

Chapter 2

Knowledge Management for School Development

Abstract This chapter critically reviews essential concepts, theories and practices of knowledge management and explores the feasibility of applying KM to school education. It addresses the nature of knowledge and the definition of KM. It articulates the application of Nonaka and Takeuchi's knowledge conversion model at individual, group and organisational levels in schools to manage knowledge, and describes how school culture, knowledge strategies and processes, staff competencies and information technology affect the implementation of KM.

2.1 What is Knowledge?

Knowledge is one of the most important assets of a school organisation, and is critical for school sustainability. Sallis and Jones (2002, p. 8) defined knowledge as “information in use, and the interaction of information with the human mind, which gives it meaning and purpose.” Knowledge is constructed through an “accumulation of facts, procedural rules or heuristics through our daily experience and study”. It also involves the intelligence to acquire and apply what one has understood through learning and experience. The knowledge management glossary of the National Electronic Library for Health (2010) provides a comprehensive definition of knowledge: “Knowledge is derived from information but it is richer and more meaningful than information. It includes familiarity, awareness and understanding gained through experience or study, and results from making comparisons, identifying consequences, and making connections.” Distinctions are often made between data, information, knowledge and wisdom. Knowledge is information combined with experience, context, interpretation and reflection (Davenport et al. 1998). In organisations, knowledge often becomes embedded not only in documents or repositories but also in organisational routines, processes, practices and norms (Davenport and Prusak 1998, p. 5). Knowledge could also be defined as a form of capital, as Stewart (1997) states that transformation of information into knowledge is a critical step in value creation, which determines what kind of advantage an enterprise has in competition.

Knowledge is the understanding that people develop as they react to and use information, either individually or as an organisation. Nonaka and Takeuchi (1995) distinguish between explicit and tacit knowledge. Explicit knowledge refers to knowledge that is transmittable in formal, systematic language which is more precisely and formally articulated, and removed from the original context of its creation or use. Tacit knowledge has a personal quality, which makes it hard to formalise and communicate. Tacit knowledge is subconsciously understood and applied, developed from direct experience and action, and usually communicated through informal conversation and shared experience.

2.1.1 Positivist Perspective of Knowledge

The classification of explicit knowledge and tacit knowledge is based on the positivist and non-positivist perspectives on what is the nature of knowledge (Vo 2012). The positivist perspective defines knowledge as justified true belief that can certainly be achieved. Vo (2012) considers knowledge to be a commodity, which “exists prior to and independently from the knowing subject” (p. 79). Knowledge takes an explicit form to represent a collection of objects and events in the world; therefore, “it is possible to codify, store, and transmit knowledge between people” (p. 79). For example, *know-what* is a form of explicit knowledge that can be explained by knowledge workers to others. Knowledge could be translated into actions so as to help solve practical problems and advance organisational practice (Tranfield and Starkey 1998). These characteristics enable knowledge workers to acquire, apply, share, store and even create knowledge. Knowledge management makes sense as a management approach or strategy to develop the organisation through managing knowledge resources.

2.1.2 Social Constructivism Perspective of Knowledge

The social constructive perspective views knowledge as a process and exists in tacit form. Lave and Wenger (1991) articulate situated learning through participation and observation in their book *Situated Learning: Legitimate Peripheral Participation*, remarking that the social construction of knowledge is rooted in practice and practice articulates how knowledge could be used to organise a practical task. Knowledge is socially constructed and held collectively in organisations and is embedded in situated practices of the individual (Gherardi 2000). Although knowledge is situated in the historical, social and cultural contexts of the organisation, it can be acquired through participation and created through mutual engagement in the negotiation process (Wenger 1998; Nicolini et al. 2003). The knowledge worker’s practice articulates what knowledge is. The phenomenon under inquiry for capturing knowledge cannot be separated from the knowledge process, but is instead contextual. Table 2.1 compares the knowledge view from the positivist and non-positivist perspectives.

