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TACIT KNOWLEDGE AND INNOVATION CAPACITY: EVIDENCE FROM THE INDIAN LIVESTOCK SECTOR

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Abstract

To cope and compete in this rapidly-changing world, organisations need to access and apply new knowledge. While explicit knowledge is important, what is often critical is an organisation's ability to create, access, share and apply the tacit or un-codified knowledge that exists among its members, its network and the wider innovation system of which it is a part. This discussion paper explores the role of tacit knowledge in livestock sector innovation capacity though the case of Visakha Dairy, one of the most progressive producer-owned milk marketing companies in India. Analysis of two episodes in Visakha's evolution clearly illustrates how it used tacit knowledge to innovate around challenges. The paper concludes that while tacit knowledge is clearly a major resource that organisations rely on to cope with change, it does not follow that knowledge management approaches that rely on codifying this knowledge are the way forward. Instead, what it does suggest is that better management of the learning processes, through which tacit knowledge is generated, would be a more useful contribution to innovation and innovation capacity — in other words, a shift from knowledge management to learning management.

Key Words: Innovation Systems, Innovation Capacity, Tacit Knowledge, Livestock, India

Journal Codes: N55, O13, O17, O31, Q13, Q16, Q18

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LIST OF ACRONYMS

APDDCF – Andhra Pradesh Dairy Development Cooperative Federation

BMCU – Bulk Milk Chilling Unit

CDP – Co-operative Development Programme

GCMMF – Gujarat Co-operative Milk Marketing Federation

GMP – Good Manufacturing Practice

HACCP – Hazard Analysis and Critical Control Points

IMSS – Intensive Milk Supply Scheme

ISO – International Organization for Standardization

MACS – (Andhra Pradesh) Mutually Aided Co-operatives Act

NDDB – National Dairy Development Board

OMFED – Orissa State Cooperative Milk Producers Federation

TDP – Telugu Desam Party

I. INTRODUCTION

Recent studies on rural development have highlighted the importance of strengthening innovation capacity. While hard competencies such as scientific and technical skills and infrastructure are important parts of this capacity, equally important are the soft competencies, such as practices and routines (institutions), patterns of interaction and policies that allow this knowledge to be accessed and applied. Such competencies are often based on tacit knowledge accumulated and shaped through experience. The innovation capacity of a sector and individual actors is understood to depend, to a large extent, on such knowledge. Thus, its exploration, and codification to make it explicit and shareable, is often assumed to be the way to make more of this resource. But is this really the case and is this type of knowledge amenable to codification and transmission in the way that formal knowledge is?

This paper explores the role of tacit knowledge in livestock sector innovation capacity through a case study of Visakha Dairy, one of the most successful dairies in India. The paper's major purpose has been to understand how tacit knowledge has contributed to the innovation capacity of Visakha; what the nature of this tacit knowledge is; and how better use can be made of it as part of attempts to strengthen the innovation capacity of organisations and sectors.

The research consisted of semi-structured interviews with individuals associated with Visakha and causal mapping exercises, supplemented by analysis of relevant secondary material. Though Visakha has evolved rather successfully over the last four decades, we have focused only on certain episodes in order to reveal the role of tacit knowledge and associated processes.

The paper begins with an overview of relevant debates about the nature and role of tacit knowledge in innovation. Section III charts the growth of the Visakha Dairy from a small enterprise in the 1960s to its contemporary role as a major player in the production and distribution of milk and related commodities throughout the southern Indian state of Andhra Pradesh. Section IV focuses on two mini case studies that explore the role played by tacit knowledge in meeting and overcoming a series of developmental challenges. Section V summarises what these mini-cases tell us about the role played by tacit knowledge in innovation

capacity. Finally Section VI presents conclusions that may be drawn from the wider case as a whole and its implications for policy.

II. TACIT KNOWLEDGE AND INNOVATION CAPACITY

The notion of tacit knowledge was first introduced by Michael Polanyi during the 1950s (Polanyi, 1966). He argued that knowledge can be classified into two broad categories: explicit/codified knowledge and tacit knowledge. The first category is articulated and transmitted in formal language, including grammatical statements, mathematical expressions and models. It can be processed by computers, transmitted electronically or stored in databases. For example, patents, trademarks, business plans, marketing research and customer lists are all forms of explicit knowledge, which can be documented, archived and codified. Conversely, it is difficult (though not impossible) to articulate tacit knowledge in formal language as it comprises subjective insights, hunches and intuition. In a sense, it is context-specific and often lies within the individual. Tacit knowledge is obtained through experience and learning by doing. Very often, it is internalised to such an extent that it is taken for granted. In other words, it is know-how contained in people's heads. Nonaka and Takeuchi (1995) defined tacit knowledge as "the personal knowledge embedded in individual experience and involves intangible factors such as personal belief, perspective and value system."

Increasingly, however, the ability to apply new knowledge (including skills and capabilities) is valued as a critical factor in an organisation's success. An organisation's ability to learn faster than its competitors is considered a significant source of competitive advantage (Senge, 1990). The idea of innovation as a complex systems phenomenon, whereby networks of research, entrepreneurs and other actors interact to produce and use new knowledge, was articulated by Freeman (1987) and Lundvall (1992) in their discussion of national systems of innovation. Lundvall (1992) identified learning and the role of institutions as critical components of such systems. Innovation — the process through which different sources of knowledge and ideas are put into use — happens when individuals and organisations, possessing different types of knowledge (scientific and non-scientific; codified and tacit), interact within particular social, political, policy, economic and institutional contexts. In other words, innovation is a process of interactive learning. In order to be successful, organisations should have the capacity to innovate.

Sustained competitive advantage lies in the capacity to innovate continuously and to learn more rapidly than one's competitors (De Geus, 1988). It is no longer the technology itself that is a strategic resource, but rather the organisational, technological and cognitive processes underlying the capacity to innovate and learn (Edmondson and Moingeon, 1996). Hall (2007) defines this capacity (to innovate) as:

> "The context-specific range of scientific and other skills and information held by individuals and organisations and the practices and routines (institutions), patterns of interaction and policies needed to create and put knowledge into productive use in response to an evolving set of challenges and opportunities. A large element of this capacity arises from learning-by-doing, whereby organisations engaging in the innovation process continuously adapt ways of working and routines — institutional learning — thus incrementally improving their ability to utilise knowledge and information."

