



An empirical model of four processes for sharing organisational knowledge

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Abstract

Purpose – This study aims to introduce an empirical model which incorporates newsgroups, knowledge forums, knowledge assets and knowledge application processes to share organisational knowledge. Therefore it seeks to illustrate an application for integrating knowledge management (KM) into the business process.

Design/methodology/approach – The Taiwanese contingent of an international certification body – also a council member of the International Organisation for Standardisation (ISO) – was selected for a case study. A hybrid technology infrastructure was designed and employed to implement the proposed model. Based on knowledge value added validation, the proposed KM model provides a set of new operating systems for sharing knowledge within an organisation.

Findings – Although many theories regarding implementation of KM in organisations have been proposed and studied, an application model for practical integration of various modern principles to share organisational knowledge is strategically important. Therefore a model that integrates principal KM applications into the business process, and the measurement of the resulting benefits, has been developed.

Originality/value – Knowledge is a valuable asset for an individual in today's economy; nevertheless the acquisition of such an asset relies heavily on knowledge sharing within an organisation. The author has proposed an exclusive hybrid platform with an empirical process model to address innovative approaches and practical values of KM within an organisation.

Keywords Knowledge application process, Knowledge asset, Knowledge forum, Knowledge value added, Newsgroup, Organizational knowledge

Paper type Research paper

Introduction

To improve business performance and create new mechanisms for knowledge sharing, knowledge management (KM) approaches have been adopted by organisations (Ng and Jee, 2012). Indeed knowledge is an important resource in both personal and organisational environments in the context of the knowledge economy, and the acquisition of such a resource depends on continuous management and education regarding categorised and synthesised knowledge. Despite various theories regarding KM (Hou and Li, 2011; Mason, 2005; Soon *et al.*, 2010), only a few practical research studies have focused on the application and implementation of an empirical model (Dixon, 2000; Housel and Bell, 2001). Thus an entire industry may lack comprehensive guidance for implementing knowledge sharing within an organisation.

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The ultimate goal of KM is to transfer knowledge among members in an organisation; some recent concepts such as “knowledge community” and “knowledge map” have been effective (Bautista-Frias *et al.*, 2012; Krishnaveni and Sujatha, 2012). However the overall benefits of KM can never be achieved if practical aspects are not integrated in an application model; furthermore there are limited studies on how different types of KM applications fit the business context. Therefore it is imperative that researchers investigate an application model to integrate KM with business strategies. Thus this study’s research questions are: How are principal KM applications integrated with the business process? Furthermore how are benefits resulting from KM processes measured?

For this research the company selected for the case study is associated with an international certification body in Taiwan; its business model is both knowledge-intensive and process-oriented. Four types of internal organisational knowledge to be shared in a business were identified by Andreu and Sieber (2005), who established an empirical model incorporating four electronic platforms for sharing knowledge within organisations: newsgroups, knowledge forums, knowledge asset management systems, and knowledge application processes.

This paper is organised as follows. In the next section the discussion of reviewed literature is provided. The following section is devoted to the research design for developing and validating the proposed empirical KM model, then some resulting KM applications and validation data are discussed. Finally the last section presents conclusions and suggestions.

Literature review

Skyrme and Amidon (1999) identified systematic organisational knowledge processes as one of seven critical success factors for successful KM implementation; a critical issue in implementing KM is preparing an organisation to accept, adopt, and utilise new KM processes (Alsadhan *et al.*, 2008). Mas-Machuca and Costa (2012) identified critical success factors of KM projects that are underway in consulting firms, and they measured the strategic, technological, and cultural factors in relation to the success of each project. The findings of their research show that technology is a primary factor for success of a KM project, and integrating KM with business objectives and choosing a proper technological infrastructure play important roles. Thus KM activities that include knowledge maps (Hussein *et al.*, 2010; Liu *et al.*, 2009), knowledge communities of practice (Gammelgaard, 2010; Shen *et al.*, 2010), and e-knowledge (Kankanhalli *et al.*, 2005; Warkentin *et al.*, 2001), have been linked to business processes. However clarity regarding what these KM processes look like within the organisational context is needed. Therefore we provide relevant illustrations in this study.

