and Luckmann (1966) with their book ''The Social Construction of Reality'', suggests that reality is reproduced by people acting on their interpretation and their knowledge of it. In other words,

Figure 1 Traditional model of knowledge transfer

reality (that which you cannot wish away) is unknowable except through a prism of experience as interpreted through social enclaves or what Berger and Luckmann (1966) call plausibility structures. According to social construction theory, knowledge is developed, transmitted and maintained in social situations. As such, knowledge is a dynamic construct that evolves as it gets interpreted, used and re-used: it is a product of the constant, everyday life interactions between humans and the social systems within which they are engaged. Social construction models thus view the relationship between humans and the society that produces and uses knowledge as iterative or circular rather than linear. This distinction between the classical view of knowledge as an object and the view of knowledge as the result of everyday interaction is crucial to our understanding of how knowledge is generated, distributed and used within social systems. Hutchison and Huberman (1994), who conducted a lot of research on the transfer of knowledge in education, consider that users of knowledge are active problem-solvers and generators of their own knowledge base instead of merely passive receptacles of information and expertise. So as each of us interprets, uses and re-uses knowledge, we are also creating new knowledge.

In a previous article, Roy *et al.* (1995, p. 1), adopting a social constructionist view defined knowledge as ''an organized representation of reality held to be true either based on experimentation, experience, practice, science or beliefs''. For the purpose of this paper, knowledge transfer is viewed as the dynamic by-product of interactions occurring between actors who are trying to understand, name and act on reality. The implication of these definitions is that knowledge needs to be considered within its appropriate context-specific social system. The difficulty with organizational knowledge transfer therefore stems in part from the fact that context, because it is socially constructed, is necessarily always subject to change, even by the very individuals considering the use of new knowledge in their context. Consequently, the model of knowledge transfer proposed in this paper must address the complexity associated with constantly changing contexts.

The adoption and utilization of new knowledge by an organization usually means the rejection of past practices that may also impact on current political, economical or cultural equilibrium in the social system. The legitimacy of new knowledge is then validated according to the values, the beliefs and the culture of potential users (Roling, 1992). All these factors have to be taken into consideration if one wants to ease the process of generation, diffusion and utilization of knowledge within target groups. As suggested by Foss and Pedersen (2002, p. 54), ''the transfer of knowledge does not imply a 'full' replication of knowledge in a new location. Indeed, knowledge transfer is often associated with the adaptation of the existing knowledge to the specific context. Therefore, what is transferred is not the underlying knowledge but rather applications of this knowledge in the form of solutions to specific problems''. In light of the complexity involved in knowledge transfer within and between specific contexts, what is needed is an approach to understanding the relationships between various contexts by integrating different perspectives.

Systems thinking

Systems thinking is a conceptual framework for problem solving that seeks to integrate different perspectives and scientific disciplines. This differs from the more traditional scientific approach to problem solving, which seeks to fragment or break down the system into divisions or sub-units in order to study how the different parts function. Von Bertalanffy, generally recognized as the father of the General Systems Theory, explained it this way:

> It is necessary to study not only part and processes in isolation, but also to solve the decisive problems found in the organization and order unifying them, resulting from dynamic interaction of parts, and making the behavior of parts different when studied in isolation or within the whole (Von Bertalanffy, 1968, p. 31).

In recent years the term ''systems'' has been adopted by almost every scientific discipline and systems thinking has come to refer to the conception of problems in their entirety (Hall, 1999; Senge, 1990). A system is a mental model or mix of parts that interact with each other within the system's boundaries (form, structure, organization) to function. Human beings see their world more or less as organized into or by systems. The machines that surround us, the

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organizations that produce them, the plants that grow in the garden, the trees in the forest, political elections, our families, our societies and ourselves – all can be understood as systems and sub-systems. In systems thinking, the word system is used to describe a thing and the relations between and among its parts and the whole.