Organisations develop new knowledge and capabilities through their interaction with other organisations and it is this new knowledge and capabilities that leads to innovation. An organisation's propensity to interact and learn is influenced by its institutions — the rules, norms, habits and patterns of interaction, which is often collective tacit knowledge or embedded knowledge residing in organisational routines, practices and shared norms. Recent discussions on innovation capacity (Hall, 2005; Hall *et al,* 2008), which have emerged from the application of an innovation systems framework in agricultural and rural sectors in developing countries, mainly focus on the collective capacity of the different organisations in a system to share knowledge and collaborate with each other. This capacity to continuously learn, adapt and apply new knowledge has both tacit and explicit elements. While some of its features — such as scientific, entrepreneurial and managerial knowledge — are more explicit, others, such as routines, organisational culture, beliefs, perceptions, partnering, values, mental models, etc., are more tacit. Understanding two key aspects — firstly, how organisations learn, and, secondly, how they manage a wide range of knowledge — is important to explore how tacit knowledge contributes to innovation capacity.

As learning is a pre-requisite for organisations to make changes or improve the capacity to respond, there has been a lot of interest to understand the processes by which organisations learn. Organisational learning is more than the sum of what each individual learns. According to Fiol and Lyles (1985), it represents systems, histories and norms within the organisation that are transmitted to new members. Though organisations comprise individuals, organisational learning is not the cumulative result of their members' learning. Individual learning occurs as members within the organisation acquire knowledge through education, experience or experimentation. Organisational learning occurs as the organisation's systems and culture retain and transfer this knowledge. One of the elements of organisational learning capability is culture change (Yeung *et al*, 1999). It refers to the extent to which an organisation assesses, modifies and transforms its shared values, beliefs and mindsets (*ibid*). This concept is similar to the concept of "institutional learning" — the process by which new ways of working emerge through changes in rules and norms in an organisation.

Organisations approach learning differently; given their time, resources, histories and competitive constraints. Yeung *et al* (1999) have identified four basic learning style typologies: *experimentation, competency acquisition, benchmarking and continuous improvement*. Typically, organisations mix all four, but in different combinations and to varying degrees. Discussion on capacity and learning would not be complete without mentioning a related concept: "absorptive capacity". Cohen and Levinthal (1990) defined absorptive capacity as the firm's ability to identify, assimilate and exploit external knowledge. They considered the level of prior related knowledge as the determinant of a firm's absorptive capacity.

What organisations can do — in particular, their capacity for learning and innovation — is closely related to how their knowledge is constituted, utilised and generated. Knowledge Management comprises a range of practices used by organisations to identify, create, represent, and distribute knowledge for re-use, awareness and learning. Knowledge in this context includes both the experience and understanding of the people in the organisation and the information artefacts, such as documents and reports available within the organisation and in the world outside. Most of the discussions in the sociology of science and organisational management literature focus on the two broad kinds of knowledge (tacit and explicit) and how tacit and

explicit knowledge interact to create new knowledge (Polanyi, 1966; Nelson and Winter, 1982, Nonaka, 1994, Spender 1996a, 1996b) at the level of a firm.

Recognising, generating, sharing and managing tacit knowledge is difficult as it is based on experience and action. Moreover, tacit knowledge can only be acquired through practical experience in the relevant context, i.e., learning by doing. Moreover, the variety of experience and the individual's commitment and involvement in the context are critical factors in determining knowledge generation and accumulation. Tacit knowledge plays an important role in providing meaning to explicit knowledge as well as contributing to development of new knowledge. Nonaka and Takeuchi (1995) argue that explicit and tacit knowledge, though conceptually different, are not separate in practice. They argue that new knowledge is generated through the dynamic interaction and combination of these two types of knowledge. They have identified four models of knowledge creation or conversions that are derived from the two kinds of knowledge (i.e., explicit and tacit knowledge) as shown in Figure 1 (below).

FIGURE 1: DIFFERENT MODES OF KNOWLEDGE CREATION OR CONVERSION

	To Tacit Knowledge	**To Explicit Knowledge**
From Tacit Knowledge	**Socialisation:** Sharing of experiences to create tacit knowledge; shared mental models and technical skills; done through observation, imitation and practice; experience is the key — mere transfer of information makes little sense to the receiver	**Externalisation:** Articulation of tacit knowledge into explicit concepts through metaphors, analogies, concepts, hypotheses or models
From Explicit Knowledge	**Internalisation:** Closely related to learning by doing; knowledge is verbalised or diagrammed into documents or oral stories	**Combination:** Systemising concepts into a knowledge system; exchange of ideas through media such as documents, meetings and conversations

Source: Nonaka and Takeuchi (1995)

Socialisation *(tacit to tacit):* Socialisation includes the shared formation and communication of tacit knowledge among people, e.g., in meetings. Knowledge sharing is often done without ever producing explicit knowledge, and, to be most effective, should take place among people who have a common culture and can work together effectively. Thus, tacit knowledge sharing is connected to ideas of communities and collaboration. A typical activity in which tacit knowledge sharing can take place is a team meeting during which experiences are described and discussed.

Externalisation *(tacit to explicit):* By its nature, tacit knowledge is difficult to convert into explicit knowledge. Through conceptualisation, elicitation, and ultimately articulation — typically in collaboration with others — some proportion of a person's tacit knowledge may be captured in explicit form. Typical activities in which the conversion takes place are in dialogue among team members, in responding to questions, or through the elicitation of stories.

Combination*: (explicit to explicit):* Explicit knowledge can be shared in meetings, via documents, e-mails, etc., or through education and training. The use of technology to manage and search collections of explicit knowledge is well established. However, there is further opportunity to foster knowledge creation; namely to enrich the collected information in some way, such as by reconfiguring it so that it is more usable. An example is to use text classification to assign documents automatically to a subject schema. A typical activity here might be to put a document into a shared database.

Internalisation *(explicit to tacit):* In order to act on information, individuals have to understand and internalise it, which involves creating their own tacit knowledge. By reading documents, they can, to some extent, re-experience what others previously learned. By reading documents from many sources, they have the opportunity to create new knowledge by combining their existing tacit knowledge with the knowledge of others. However, this process is becoming more challenging because individuals have to deal with ever-larger amounts of information. A typical activity would be to read and study documents from a number of different databases.