Table 2.1 Positivist and social constructivism perspectives on knowledge

Knowledge	Positivist perspective	Social constructivism perspective
Definition of knowledge	A justified true belief Possessed by people “A collection of representations of the world, which is made up of a number of objects and events” (Chiva and Alegre 2005, p. 53)	Socially constructed as a process Created by people Not as a representation, but as constructing or creating acts (Vo 2012) “Neither universal nor abstract, rather depends on context” (Chiva and Alegre 2005, p. 58)
Existing form	Visible, objective and rational Explicit knowledge Can be codified and stored	Unseen, subjective and experience based Tacit knowledge Shared through communication
Location of knowledge	Locates at written and verbal information recorded in video, audio, databases and documents	Resides in knowledge individuals’ minds and/or communities of practice
KM strategies	Codification	Personalisation

2.2 What is Knowledge Management?

Knowledge management (KM) can be defined as a systematic and integrative process of coordinating the organisation-wide activities to retrieve, use, share, create and store knowledge, actionable information and expertise of individuals and groups in pursuit of organisational goals (Cheng 2012; Rastogi 2000). These KM processes support organisational processes involving innovation, individual learning, collective learning and collaborative decision making. The fundamental principle underpinning KM in organisations is that by managing knowledge as a resource to fill the existing knowledge gap, the organisation’s performance will be improved (Davenport and Prusak 1998). KM enables the maximisation of organisational knowledge-related effectiveness and prosperity (Wiig 2004) and provides a sustainable competitive advantage (Hatch and Dyer 2004). KM supports organisations in creating a mechanism that measures, stores and transforms knowledge into intellectual capital. It increases the capability of staff to solve problems and the ability of the organisation to make improvements (Sallis and Jones 2002).

The areas and foci of study in knowledge management are far more extensive and sophisticated than those of information management (IM), as “KM is the systematic, explicit, and deliberate building, renewal, and application of knowledge and other intellectual capital assets to maximise the enterprise’s knowledge-related effectiveness and prosperity” (Wiig 2000, p. 6). It supports knowledge workers to make decisions and carry out effective actions by providing them with insights and experiences through socialisation processes and/or information retrieval from using computers and communication tools. While information management serves the function of collecting and distributing information to people, the socialisation process for knowledge creation differentiates KM from IM. KM concerns the

socialisation process of knowledge, organisational learning and reflection, while information management focuses on data processing, constructing computer architectures and building taxonomies. However, KM needs to be built on effective information management, because managing knowledge is harder than managing information.

The development of knowledge management is partially motivated by intellectual capital theory and organisational strategy research (Baskerville and Dulipovici 2006). These economics and strategic management perspectives provide a theoretical foundation to the development of KM theories. Intellectual capital is individual or collective knowledge in an organisation that can be used to gain a competitive advantage and to enhance the value of other types of capital (Casey 2010). It consists of a variety of things beyond know-how, procedures, lessons learned, and all of the other instantly recognisable repositories of knowledge. It also includes reputation, brand recognition, trust, and many other qualities that ultimately are based on knowledge. KM strengthens the professional competency of the staff and improves the organisation's structure and policies. Therefore, implementing KM could help an organisation build up intellectual capital by transforming the knowledge resources into intangible values.

Models for exploring intellectual capital and assessing its value tend to break it down into a number of component elements. A "tripartite model" disaggregates the intangible resources into three components: human capital, internal capital and external capital (Kelly 2004; Sveiby 2001; Guthrie and Petty 2000). The three components are interlinked, and they support and reinforce each other when an organisation has a shared sense of purpose combined with an entrepreneurial spirit, and management places a high value on agility and governs more by carrot than stick (Stewart 1997). Since KM is concerned with simplifying and improving the processes of sharing, distributing, creating, capturing and understanding knowledge (Gottschalk 2006), it serves as the process of creating value from an organisation's intangible assets (Liebowitz and Megbolugbe 2003); therefore, the implementation of knowledge strategies could build intellectual capital.