The systems view of the world maintains that the universe represents a systemic hierarchy of integrated complexity – a series of wholes within wholes, all of which are interconnected and interdependent. Within this perspective, an individual system cannot be properly understood without also understanding its relationship to the environment of which it is a part. Systems thinking is an abstract way of engaging with the world by understanding the relationships between the different systems in the world. In the same way a mechanistic view breaks parts down to understand the functioning of a machine, the systems thinking view attempts to understand the world through regrouping the relationships that exist between systems. We project onto the world our own models for organizing our experience, and we share these models with those around us. By examining these models thoughtfully we can see that, like any language, they are formed of parts, processes, rules and boundaries. The science of these relations is systems thinking. For Rubenstein-Montano *et al.* (2001, p. 6), ''problem-solving in this way involves pattern finding to enhance understanding of, and responsiveness to, the problem''.

In 1972, Ackoff and Emery (1972), two well-known systems thinkers, developed the concept of purposeful systems to reinforce the idea that systems exist in the context of specific goals. Holland (1962) had already formalized the concept of adaptive systems that denote the necessity for systems to change and adapt to changes within the system's context to better achieve their goals. Shakun (1981) then advanced the idea of responsive systems to allow for the way systems learn from past performance to improve functioning and efficiency. Finally, Rubenstein-Montano *et al.* (2001, p. 6), pointed out that:

> Outcomes from systems thinking depend heavily on how a system is defined because systems thinking examines relationships between the various parts of the system. Boundaries must be set to distinguish what parts of the world are contained inside the system and what parts are considered the environment of the system. The environment of the system will influence problem solving because it influences the system, but it is not part of the system.

Thus, knowledge transfer within and between systems must begin with a robust definition of the system being referred to, along with its boundaries.

The dynamic knowledge transfer capacity model

The Dynamic Knowledge Transfer Capacity (DKTC) model advances a new systemic and generic framework to identify the components required for social systems to generate, disseminate and use new knowledge to meet their needs. By applying a holistic, systems-thinking focus to knowledge transfer, one can begin to appreciate knowledge transfer as linked to the relationships between and within systems – including their systems of needs, goals and processes. This systemic perspective allows viewing knowledge transfer from both how knowledge gets transferred (the process), and also what capacities the system possesses for knowledge transfer to succeed. As all systems have limits, the model takes into account the boundaries within which knowledge transfer typically occurs. In contrast to the more traditional knowledge transfer models that describe knowledge transfer as a process, the DKTC model focuses on the components a social system must

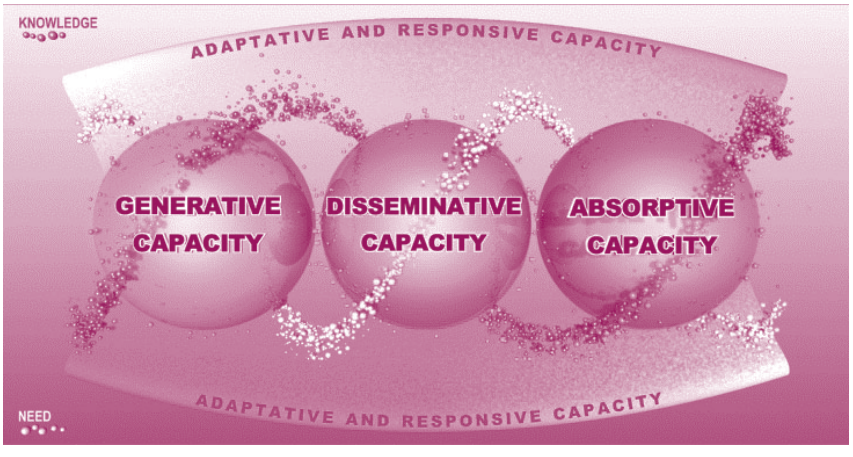
possess for knowledge transfer to occur, or as Teece *et al.* (1997, p. 529), put it, the ''assets'' the system has to play the game. As illustrated in Figure 2, the model includes two pre-existing conditions (need and prior knowledge) and four capacities. These distinct components are described in more detail in the following pages.