The *socialisation* mode usually starts with the building of a "team" or "field" of interaction. This field facilitates the sharing of members' experiences and perspectives. The *externalisation* mode is triggered by successive rounds of meaningful "dialogue". In this dialogue, the sophisticated use of metaphors can be used to enable team members to articulate their own perspectives, thereby revealing hidden tacit knowledge that is otherwise hard to communicate. Concepts formed by teams can be *combined* with existing data and external knowledge in search of more concrete and sharable specifications, facilitated by triggers such as coordination among team members and others in the organisation, and followed by the documentation of existing knowledge. Through an iterative process of trial and error, the concepts are articulated and

developed until they emerge in concrete form. This experimentation can trigger *internalisation* through a process of learning by doing.

Effective knowledge management typically requires an appropriate combination of organisation, social and managerial initiatives, along with, in many cases, deployment of appropriate technology (Marwick, 2001). Marwick also suggested several technologies that can support or enhance the transformation of knowledge. Disterer (2003), however, argues that knowledge sharing is not a technical challenge, but more a sociological one. Many barriers to effective knowledge sharing exist within and between organisations. However, there are arguments against the externalisation thesis. Two conflicting positions exist: the 'no access' position and 'possible access' position. For the former, Cook and Brown (1999) argue that tacit knowledge cannot be transformed into explicit knowledge although it may help to create the latter. The 'possible access' stance holds that at least certain parts of tacit knowledge have the potential to become conscious.

Because tacit knowledge is unique, imperfectly mobile, imperfectly imitable and non-substitutable, it is a source of competitive advantage, according to the resource-based view of the firm[5] (Barney, 1991; Wernerfelt, 1984). Ambrosini and Bowman (2001) argue that the expression 'tacit knowledge' should be replaced by 'tacit skills' — 'skills' implying 'doing'. Drawing the distinction between tacit skills and tacit knowledge helps us make explicit the point that tacit knowledge is not about 'knowing about' (knowing in the abstract) but that it is about 'action or doing' (*ibid*).

One of the main reasons why there have been very few attempts to empirically research tacit skills is that it is problematic. Research instruments such as surveys and structured interviews are likely to be inappropriate as individuals cannot be asked to state what they cannot readily articulate (Ambrosini and Bowman, 2001)[6]. Codifying tacit knowledge is relatively difficult, but not impossible. Cowan and Foray (1997) have defined knowledge codification as the process of

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[5] Resource-based view is concerned with the relationship between a firm's resources and competitive advantage. The view suggests that organisations can be regarded as a bundle of resources and that resources are simultaneously valuable, rare, imperfectly imitable and imperfectly substitutable (Barney, 1991).

[6] This paper by Ambrosini and Bowman (2001) discusses the different knowledge capturing techniques

conversion of knowledge into messages that can then be processed as information. Codification in this sense may well involve use of language to articulate, describe, explain, etc. Codification is thus a process by which knowledge is made explicit, whether it be tacit knowledge or otherwise. Attempting to transfer knowledge through codification of information necessitated the emergence and definition of codes (Hall, M. 2006). This has implications for the transferability of knowledge to individuals and groups who do not know how to interpret or 'decodify' the code.

There seems little point in codifying knowledge for the purpose of transferring it elsewhere in the organisation without someone else being able to decodify it, And, without knowing who that someone may be, it is difficult to know how to codify the knowledge to begin with (Hall, M. 2006). This, again, brings us back to the previous discussion on absorptive capacity — which means an organisation's ability to recognise, assimilate and apply external knowledge to commercial ends (Cohen and Levinthal, 1990).

The major points that emerge from the review of relevant literature are as follows:

1. Innovation capacity of a sector (comprising a cluster of interdependent and interacting organisations) depends on:
   a. The knowledge and expertise (tacit as well as explicit) of individuals and organisations that comprise the sector
   b. The ability of organisations to manage knowledge (create, access, share and use knowledge) through adopting a range of strategies
   c. The ability of organisations to continuously learn, adapt and apply knowledge more effectively towards social, economic and environmental goals

2. Organisations learn and manage knowledge in several ways. This involves continuous interaction between tacit and explicit knowledge of individuals within the organisations and across different organisations.

3. Codifying tacit knowledge — or the process of converting tacit knowledge into messages (which can be processed as information) — to make it explicit is relatively difficult, but not impossible and there are several methods for explicating tacit knowledge. Tacit knowledge could also be explicated without codification. But the explicated tacit knowledge should be of use only when users have the ability to decodify the explicated information for use in their own context.

III. CASE STUDY: VISAKHA DAIRY

Visakha Dairy (Sri Vijaya Visakha Milk Producers Company Ltd.), headquartered at Visakhapatnam in Andhra Pradesh, is one of the fastest growing milk and milk products manufacturing organisations in India. It procures milk from coastal Andhra districts (Srikakulam, Vizianagaram, Visakhapatnam & East Godavari) and its sales operations cover several states in the country. Visakha was established in 1966 but registered under the Indian Cooperatives Act only in 1973, with milk procurement operations in 50 villages and a handling capacity of 10,000 litres per day. The company has gone through several transformations, since. In 1999 it was transformed and renamed the 'Sri Vijaya Visakha District Milk Producers Mutually Aided Cooperative Union' under the Mutually Aided Cooperative Act (MACS Act, 1995). On January 6, 2006, it underwent another conversion into a producer company under the Company Act 1956 and was renamed the 'Sri Vijaya Visakha Milk Producers Company Limited'. At the time of writing this paper Visakha Dairy procured milk from 2744 villages and served more than 200,000 milk producers.

Genesis: In response to rapid industrialisation in the 1960s, the Andhra Pradesh state government introduced the *Intensive Milk Supply Scheme* (IMSS) in 1966, primarily to meet the increasing demand for milk in urban areas. The Animal Husbandry Department (AHD) implemented this scheme across the state, working in association with milk producers at the village level. It provided surplus milk produced in the village directly to consumers, thereby eliminating middlemen. Collection points were also established at several places, including Visakhapatnam. These later became part of Visakha Dairy. The dairy started procuring milk from two districts — Srikakulam and Visakhapatnam. When Vizianagaram district was formed in 1978, the dairy included producers from there in its milk collection.