2.3 How Does KM Contribute to Schools?

KM in schools can be conceptualised as strategic management activities that support teachers to collect information or make use of the organisation's knowledge resource to carry out their teaching and tasks effectively. These knowledge management practices can help capture, codify and distribute knowledge in school through the application of information and communication technologies or human interaction so that it can be shared by all teachers. Therefore, KM provides schools with adequate communication channels for teachers to discuss school issues with management. Teachers can reflect on and review feedback from others and develop further strategies and plans for improving school-based policy and

teaching effectiveness. School policies can be adjusted in light of teacher feedback for maximising student learning.

Leung (2010) conducted a KM study on schools in Hong Kong. He found that KM not only provides a platform for teachers to discuss different ideas for teaching and to post resources for student learning, but also retains the expertise of experienced teachers, increases their effectiveness in terms of teaching and learning performance, supports the development of a knowledge community in schools, and fosters the culture of learning. KM helps to capture and retain experienced teacher knowledge in the school and strengthen the novice teacher's knowledge through knowledge transfer in administrative work and teaching. KM can strengthen the knowledge-sharing culture and build collegiality into the school organisation.

KM supports innovative teaching and effective learning. Through conducting data mining in student test scores, teachers can identify students' strengths and weaknesses for effective instructional design. A few communities of practice on lesson study can be cultivated by the KM system for capturing, sharing, storing and creating pedagogical knowledge and pedagogical content knowledge. As a result, teachers' professional development can be enhanced (Cheng 2009). With the building of a knowledge repository for student affairs services, KM provides a one-stop service to teachers and students to achieve information on student study advancement and career guidance, and teachers can be better equipped to provide student guidance and counselling.

Applying KM in school education is a new concept; thus, we need a KM model to help us conceptualise the disparate elements of the complete picture in a way that leads to a deeper understanding of how the knowledge process works within the school organisation. For example, it is important to have a solid foundation of understanding about what KM is, what the key KM cycle processes are, and how these processes feed into a model, in order to interpret and set up a causal relationship.

2.4 The Nonaka and Takeuchi KM Model

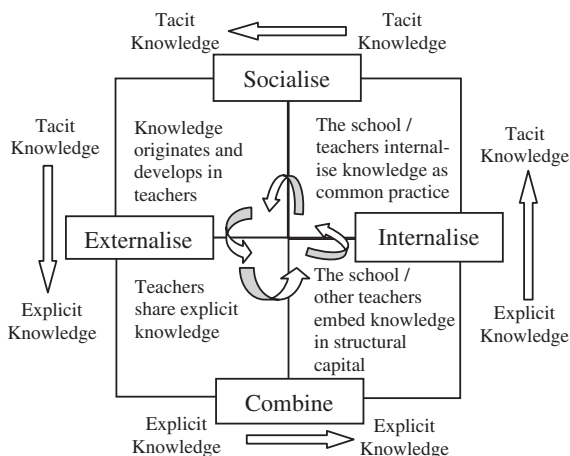
The Nonaka and Takeuchi KM model focuses on knowledge spirals that explain the transformation of tacit knowledge into explicit knowledge and then back again as the basis for individual, group and organisational innovation and learning. Nonaka and Takeuchi (1995) suggest that Japanese companies have been successful because they make use of their skills and expertise to create knowledge for innovation. Nonaka and Takeuchi's study theorised that Japanese companies survived in the turbulent external environment by building a knowledge management system to create knowledge for renewal. Knowledge management in this sense is regarded as the means to manage rapid change within the organisation. The fundamental question underpinning the proposed theory is how to build a knowledge management system to convert tacit knowledge in the market and the organisation to explicit knowledge, and then to crystallise it into an innovative product. The

theory also includes the ideas of re-conceptualisation of organisational design and strategy from the perspective of knowledge creation.

The Nonaka and Takeuchi KM model is basically a two-dimensional matrix depicting four possible scenarios of tacit and explicit knowledge interaction or conversion. The SECI model is a descriptive theory that is rooted in a dialectic epistemology of tacit and explicit knowledge. The SECI process outlines the conversions between tacit and explicit knowledge: explicit knowledge can be converted to tacit knowledge and vice versa. Nonaka and Takeuchi's four modes of knowledge conversion—socialisation, externalisation, combination and internalisation—create a dynamic process for organisational knowledge creation (see Fig. 2.1). Socialisation is a process of creating common tacit knowledge through shared experiences. Externalisation is a process of articulating tacit knowledge into explicit knowledge as concepts and/or diagrams. Combination is a process of assembling new and existing explicit knowledge into systemic knowledge, such as a new curriculum implementation plan and teaching methods. Internalisation is a process of embodying explicit knowledge into tacit, pedagogical knowledge such as having the “know-how” to teach.