Different categories of knowledge provide benefits that vary according to task unit (Haas and Hansen, 2007). For instance Tsai *et al.* (2011) surveyed 600 large firms in Taiwan and found that the moderating effect of KM strengthens the relationship between ERP data maintenance and business performance. Ng and Jee (2012) surveyed 200 Malaysian firms and found that, in general, KM has a positive and significant influence on manufacturing performance. Thus it is evident that KM strategies within organisations should not be neglected. Dixon (2000) proposed five categories of organisational knowledge in a KM approach: expert knowledge, strategic knowledge, serial knowledge, near knowledge, and far knowledge. Andreu and Sieber (2005)

proposed different possibilities for integrating knowledge based on differences in personal relationships, as shown in Figure 1; their model may be a candidate for further study regarding incorporation of practical KM into business processes. This research, therefore, is based on the four possibilities of knowledge integration to develop an empirical model for sharing organisational knowledge.

A starting point of KM is the identification of business knowledge that is critical to organisational success (Studer *et al.*, 1998). Valuable organisational knowledge can be divided into the following categories: systemic assets, routine assets, information assets, data documents, software assets, visible assets, human resource assets, and service assets (Smith, 2001). Chen (2012) further integrated human resource assets, complementary assets, technical assets, and relationship assets into a teach-and-learn process of knowledge transfer. However beyond the categorisation of knowledge assets, KM practitioners will need an integrated process that includes a platform for sharing assets. The proposed empirical model incorporates various knowledge assets as essential for sharing knowledge within an organisation.

Bautista-Frias *et al.* (2012) identified tacit knowledge of workers by mapping the conversion of knowledge and converting it to explicit knowledge. Chen *et al.* (2006) successfully analysed and retrieved tacit knowledge from an international group's email. Martz and Shepherd (2003) verified that an active teach-and-learn process is ideal for transferring tacit knowledge. Matsumoto *et al.* (2009) successfully derived expert implicit knowledge in problem-solving processes associated with production systems. Many studies have established technological resolutions for managing tacit knowledge, but they have not emphasised the management process. In this study implicit knowledge was reserved via audio and video files that serve as records of the entire problem-solving process in which targeted expert knowledge was applied.

A main task in KM is to construct communities that engage workers in acquiring and applying knowledge through learning, working, and collaboration (Sharpton and Jhaveri, 2006). Despite various definitions of online communities, a major distinction in this study is that newsgroups offer informational and social support (Muncer *et al.*, 2000), but forums offer a mix of problem-solving knowledge via mentoring support (Wei and Chen, 2006). Soon *et al.* (2010) established an online forum to reuse knowledge

<i>Individual</i>	Self-study (internal monitor) weak	Master/apprentice Moderate/strong
	Structured teams moderate	Teams very strong
<i>Collective</i>		
	Explicit	Implicit

Figure 1.
Different possibilities for
knowledge integration



in a learning organisation; Hou and Li (2011) successfully conducted a newsgroup discussion among programmers to share knowledge in software development. Thus knowledge sharing occurs via forums and newsgroups, but integrating KM with business processes has not been addressed. Therefore this research aims to develop business processes in which organisational knowledge can be stored and used through online communities.

Knowledge value adding (KVA) was used originally for evaluating the reengineering process within organisations, as organisations would often emphasise cost reduction rather than evaluation of returns (Housel and Nelson, 2005). Yu *et al.* (2009) proposed an internet-based web service system – i.e. a KVA system – to implement the proposed knowledge value-adding model. A case study of a local consulting firm was conducted to demonstrate the proposed knowledge value-adding model and to test the applicability of the KM system. Past studies provide illustrations for measuring KM benefits; consequently more case studies are required to promote KM as a means of achieving business excellence. In this study two of three core processes are innovatively selected, both the easiest and the hardest to learn, to implement the proposed KM model and to observe performance differences for KVA.

Methodology

In this section a matrix depicting the types of organisational knowledge is provided, followed by the structural design of the empirical KM model and a description of the KVA validation that was adopted.