The 1980s: The dairy was elevated to a multi-District Milk Federation Unit for Srikakulam, Vizianagaram and Visakhapatnam and registered as Srivijayavisakha Districts Milk Producers Union in 1983. When the National Dairy Development Board (NDDB) implemented the second

phase of Operation Flood[7] in Andhra Pradesh in 1981, one of the milk unions selected for assistance was Visakha. NDDB's Co-operative Development Programme (CDP) helped Visakha strengthen its societies. In the initial days, this exercise was spearheaded by a team comprising one NDDB official and 15-20 supervisors from the dairy. The programme trained milk producers to establish and maintain the society and its record books, as well as produce clean milk.

Using funds available from the *Telugu Grameena Kranthi Pathakam* scheme (introduced by the Telugu Desam Party government in 1983), Visakha constructed buildings for around 250 of its milk societies. Half the funds for this were provided by the state government and the remainder contributed by the village panchayats. These buildings provided a common platform for interaction among producers, milk society members and employees of the dairy and helped create a sense of ownership among milk producers.

Realising the central role of producers and their families, Visakha established a trust — "Milk Producers and Employees Education Health and Medical Welfare Society" — in 1989, with the aim of providing educational, health and medical services to producers, their families, and employees of the Dairy (and their families). The trust currently manages a school, a college and a hospital in Visakhapatnam and provides a wide range of services to milk producers.

The 1990s: By the early '90s, daily milk procurement started to exceed 200,000 litres, even as daily liquid milk sales remained at around 100,000 litres. To tackle this surplus, Visakha commissioned and constructed a milk powder factory with a daily capacity of 13 Mt. in May 1998. Initially, the factory produced *doodh peda (a sweet made from consensed milk and sugar)*, buttermilk, curd and *paneer (a type of cheese)*. Later, it introduced rose and other flavoured milk, *lassi* (yoghurt-based drink)*, mistidohi* (sweetened yoghurt)*,* milk cakes, *mysore pak* (sweet)*,* ice cream and *shrikand* (sweetened, spiced and strained yoghurt). Under the new Andhra Pradesh Mutually Aided Co-operative Act, 1995 or the MACS Act, Visakha converted into a MACS Society around this time. The new Act gave Visakha the freedom and flexibility to experiment with and evolve new institutional arrangements.

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[7] A rural development programme started by India's National Dairy Development Board (NDDB) in 1970. One of the largest of its kind, the programme's objective was to create a nationwide milk grid.

2000 onwards: In 2001 the dairy established an Aseptic Packing Station, as well as a sales point for liquid milk in the state capital of Hyderabad — where it currently sells about 30,000 litres of milk every day. It also supplies tetra-packed UHT processed milk to the Gujarat Co-operative Milk Marketing Federation (GCMMF) under the latter's brand name Amul. Based on a successful experiment with one Bulk Milk Chilling Unit (BMCU) in 1999, Visakha established 65 BMCUs in 2004, helping it reduce the extent of spoilage of collected milk. Earlier, the milk was collected at district level Milk Chilling Centres and, quite often, delays in transporting milk to from far-off villages resulted in the milk curdling.

In the past decade Visakha has expanded its product range to include homogenised and full cream milk and its area of operation to several other states. Its introduction of the 200 ml sachet of milk has increased sales among poorer sections of society.

Liquid milk is mainly sold in plastic packets, which are handed down to retailers at identified points, and who, in turn, hand them down to delivery boys/sub-agents. The milk packets ultimately reach consumers through a home delivery system. The dairy also supplies products in bulk to hostels and navy units as well as caterers. All other dairy products are supplied through stockists, who, in turn, supply retailers — both exclusive dairy parlours as well as retail agents.

Each Visakha city office is run by an official, who oversees route and business development supervisors. They, in turn, monitor booth agents. Regular meetings with commission agents are organised route and zone-wise to address constraints and support working capital management. The dairy also encourages booth agents with monetary and non-monetary incentives.

With the dairy's continued expansion and modernisation, the need for new skills and expertise became more evident. The MACS Act and the subsequent Producer Company status gave Visakha greater freedom on recruitments. Initially, employees were recruited by the state government. After the dairy was converted to a producer company, a separate recruitment policy was formulated, under which several technical/ professional staff was recruited into senior positions. This situation had created some rift among older employees and newly-recruited professional staff. However, the dairy made some effort to address any simmering resentment

through a revised salary increment plan, which offers increments in the 8th, 16th and 24th year of service.

Under the previous 1964 Co-operative Act, Visakha was audited by the state government. With the 1995 Act, the organisation enjoyed greater financial independence. However, once it became a producer company, it recognised the importance of finance and personnel management, and, interestingly, now closely monitors staff activities.

IV. EXPLORING TACIT KNOWLEDGE IN VISAKHA

Running a successful co-operative dairy enterprise necessitates integration of knowledge from a number of sources. In the case of Visakha, these include:

a. A large number of milk producers from varied socio-economic backgrounds
b. Its staff, with different kinds of expertise: procurement, processing, marketing, administration, finance, etc.
c. Dairy equipment manufacturers
d. Transporters
e. Livestock support agencies: Department of Animal Husbandry (veterinary doctors, para veterinarians, AI technicians), cattle suppliers, veterinary pharmaceutical agencies
f. Commission agents, stockists, milk parlour franchises
g. Consumers of milk and milk products
h. Politicians and bureaucrats in the Government/ Opposition (from the Departments of Cooperation, Animal Husbandly, Industry, Financing, etc.) and civil society leaders
i. Sector coordinating bodies, such as state dairy federations, National Dairy Development Board (NDDB)
j. The Judiciary

The dairy, in a sense, acts as a knowledge processing centre, where these different kinds of knowledge are integrated and applied. One of the hypotheses set for this study was that the innovation capacity of a sector is linked to the knowledge (tacit and explicit) of actors in the innovation system; how it effectively manages this knowledge; and its ability to continuously learn, adapt and apply this knowledge.

In the course of this case study, we interviewed individuals and groups in Visakha and its wider networks in order to understand how the dairy has been managing knowledge and learning to deal with challenges arising from the changing environment. What follows are two cases of innovating around challenges, which illustrate how Visakha has managed tacit and explicit knowledge to deal with two interesting and significant developments in its evolution.