The Nonaka and Takeuchi KM model has been widely applied to examine the knowledge process in educational organisations. Wu et al. (2013) applied the case-study method to interview and observe members of an educational organisation that was using the SECI model, in order to explore the knowledge transfer and creation process of an educational organisation. They found that internal organisational knowledge flow can be obtained through mutual interaction and sharing by the organisation's members, thereby strengthening the organisation and the teaching skills of individual members. Joia (2002) conducted a case study to evaluate a programme that aims to train in-service teachers without a teaching qualification in Brazilian K-12 public schools by using the SECI model. The programme aims to give these teachers the skills and expertise to do their job. Joia found that only

Fig. 2.1 Nonaka and Takeuchi's four modes of knowledge conversion in a school context



the socialisation process (tacit to tacit knowledge) of the SECI model worked well. This finding illustrates the tacit nature of teacher knowledge which is to be transferred via social learning.

2.5 The SECI Model and Japanese Lesson Study

Nonaka and Takeuchi's four modes of knowledge conversion model can be applied in schools to explain how teachers share their tacit and explicit knowledge through lesson study (see Fig. 2.2). Lesson study is seen as a type of action research and professional development activity in which teachers collaborate to create effective lessons and examine their practice (Fernandez 2002; Lewis 2002). *Jugyou ken-kyuu*, which is a method of teachers' professional development, has a long history in Japan (Yoshida 1999; Watanabe 2002). A lesson study involves a group of teachers meeting regularly for a few months to a year to work on the design, implementation, testing and improvement of one or several research lessons (Stigler and Hiebert 1999, p. 110). The focus of the research lesson lies in a specific teacher-generated problem, goal or vision of pedagogical practice, which is carefully planned in collaboration with one or more colleagues, observed by other teachers, recorded for analysis and reflection, and discussed by all members of the lesson study group, other colleagues, leaders or invited commentators (Lewis and Tsuchida 1998).

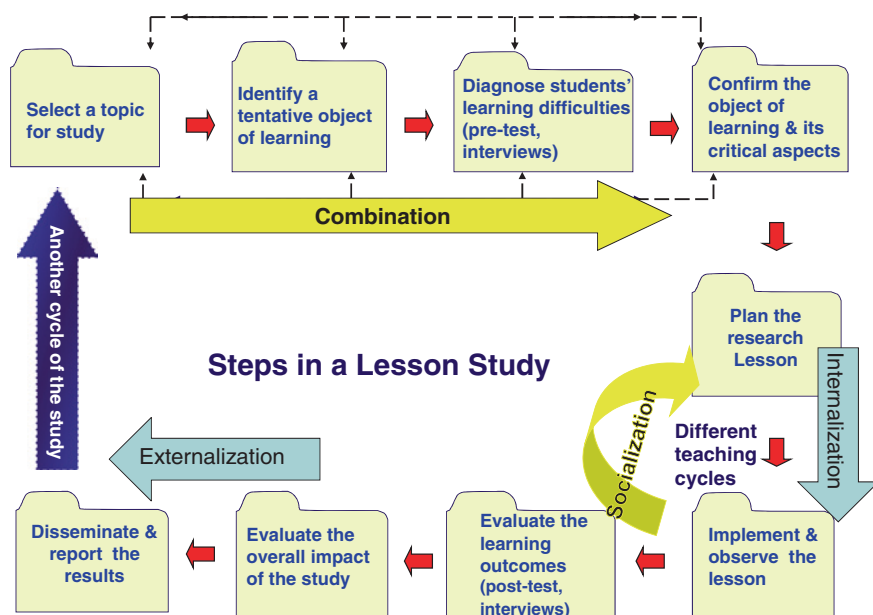


Fig. 2.2 Nonaka and Takeuchi's four modes of knowledge conversion in a lesson study

The concrete steps of a lesson study which are thought to lead to increased professional knowledge and skills are (Stigler and Hiebert 1999, pp. 112–115):

- Defining and researching a problem.
- Planning the lesson.
- Teaching and observing the lesson.
- Evaluating the lesson and reflecting on its effect.
- Revising the lesson.
- Teaching and observing the revised lesson.
- Evaluating and reflecting a second time.
- Sharing the results.