A social system usually forms in response to a specific need on the part of its members and is typically made up of individuals grouped together in a variety of either loosely- or tightly-knit relationships. The purpose, problem or need must be sufficiently complex to imply the involvement of multiple stakeholders. The social system can take many forms: a company, network, association, group, society, state, region or country. The number of social systems is infinite, and to understand how knowledge gets transferred within and between them, we need to understand the need that the system is trying to address or the problem it wants to solve. For example, what does a country's health care system need to address the problems caused by constantly rising costs; or from an academic perspective, what knowledge does the researcher community need from the health care sector to help them address vital health care issues; or from a corporate perspective, what new knowledge does a pharmaceutical company need to meet the medication needs of the health care sector and thereby continue to compete in the global economy? In the DKTC model, problem solving in its broadest sense is considered the primary reason for transferring knowledge within and between social systems, and the greater the magnitude of the need, the more energy the actors will be willing to invest in the knowledge transfer process.

The initial identification of the system's needs is particularly important since it determines to a large extent the type of new knowledge to be transferred. For example, to say that our society has a problem with the treatment of lung cancer leads us to generate and transfer new knowledge for treating lung cancer (medical interventions). On the other hand, to say that we have a societal problem with nicotine dependence leads us to search for and transfer ways to prevent smoking (social and educational interventions, as well as medical and legal means). In addition to clarifying what new knowledge the system needs, the initial identification of the need also serves to clarify the actors or special interest groups that must be involved in solving the problem, as well as the current state of knowledge, both tacit and explicit, possessed by the system.

The need the system wants to address, and the level of existing related knowledge the system possesses, constitute the backbone of our model. In Figure 2, they have been illustrated using light and dark bubbles respectively; the porosity of the lines conveys that the four capacities are influenced by these two components at the same time as they influence them. The continuous flow of the lines representing existing and required knowledge signifies that the knowledge and needs are infinite. Once the need and existing

Figure 2 The dynamic knowledge transfer capacity model



knowledge are identified, the social system needs to possess or acquire the four capacities for knowledge transfer to be successful. By capacity the authors mean potential for action, or ability based on existing resources within or available to the social system.

Generative capacity refers to the ability to discover or improve knowledge and the processes, technologies, products and services that derive from it. It is based on the system's intellectual and creative capital, which is present among its members, research infrastructure and alliances. Disseminative capacity denotes the ability to contextualize, format, adapt, translate and diffuse knowledge through a social and/or technological network and to build commitment from stakeholders. This ability is generally based on the existence of an articulated social network (social capital including strong and weak ties), brokers, and other intermediaries, including support by a technological and social infrastructure of communications. Absorptive capacity, initially conceptualized by Cohen and Levinthal (1990), is defined here as the ability to recognize the value of new external knowledge, assimilate it and apply it to address relevant issues for a system's stakeholders. Absorptive capacity is typically found in environments that possess prior related knowledge, a readiness to change, trust between partners, flexible and adaptable work organizations and management support. Finally, adaptive and responsive capacity refers to the ability to continuously learn and renew elements of the knowledge transferring system in use, for constant change and improvement. It is based on prior continuous learning experience, visionary and critical thinking, distributed leadership among stakeholders, multiple feedback loops and monitoring mechanisms. All four of these capacities are necessary to varying degrees for a social system (network, organization, society, etc.) to be able to transfer knowledge successfully. The absence of any one of these capacities requires that the system wanting to transfer knowledge acquires or develops that capacity.

The first three capacities (generative, disseminative, and absorptive) are central to the model. Their relative importance varies depending on the problem. In certain cases, the complexity of the problem may require a significant investment of time and energy in research and development (such as research for a new molecule in the pharmaceutical industry), while diffusion and absorption are less challenging. In other circumstances, diffusion may be quite problematic (such as the problem of research findings that get published in scientific journals, but never make it to the practice arena). In other circumstances, resistance to change resulting from cultural challenges, for example, may make absorption the main obstacle. (An example of this would be the implementation of birth control in some countries.)