(i) Breaking the hold of bicycle vendors: Institutionalising Milk Societies

The 1980s were a time when the concept of milk societies really came into vogue in India. However, introducing the co-operatives into a rural social setting was not easy. Before this, vendors on bicycles collected milk from producers and supplied it to hotels and restaurants in nearby towns and cities. Producers were often at the mercy of these vendors and the prices they quoted. In most cases, vendors belonged to the same village as the producers and shared formal or informal kinship relations.

When Visakha first approached villages with the objective of establishing milk societies, it had to face stiff resistance from the bicycle vendors, as well as village elders who suspected that these new arrangements would disturb the status quo. The elders were also apprehensive about the entry of a new organisation into the village and its likely implications on the social fabric. For the vendors, the apprehension, obviously, was that the dairy would take away their business.

Despite the resistance, the dairy persisted with its efforts by highlighting the loopholes in the existing system and suggesting cooperatives as an alternative. Visakha realised it would have to convince producers about the unfair practices of the bicycle vendors. It did this by contrasting the ever-improving financial situation of vendors against that of the producers, whose economic plight had either remained stable or had actually worsened in the same period. These attempts to sway milk producers usually took between 3-6 months, but eventually paid dividend. Once the majority of producers in a village were convinced of the cooperative model, they were taken to the societies already on the ground to show how these functioned.

The next step was to establish a society in the area. Realising the important role of vendors, the dairy adopted several strategies to win them over. In some cases, the village vendor was made the secretary of the society; in others, he was put in charge of running the society and taking care of daily milk collection. In cases where the producers remained unconvinced, the vendor was encouraged to collect milk from them and provide it to the society directly. In some villages where producers were not willing to establish a society, the dairy came up with the idea of

'shadow societies' — societies set up on a trial basis to experiment with the cooperative model. If this still failed to convince producers, they were free to revert to their earlier model.

TABLE 1: USING TACIT KNOWLEDGE TO ESTABLISH NEW SOCIETIES

Innovating around Challenges	Different kinds of knowledge		Ways of explication and use of Tacit Knowledge
	Tacit	**Explicit**	
Breaking status-quo: Setting up new societies	- Shared or collective understanding of the roles of milk producers and vendors in society - Malpractices in the existing system of transactions - Apprehensions or fears about shifting to a new way of working (cooperative) - Varied understanding or mental models of what a cooperative may look like in practice - Bicycle vendor's networks, relations and knowledge about milk producers - Ethics, values and practices in running a producer-managed society	- Cooperatives: Definition, legal status, formation, selection of board, management, functioning, auditing, etc. - Guidelines on collection, transportation and payment of milk, maintenance of records	- Meetings, group discussions and question-answer sessions with milk producers to highlight loopholes in the existing system and reiterate value of cooperatives in order to create the motivation for change - Exposure visit to established societies; (Seeing is believing) to get a shared understanding of how cooperatives work in practice) - Running a society on a trial basis for 6 months (Experiential learning) - Making the vendor the secretary or an employee of the society (employing his tacit knowledge for the benefit of the society) - Training society members on the philosophy and principles of cooperatives and ways of managing them

Analysing the case from the perspective of knowledge creation or conversion, we can see that for milk producers, the idea of a "cooperative' was new knowledge that had both tacit and explicit elements. This was introduced in a situation where there was a tacit, shared or collective understanding of the respective roles of the milk vendor and producer. This shared understanding emerged from years of *socialisation* in these societies. Due to their lack of experience working as

cooperatives, communities were apprehensive of their implications. When Visakha first introduced the idea of cooperatives, they were creating ambiguity in the minds of the villagers. This is similar to the model of 'unfreezing, freezing and refreezing' suggested by Kurt Lewin to describe the change process[8]. To resolve this ambiguity, new experience had to be provided so that the idea of a cooperative — which was very abstract and tacit in the beginning — slowly became explicated and transformed into practice.

The tacit knowledge on cooperative behaviour is *externalised* or explicated to the community in village level meetings through presentations, question-answer sessions, stories, anecdotes, etc., so producers are fully able to appreciate these ideas. Once the majority of producers is convinced of the merits of the cooperative model, they are taken to already-established societies so that they see in practice what was explained to them in theory. This is the stage where different types of knowledge are *combined* (enrichment of collected information and its reconfiguration). This is followed by an experiential learning experience (running the society on a 6-month trial basis) so that the new knowledge is *internalised* (See Figure 2 on the next page for a visualisation of the entire process).

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[8] An early model of change developed by Lewin described change as a three-stage process. The first stage, which he called "unfreezing", involved overcoming inertia and dismantling the existing "mind-set". Defense mechanisms have to be bypassed. In the second stage the change occurs. This is typically a period of confusion and transition. We are aware that the old ways are being challenged but we do not have a clear picture as to what we are replacing them with yet. The third and final stage he called "freezing", where the new mindset is crystallising and one's comfort level returns to previous levels. This is often misquoted as "refreezing" see Lewin K (1947).

FIGURE 2: KNOWLEDGE CONVERSION PROCESS TO DEAL WITH CHANGE*

	To Tacit Knowledge	**To Explicit Knowledge**
From Tacit Knowledge	**Socialisation-** Shared mental model of the existing situation (role of bicycle vendors) in the community due to years of informal interaction Idea of cooperatives is introduced to these communities by the staff of the dairy. Communities discuss these ideas and shape their opinions based on their limited understanding	**Externalisation** Dairy employees explicate the idea of cooperatives (a new way of functioning for milk producers) through meetings, question-answer sessions, use of anecdotes, stories etc.
From Explicit Knowledge	**Internalisation** Learning by doing (running the society on trial basis for six months), where this knowledge is applied and internalised	**Combination** Visit to established societies so that producers combine different experiences to reinforce explicated knowledge

* Basic framework of Nonka and Takeuchi (1995) adapted to this study

The Visakha teams charged with forming new societies soon learnt the importance of the bicycle vendors' role, as well as ways of co-opting them into the new arrangement as the societies' secretaries or employees. The teams have been sharing their experiences of forming societies in divisional meetings. Therefore, the tacit skills/knowledge on forming societies is widely shared and explicated throughout the dairy. Although these experiences are not codified into written documents, these are sufficiently explicated within the organisation. We tried to codify the mechanism of establishing milk societies through the process of causal mapping. The outputs of this exercise are detailed in Box 1.