Adaptations of any imported innovations often have a life of their own. Thus, attempts to adapt the practice of *Jugyuu kenkyuu* vary widely across countries, especially since information about it is mostly published in Japanese.

2.5.1 Combination

Combination is a process of converting explicit knowledge into a more usable form. In planning a lesson, teachers work together to choose the topic, define a research problem, and plan the lesson. This collaborative lesson planning process involves the combination of teachers' own conceptual understanding of the subject knowledge and how they dealt with the subject knowledge in the past. The combination of explicit knowledge allows teachers to design learning activities that will tackle student learning difficulties.

2.5.2 Internalisation

Internalisation is a process of understanding and absorbing explicit knowledge, thus turning it into tacit knowledge held by the individual. After the planning stage, the research lesson is taught by one of the teachers in the group and observed by others. The teachers who enact the lesson plan and explicit teaching theories can then internalise the tacit knowledge through enactment of the lesson plan. Tacit knowledge is actionable by the owner via actually doing or through simulations. The enactment of the lesson plan is an internalisation process that transfers school and team explicit knowledge to the individual. As teachers apply the knowledge shared in the lesson planning in their teaching practices, the explicit knowledge is being internalised to become the teachers' personal knowledge (Kolb 1984).

2.5.3 Socialisation

The process that transfers tacit knowledge from one person to tacit knowledge in another is socialisation. It is primarily a process between individuals. It involves

capturing knowledge by direct interaction and sharing experience with individuals outside and inside an organisation. The lesson implementation is videotaped for detailed analysis in the meeting. Immediately after the lesson, a post-lesson conference is conducted, where the teachers reflect on the lesson and suggest improvements. A second teacher will revise the lesson plan, taking into account the suggestions and the post-test results, and teach the revised lesson to another class. This lesson will also be videotaped, discussed and revised. This process is repeated until all the teachers have taught the lesson to their respective classes. Teaching practice articulates how pedagogic knowledge could be organised to a practical teaching task in order to enhance student problem-solving ability. Since tacit knowledge is situated in a lesson study committee, it is acquired through some form of participation, and is continually reproduced and negotiated. Participation in lesson planning, teaching and the post-lesson conference is a socialisation process in which tacit knowledge is extracted and co-constructed through discussion and collaboration. Since tacit knowledge is situated in a lesson study committee, it is acquired through some form of participation, and is continually reproduced and negotiated, as shown in the study by Nicolini et al. (2003).

2.5.4 Externalisation

The process for making tacit knowledge explicit is externalisation. When all teaching cycles are completed, teachers conduct an evaluation meeting as part of the final evaluation stage. This involves data triangulation among the test scores, student interview data, and video analysis of the teaching practice, with the aim of finding a relationship between how teachers handled the subject and what the students learned. In the evaluation meeting, the teachers will suggest further improvements and revise the lesson design for future reference. They are encouraged to reflect on what they have learned through the lesson study by conducting a public presentation, thus turning their tacit knowledge into transferable explicit knowledge (Nonaka and Takeuchi 1995). Finally, the whole experience is written up as a case report, which becomes a transferable and shared inventory of the school. The pedagogical content knowledge is coded in the form of a teaching manual, meeting records and the case report.

The application of the SECI model to schools is illustrated by the lesson study. The SECI model could be adopted to create pedagogical knowledge by building a knowledge-sharing platform or knowledge management system. School leaders should consider nurturing a set of conditions that support and sustain the knowledge creation process (e.g. creating an organisational learning culture, developing teacher PKM competency, cultivating a professional learning community, and institutionalising a knowledge management system). In Takeuchi and Nonaka's (2004) discourse, knowledge management is framed as a management perspective and not as a set of tools and methods to leverage knowledge. They believe that knowledge management is at the centre of what management has to do in a fast-changing, complex and uncertain world. They also state that since knowledge creation is at the heart of management in today's knowledge society, that model will serve as the universal model for management at large.