The fourth capacity, called adaptive and responsive capacity, is a second order or superior level capacity, the function of which is to reflect continuously on the appropriateness of the knowledge transfer activities within the system, to encourage rapid adaptations to changes in the environment. (For example, are MBA programs still the best way to train executives?) Table I illustrates the resources required, activities typically associated with and the results generally obtained for each of the capacities contained in the model.

The model is coherent with Rubenstein-Montano *et al.*'s (2001) call for frameworks in knowledge management, consistent with systems thinking, that are both prescriptive and descriptive and also able to consider purpose/objective, knowledge, technology, learning and people/culture variables. The more complex the need and the greater the number of actors required to address that need, the easier it is to appreciate the value of the DKTC model. It is very difficult for complex issues to be resolved by any one individual. For example, how are organizations going to ensure the transfer of value-creating knowledge from baby boomers about to retire to other members of the organization? Or how will our society address the anticipated shortage of critical human resources of our society (doctors, nurses, teachers, researchers, etc.) in the next five years? Or on a slightly smaller scale, how can the health care industry deal with the upcoming shortage of health care professionals while continuing to provide state-of-the-art health care services to an aging population? Are we going to address these issues from a departmental, organizational, industry or societal level? Who should be involved in generating, diffusing and absorbing the knowledge

Table I The dynamic knowledge transfer capacity model

	Generative capacity	*Disseminative capacity*	*Absorptive capacity*	*Adaptive/responsive capacity*
Primary focus	Discovery	Diffusion	Application	Renewal
Assets generally associated with each capacity	Research and development Intellectual capital Creativity and imagination Advisory networks Alliances	Social capital Social and technological infrastructure Information technology Knowledge brokers (translators, gatekeepers, boundary-spanners, facilitators . . .)	Prior related knowledge Readiness to change Trust between partners Trust between partners Flexible and adaptable work organization Management support	Prior continuous learning experience Visionary and critical thinking Distributed leadership among stakeholders Multiple feedback loops Monitoring mechanisms
Activities generally associated with each capacity	Matching stakeholders' needs and research Linking researchers and practitioners Scanning external sources of knowledge Attracting creative leaders from different perspectives (disciplines, sectors, education) Creating ''think tanks'' Building alliances (expertise, ''best practices'') Inventing (externalizing ideas, intuitions, combining, experimenting, testing, revising)	Networking, clustering and building commitment of stakeholders Brokering and negotiating knowledge transfer arrangements Contextualizing the new knowledge Adapting/translating the new knowledge to end-users' reality Formatting knowledge (publications, activities, IT) Delivering transferable knowledge to different stakeholders (contamination . . .) Working with opinion leadership Developing iterative mechanisms to facilitate a large diffusion of knowledge	Recognizing external relevant knowledge to solve problems and/or address critical issues Managing stages of change Exploring the new knowledge Deciding to change (evaluation) and/or adopt the new knowledge Experimenting/combining/modifying practices, technologies . . . Internalizing the new knowledge Utilizing the new knowledge	Monitoring KT system Critically reflecting on KT ''best practices'' and mechanisms Exploring/comparing multiple KT systems' perspectives Combining/experimenting with new practices Upgrading or redesigning KT system
Outputs generally experienced	New or improved knowledge (codified or not) relevant to issues or problems: concepts; processes/routines; technologies; and products/services (patents, databases)	Knowledge adapted and shared with committed stakeholders: transferable knowledge; adaptable/applicable knowledge; and meaningful knowledge	Knowledge identified, assimilated and applied by end-users (other researchers, policy makers, decision makers, providers, operators, technicians) to solve problems and/or issues: application of new concepts; new integrated practices/processes/routines; new technologies adopted; and new products/services in place	Improved knowledge transfer ''best practices'', mechanisms and norms: KT practices continuously assessed repositories of best KT practices and their specific context processes and mechanisms of KT well adapted to context culture of creativeness, sharing, trust and learning

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needed to solve these vital issues? It seems clear that our societies and organizations are going to have to develop the knowledge transfer capacities contained in the DKTC model to address these pressing challenges.