BOX 1: CURRENT WAYS OF ESTABLISHING MILK SOCIETIES (KNOWLEDGE CODIFIED BY THE RESEARCHERS)

Currently, the dairy follows two ways of establishing milk societies. Firstly, it identifies new villages in a region where the dairy already procures milk from neighbouring villages. This is called the established milk route. (The milk route is defined as a group of villages that are connected through the dairy's network of milk procurement. It usually consists of 10-15 villages within a geographical radius of 5-10 kms). Secondly, it establishes a new milk route by identifying villages with untapped potential (usually referred to as virgin villages) and then establishes a collection centre. Once the milk procurement rate stabilises at 100 litres per day, the collection centre is converted into a milk society and registered under the relevant Act. The society is governed by a management board headed by a president. The members and the president are elected from among the producers to ensure their participation in the society's activities.

Having identified the village or a cluster of villages with untapped potential, the dairy's spearhead team approaches the village headman/*sarpanch* to put the idea of a cooperative forward. The headman then puts across the idea to the other villagers in a meeting, during which public opinion is collected. In case of a positive response, Visakha makes an elaborate presentation of its activities and plans to the community on a mutually convenient date. Dairy staff maintains regular contact with the villagers to mobilise public opinion in favour of establishing a society.

The dairy organises different kinds of training activities to society members. These generally focus on clean milk production practices, maintenance of record books and management of cooperatives. Training also creates a sense of ownership among producers towards the society and the dairy.

Once the society is established, the spearhead team moves on to the next location to organise similar activities. One team member is left behind to supervise activities for some villages — usually numbering between 60-70 during the initial phase, but down to a modest 15 villages under a supervisor currently.

Participation in cooperatives essentially entails a change in behaviour. With changing technology, more stringent quality norms and increasing competition, this behavioural change needs reinforcement. This would also mean managing different bits of knowledge on a continuous basis — from "tacit to explicit" and "explicit to tacit" — and this necessitates regular communication. For instance, the supervisor employed by the dairy maintains regular communication with the society and the producers and acts as a link between the producers and the dairy. These regular contacts and trainings have contributed to Visakha's enhanced procurement of quality milk. Needless to say, the goodwill and trust of milk producers has been a major factor in the dairy's innovation capacity.

(ii) Weathering the Storm: Dealing with Political Change (2004-2006)

It's a well-known fact that cooperatives in India are managed as just another arm of government; in other words, government controls cooperatives. Governments have also been investing in cooperatives by way of grants for expansion, infrastructure development and free land for

building plants. The steady decline of a majority of cooperatives across the country (barring a handful) has been attributed to the politicisation and tinkering by civil servants under the 1964 Co-operative Societies Act. In response to the demands of several cooperatives and civil society organisations for a liberal cooperative law, the Government of Andhra Pradesh passed the Andhra Pradesh Mutually Aided Co-operatives Act (MACS) in 1995.

Converting to the new Act in 1999 provided Visakha Dairy greater freedom and flexibility to experiment with and evolve new institutional arrangements. The MACS Act allowed for both the registration of new cooperatives and the conversion of co-operatives already registered under the old law (1964 Act). In Andhra Pradesh, 8 out of the 11 existing district milk unions, including Visakha, converted to the MACS Act. All eight improved their management and business capacities after conversion (CDF, 2006), while the three milk unions that remained under the old law languished.

However, a change in government in May 2004 opened up new challenges for the MACS unions, with the election of the Congress party to power in the state. During their time in the Opposition, several Congress politicians had voiced their unhappiness with the 1995 MACS Act as it granted the milk boards greater freedom from government control. Another issue is that the constitution of the milk boards has traditionally always been highly politicised; in the case of Visakha Dairy (as with most of the other milk unions in the state), board members were overwhelmingly allied with the rival Telugu Desam (TDP) political party. The dairy had a tense relationship with the new party in power, stemming from prior clashes over elections to its board.

Once in power, the Congress began exploring ways to amend the 1995 Act to bring the dairies back under government control. In November 2004, the Registrar of MACS, Andhra Pradesh, issued an order to the milk district unions, asking them why their registration under the 1995 Act should not be cancelled due to a technicality (they had not entered into a memorandum of understanding, as required by the law). A series of petitions and court hearings followed, during which Visakha began to consider its options to resist government interference.

One such option came in the form of a recent amendment by the Indian Government to the Companies Act, allowing *inter-state* cooperatives to transform themselves into producer companies. Given its marketing arrangements in other states, Visakha immediately proposed transition into a producers company. However, the transition didn't prove as smooth as expected, as the dairy was inundated by a series of actions against it, ranging from court orders to a state government investigation into irregularities in its activities. In February 2005, a House Committee formed by the State Assembly recommended that all cooperative dairies be exempt from the MACS Act and reverted to the previous 3-tier structure. As the issue raged in debate in cabinet meetings, Visakha's management scrambled to find other alternatives. The dairy got in touch with its wider network of supporters and experts for advice, and was finally able to put its case forth before the office of the Registrar of Companies in Hyderabad and Delhi. On January 2006, Visakha Dairy was registered as a producer company.

Anticipating other dairies to follow suit, the Congress government passed an order on February 1, 2006, repealing the MACS Act and bringing all dairies into the 1964 Act. On February 4, 2006, the government issued an ordinance to take over management of Visakha Dairy and seven other cooperative dairies in the state. Visakha immediately filed a petition in the state High Court, stating that the move was illegal as it was a company and not a cooperative society. The very next day, the court granted them a stay. Other dairies followed suit, and following more than a year of petitions, hearings and deliberations, the High Court finally quashed the government order as unconstitutional.

Visakha was able to stay one step ahead of the state government all the while as it was well-networked into the political and bureaucratic process. The dairy was well–equipped to deal with the hurdles the government threw up in its way, thanks to the relationships it cultivated over the years. An added advantage was its recruitment, in 2004, of a retired government employee (from the state co-operative department) as its administrative officer. Besides being well-networked into government circles, the officer also brought with him a wealth of expertise on co-operative laws.

Visakha's decision to convert into a producer company was essentially based on its tacit knowledge of the situation and its likely implications. As soon as the government issued an ordinance enforcing a takeover of the dairies, Visakha used its networks to acquire a copy of the ordinance and filed a petition in the High Court. Other dairies in the state could not, however, pre-empt the government move, and spent the next 18 odd months fighting their case in court..