2.6 Knowledge Management Strategy

Knowledge management strategy refers to the overall approach an organisation intends to take to align its knowledge resources and capabilities for enhancing organisational performance (Zack 1999). KM strategies can be divided into two categories: codification for knowledge storing; and interpersonal interactive knowledge sharing (Hansen et al. 1999; Zack 1999). Codification for knowledge storing emphasises the capability for storing, sharing and using an organisation's explicitly documented knowledge. In such instances, individuals strive to explicitly encode their knowledge into a shared knowledge repository, such as a database, and also retrieve knowledge they need, which other individuals have added to the repository. These strategies usually apply information technology to facilitate the processes of knowledge retrieval, knowledge storage and knowledge utilisation.

Interpersonal interactive knowledge sharing emphasises the use of dialogue through social networks, including occupational groups and teams, and knowledge can be obtained in this way from experienced and skilled people (Swan et al. 2000). In such instances, individuals can provide their insights to the particular person or people in need of them (Snowden 2002). It helps to share knowledge through person-to-person contact (Hansen et al. 1999). This strategy attempts to acquire internal and opportunistic knowledge and share it informally (Jordan and Jones 1997). It involves the knowledge processes of retrieval, sharing and utilisation.

In school education, KM not only provides a platform for teachers to discuss different ideas for teaching and to post resources for student learning, but it also retains the expertise of experienced teachers, increases their effectiveness in terms of teaching and learning performance, supports the development of a knowledge community in schools, and fosters the culture of learning (Leung 2010). It strengthens the professional competency of the staff and improves the organisation's structure and policies. Leung (2010) conducted a qualitative study of schools in Hong Kong to identify the factors that support or hinder the implementation of knowledge management in education. He found that leadership and change management, strategies and goals, organisational learning, technical support, school culture and trust among teachers are the critical factors affecting knowledge management in the school context. He concluded that successful knowledge management in a school involves different aspects such as accessibility of information technology, strong leadership, cultural influences, organisational structure and human characteristics. Cheng (2012) conducted research on knowledge management and organisational learning in a school context and explored a knowledge strategy that could be applied effectively in an educational organisation. He discovered that the effective knowledge strategies for building school intellectual capital tend to be knowledge sharing via interpersonal interaction (Zack 1999), rather than the codification strategies for knowledge storing.

Studies conducted in schools in other countries have also emphasised the importance of knowledge strategies in decision making and organisational learning. For

example, Schechter (2008) conceptualised the process of implementing knowledge strategies that represent the management of distributed knowledge throughout the entire organisation as an organisational learning mechanism. Abdul Hamid (2008) conducted a study to explore the personal knowledge strategies of school leaders and teachers. She found that personal knowledge strategies are highly correlated with the perception of positive knowledge management environments in schools, the quality of data kept within schools, and the extent to which decision making in schools was information-driven. Personal strategies also tend to influence the knowledge culture within schools. Abdul Hamid (2008) concluded that personal strategies can manipulate the way people seek and tolerate new knowledge, and how ideas are valued and used. Higher levels of personal knowledge strategies are also likely to result in a stronger belief in the quality process of decision making in schools. The study included the strategies of seeking, receiving, analysing, using, storing, retrieving and disseminating information.

2.7 Summary

School knowledge management is a set of relatively new organisational activities that make use of knowledge as an important resource to improve organisational behaviours, decisions, student learning, teaching processes and collegial relationships that enable schools to improve their overall performance. The knowledge management and conversion process between tacit and explicit knowledge in the Japanese lesson study is illustrated by Nonaka and Takeuchi's SECI model. In the SECI model, knowledge is an important asset to support schools' sustainable development. The different perspectives on knowledge, between social constructivism and positivism, have led to the formation of personalisation and codification knowledge management strategies respectively.

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