The dynamic implications of the model suggests to the need for constant vigilance and adaptation in the midst of an economy characterized by rapid change. For Teece *et al.* (1997, p. 516) dynamic capabilities are ''the firm's ability to integrate, build, and reconfigure internal and external competence to address rapidly changing environments. Dynamic capabilities thus reflect an organization's ability to achieve new and innovative forms of competitive advantage . . . ''. For Winter (2002, p. 992), ''there is a broad consensus in the literature that 'dynamic capabilities' contrast with ordinary (or operational) capabilities by being concerned with change''. Teece *et al.* (1997), argue that dynamic capabilities are seen as the key to competitive advantage and that competitive advantage is not just a function of how one plays the game, it is also a function of the ''assets'' one has to play with and how these assets can be deployed and redeployed in a changing market. The DKTC model sheds new light on existing knowledge transfer research by focusing attention on the capacities ''assets'' the system must possess to improve KT.

Implications of the DKTC model for the world of management

Problem solving is a fundamental responsibility for all managers striving to improve their company's performance by making the best use of limited resources. The more complex the problem, the greater the capacities required to solve them. The increase in the number of people involved in solving a problem increases the need for effective knowledge transfer.

An economy characterized by the globalization of markets and the intensification of competition has led organizations to concentrate their efforts on their ''core business'' and ''core competencies'', and to rely on a network of partners to reinforce their value chain. Such networks allow organizations to attain levels of global performance and flexibility never before attained. In this environment competition takes place less between companies and more between networks of partners located around the block or scattered throughout the world.

The capacities of generation, dissemination, and absorption of new knowledge among these networks represent a definite competitive advantage for network members. At Toyota, for example, once a subcontractor has established credibility, they are invited to engage in a long-term relationship with the Toyota knowledge-sharing network. This relationship provides them with access to an army of specialists with whom they can consult on questions related to operational and design issues. In return, they are expected to share their knowledge and expertise with the network. This unlimited access to knowledge generated by network members enhances the knowledge transfer capacities of the Toyota network itself as well as all network members.

Conclusion

Past knowledge transfer models have focused on knowledge transfer as a process. Within that paradigm, organizations are seen as the place where the knowledge transfer process occurs, and most attention is placed on how knowledge transfer takes place. Consequently, relatively little attention is paid to the capacities or ''assets'' for knowledge transfer present in those organizations. With this article, the authors propose a knowledge transfer model that

"The latest models to capture the imagination of the research and practice communities are the communities-of-practice and the knowledge network model."

instead focuses attention on the capacities that must be present in organizations and social systems as a precondition for knowledge transfer to occur. Knowledge in this context is viewed not as an object to be transferred but as a by-product of interactions between individuals within a social system with varying knowledge transfer capacities.

In this DKTC model, we begin with a clear definition of the problem to be addressed by the organization or network, coupled with a good picture of the knowledge presently possessed by the members of the system. We must then establish what capacities the organization possesses and what it lacks. For knowledge transfer to succeed, the system must possess knowledge generation, dissemination, absorption, and adaptation and responsiveness capacities.

A system's ability to transfer knowledge from one part of the system to another or from one system to another has been found to contribute significantly to its performance. This is particularly the case in networked organizations, where members need to be simultaneously autonomous and interdependent. The greater the level of complexity and heterogeneity present within the system, the better the DKTC model is at helping the system identify and facilitate the introduction of those capacities required for the system to succeed at knowledge transfer and value creation. So, the model is particularly well-suited to analyze complex systems with multiple stakeholders as opposed to small scale knowledge transfer systems. Empirical research in complex systems environments is needed to verify, enrich and generalize the model and to identify more precisely its limits. Further research must also be conducted on the processes and mechanisms that sustain each capacity in order to clarify and reinforce their characteristics.

This study of knowledge transfer capacities within a systems thinking framework provides a valuable new lens through which to view this complex and important field. This view holds enormous promise for new value-creating research on, and application of, knowledge transfer capacities in an increasingly knowledge-based economy.

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