TABLE 2: USING TACIT KNOWLEDGE TO DEAL WITH UNCERTAINTIES

Innovating around Challenges	Different kinds of knowledge		Ways of explication and use of Tacit Knowledge
	Tacit	**Explicit**	
Weathering the storm: Dealing with the political change in the state	Likely consequences from change in government in 2004 Knowledge about plans being considered by the new government to bring the dairy under its control Knowledge on sources of reliable information and advice Extensive contacts within the bureaucracy and political system	Rules and regulations (Acts, ordinances, Government Orders) regarding cooperatives and Producer Companies Legal provisions to deal with conversion to new forms of ownership	Using wide networks to derive credible information and pre-empt adverse consequences Using existing networks and expert sources to use explicit and tacit knowledge on rules/laws and regulations

V. DISCUSSION: TACIT KNOWLEDGE AND INNOVATION CAPACITY

One of the main reasons for Visakha's evolution and its capacity to innovate is its ability to successfully access, share and apply new knowledge. The two instances discussed in the previous section reveal that Visakha has built up "context-specific skills and information and the institutions, patterns of interaction and policies needed to put knowledge into productive use" (judged by Hall, 2007, to constitute 'innovation capacity'). It has developed the necessary scientific and entrepreneurial capacity and knows how to obtain the needed managerial skills and knowledge. Save for its temporary hostilities with the state government, Visakha has had productive interactions with other actors in the system. Its empathy with the wider concerns and multiple needs of producers and consumers and its ability to anticipate and quickly respond to these concerns has created goodwill and support. The salient points that emerge from these cases are as follows:

Organisational learning allows for the acquisition of new knowledge: Both cases discussed in the previous section reveal how Visakha used different organisational learning strategies as part of its innovation capacity. These strategies were quite diverse (Table 3). These range from, for example, recruiting personnel with prior knowledge and capabilities to the use of experimentation (i.e., trying out different marketing arrangements).

TABLE 3: ORGANISATIONAL LEARNING IN VISAKHA*

	Learning Type	Examples
1.	Experimentation	• Developing new products, obtaining consumer feedback, product modifications • Trying out the bulk milk cooling units (BMCUs) • Trying out different marketing arrangements to promote its products
2.	Competency Acquisition	• Training its staff as part of commissioning new plants and equipment (under the contract with the manufacturers/suppliers) • Access to professional inputs on cooperative development and new product development from NDDB (as a partner in implementation of Operation Flood-II) • Establishment of a training centre with NDDB assistance to train its field staff, orient Director Board members and para-veterinary staff • Placement of competent staff in Finance, Administration, Training and several other fields by devising its own recruitment rules
3.	Benchmarking	• Amul (Khaira District Milk Producers Cooperative)

4	Continuous improvement	• Continuous improvement in quality and performance (procurement, marketing and profits) has been its goal. It obtained the relevant quality standards (GMP, HACCP, ISO) in its plants by ensuring compliance to higher quality standards.
		continues to be the benchmark for Visakha (and for many other dairies in the country). Visakha's activities have been influenced by its association with Amul (Tribuvan Das Trust, Hospital for dairy producers, etc.)

Based on the typology developed by Yeung et al (1999)

Exploiting tacit knowledge helps in dealing with challenges: The cases also reveal that Visakha's tacit knowledge about "know-how", "know when" and "know who" — and its ability to use these strategically — helped it deal with the various challenges it faced during its evolution (See Table 4). These different types of tacit knowledge are embedded in its organisational routines, practices and shared norms. For example, its extensive networks in political, bureaucratic and civil society circles, its wide-ranging support to producers — including educational and medical support — and its commitment to consumers in terms of quality, pricing and availability are the three important "institutions" that facilitated Visakha in its successful evolution and growth. These "institutions" supported Visakha in accessing, sharing and applying tacit knowledge, to compete, expand and flourish.

Codifying tacit knowledge is difficult, but the codified knowledge only has limited value: Though tacit knowledge contributed immensely to Visakha's innovation capacity, the dairy is yet to adopt mechanisms to codify much of this knowledge. Codification is considered important in situations where there is a quick turnover of staff (people retire or move on) and if not codified, the knowledge may be lost. However, Visakha has not developed any system for documenting lessons and experiences. And there is every reason to believe that some of its tacit knowledge has been lost when people moved out of the organisation. However, explicating tacit knowledge need not necessarily be in the form of written documents. For instance, apprenticeship in dairy plants is an example of sharing, communicating, explicating and internalising tacit knowledge. Similarly, exposure visits to successful dairy societies is yet another way of explicating tacit knowledge about managing dairy societies to members who do not have this experience.

As researchers, we tried to codify some of this tacit knowledge primarily to understand the contribution of this knowledge to Visakha's innovation capacity. However, one major constraint we faced has been the fear and uncertainty among respondents regarding how the shared knowledge would be used by us or by the management of Visakha, in case they heard about it. We had to organise several rounds of discussions to develop a rapport with respondents and explain our intentions before they felt comfortable talking to us. Another major constraint was the wide variation in the ability of respondents to share their tacit knowledge in individual interviews and group exercises. Regardless, we have tried to codify some of the tacit knowledge that has contributed to the innovation capacity of Visakha. This tacit knowledge might be useful to those in Visakha — as well as other actors in the innovation system around Visakha — presuming, of course, that they can decodify this context-specific knowledge.

TABLE 4: TYPES OF TACIT KNOWLEDGE IN VISAKHA

	Type of Tacit Knowledge	Means of Acquiring and Sharing Tacit Knowledge	Evidence from the study
1	**KNOW HOW?**		
	How to acquire new expertise?	Consulting/ employing experienced hands	• Use of NDDB consultants/staff as part of the co-operative development programme • Employing a senior (retired) employee from the State Co-operative Department • Employing a former employee from the banking sector as finance manager
	How to learn and share knowledge?	Regular interactions at various levels for sharing of tacit knowledge among team members	• Regular meetings at divisional levels, at least once a week to discuss operational issues • Regular, almost daily, meetings of senior managers and the Managing Director • Continuous interaction with civil society groups working on development of cooperatives
	How to partner?	Work together and support each other	• Working with other dairies and supporting them in the short term by way of loans to tide over cash flow problems • Developing business relations (Amul and Omfed)
	How to resolve conflicts?	Conflict avoidance Resolving conflicts legally	• Avoid conflicts by careful selection and election of Board members belonging to the same group/political party • Champion for and facilitate the process of bringing parallel legislation to overcome hurdles • Use legal measures (fight in the courts)
2	**KNOW WHEN?**		
	How and when to meet market demands?	Ensuring quality and aggressive marketing	• Developing mechanisms for obtaining customer feedback and acting on it • Make available all its products to the customers through a wide delivery format-e.g.: agents, parlours, retailers and super-markets • Incentives to agents based on performance (sales)
	How and when to meet local needs and aspirations for	Addressing the wider developmental concerns of the community	• Forming a trust to address health (hospital, medical insurance), education (school, colleges and scholarship) and other rural infrastructure

	development?		
	How to adapt to changing conditions?	Pre-emptive actions through political and legal measures	• Legal measures: stays on government orders • Pre-emptive moves (conversion to producer company)
3	**KNOW WHO?** (knowledge of knowledge)		
	Who knows what?	Wide networks	• Using wide networks in political circles, dairy business, cooperative development, bureaucracy • For bringing out new legislation-1995 MACS Act • Staying afloat during the political turbulence starting with change in government
	Who can exploit new information/ help with new problems?	Using networks helps to identify the right people and the dairy recruits them	• Recruit those with right skills and experience (Administration, Finance, Training)

Creating opportunities for sharing tacit knowledge is more important than trying to codify tacit knowledge: While codifying tacit knowledge has only limited value, what is more important is the creation of opportunities for its wider sharing. If people have to be motivated to share tacit knowledge, organisations need to build and nurture an environment that creates relationships and trust among various individuals and organisations, and which also values sharing of knowledge. Visakha has created some mechanisms for wider sharing of tacit knowledge, mainly by way of regular meetings within and among the different divisions. Although new technologies have made knowledge sharing and management easier in some ways, there are several individual and social barriers to sharing tacit knowledge. Quite often opportunities for sharing tacit knowledge do not exist. Some of the "institutions" (habits, practices, rules, norms) within organisations also influence this sharing. For instance, bureaucratic procedures within centralised organisations often prevent sharing of tacit knowledge. For instance, the top-down hierarchical structure maintained by APDDCF finally led to several dairies, including Visakha, pulling out of the Federation. Also, in some of the primary societies we visited, members felt they had not been consulted by Visakha in decisions on how funds would be managed. However, they were not keen to share these concerns openly as they believe the dairy had become too big and "noises like these would not be heard".

Lack of effective platforms to share knowledge within an organisation and among different organisations within a sector currently constrains creation and sharing of tacit knowledge. As Cowan and Foray (1997) pointed out, "knowledge is easier to codify and codified knowledge is easier to diffuse within a community of agents, who can read the codes." A growing number of people and organisations in various sectors are now focusing on communities of practice[9] as a key to improving their performance (Wenger, *et al* 2002). Developing a community of practice in the dairy sector, therefore, assumes importance as one mechanism for sharing tacit knowledge.

Studies have shown that individuals who have a feeling of emotional attachment to their organisation are likely to share their knowledge in situations where they realise that doing so is

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[9] A Community of Practice is defined as "a group of professionals, informally bound to one another through exposure to a common class of problems, common pursuit of solutions, and thereby themselves embodying a store of knowledge." Communities of practice are formed by people who engage in a process of collective learning in a shared domain of human endeavour: a tribe learning to survive, a band of artists seeking new forms of expression, a group of engineers working on similar problems, a clique of pupils defining their identity in the school, a network of surgeons exploring novel techniques, a gathering of first-time managers helping each other cope (Wenger, 2002).

appreciated and their knowledge will actually be used and will eventually benefit the organisation (Lin, 2007). Therefore, building trust among staff within the organisation — and relationships and trust across different actors in the innovation system — assumes importance. A large number of those who supply milk to the unions still belong to unregistered societies and so are not able to access the wide range of services offered by Visakha Dairy and its Trust. Thus, on the inclusiveness and participation side, Visakha's record has not been very good. Moreover, the whole dairy revolves around the personality of the chairman. However, several actors felt that it was this leadership that allowed Visakha to succeed where other dairies have failed. To a large extent, this type of pioneering leadership is good. But then there are genuine concerns over the lack of a second generation leadership within Visakha.

VI. CONCLUSIONS AND POLICY IMPLICATIONS

This discussion paper has explored the role of tacit knowledge in innovation capacity, using the case study of Visakha. The major conclusions are as follows:

Firstly, innovation capacity is very much a function of the diffusion and deployment of tacit knowledge. The episodes of coping with change discussed in the case study relied almost entirely on tacit knowledge. The identification, creation, sharing, and increased application of tacit knowledge is, therefore, an important route to strengthening innovation capacity.

Secondly, the ability to exploit tacit knowledge depends on how well-networked an organisation is with its internal and external audience or stakeholders. This is also important for acquiring new skills and expertise. Therefore, strategies to improve networking with a broad set of stakeholders should be a priority for making better use of tacit knowledge and enhancing innovation capacity.

Thirdly, creating and sharing tacit knowledge is more important than codifying tacit knowledge. But if people have to be motivated to share tacit knowledge, organisations need to build and nurture an environment that creates relationships and trust among the various individuals and organisations and that also values sharing of knowledge.

Fourthly, creating time and mechanisms within organisations for reflecting and sharing of experiences can lead to creation of relevant new knowledge. Quite often, organisations do not clearly know what specific kinds of knowledge are relevant to the tasks, challenges and opportunities each individual within an organisation faces, as opportunities do not exist to share, reflect, improve and create new tacit knowledge. Regular reflective workshops, inter-divisional staff meetings, developing corporate yellow pages are some of the ways forward.

Fifthly, to promote creation, sharing and application of tacit knowledge, action has to also be taken at the sectoral level. Promoting sector coordination bodies, communities of practice on

select themes, inter-agency policy working groups, etc., can go a long way toward enhancing innovation capacity through wider sharing and application of tacit knowledge.

The case study in this paper seems to support the idea that tacit knowledge plays a critical role in innovation and innovation capacity. While tacit knowledge is clearly a major resource that organisations rely on to cope with change, it does not follow that knowledge management approaches that rely on codifying this knowledge are the way forward. Instead what it does suggest is that better management of the learning processes through which tacit knowledge is generated and shared would be more useful contribution to innovation and innovation capacity. This suggests that a shift is required from knowledge management to learning management.

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