Matrix of organisational knowledge

The dimensions of relationship types (collective vs individual) and knowledge categories (explicit vs implicit) are useful for defining the integration approaches based on categories of knowledge to be shared in an organisation. The proposed matrix of organisational knowledge is shown in Figure 2. A refined application of newsgroups could fit the need for sharing organisational knowledge by self-study (Andreu and Sieber, 2005); likewise the form of knowledge asset management is suitable for capturing organisational knowledge in a structured team. A process-oriented database

<i>Individual</i>	Newsgroup	Knowledge process
	<i>Collective</i>	Knowledge assets
		Explicit

Figure 2.
The dimensions of relationships types and knowledge categories among the four electronic platforms



for describing the application of organisational knowledge is appropriate for conveyance of master-apprentice knowledge, and a knowledge forum is suitable for sharing of organisational knowledge by expert teams.

Proposed system model for sharing people's knowledge in an organisation

Based on the previous concepts, a system model, or a structured knowledge-sharing model, is depicted in Figure 3. The four possibilities of knowledge integration lead to the identification of four kinds of target knowledge to be managed. Four designated IT applications are employed to reposition those kinds of target knowledge in the business process. Finally these layers of technological infrastructure are provided with the first layer of workflow, groupware and AV-publication in receiving knowledge, the second layer of knowledge base in storing knowledge, and the third layers of hybrid e-learning and knowledge search in retrieving knowledge. At the end of the model

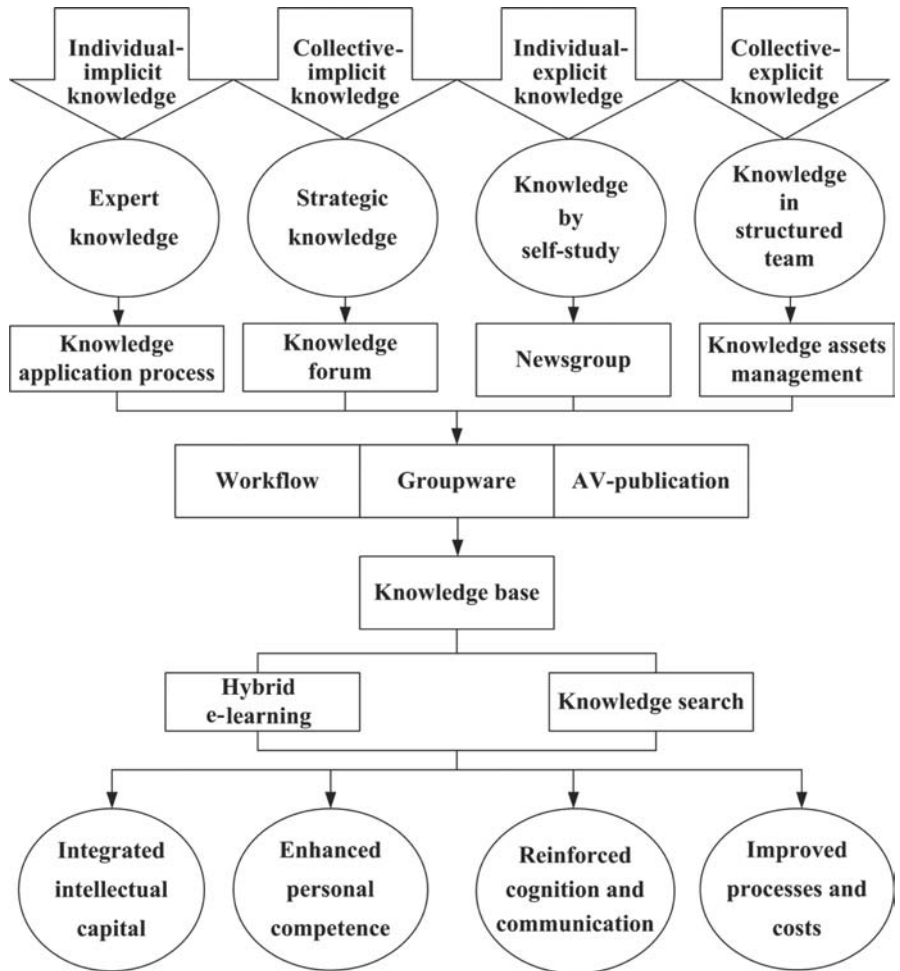


Figure 3. Empirical model for sharing knowledge in an organisation

there are four typical benefits as the expected outcomes of sharing organisational knowledge in the case company.

Focal company of case study

The company selected for this study is part of an international certification body in Taiwan, which is a council member of the International Organisation for Standardisation (ISO). Thus the company is experienced in organising and applying knowledge systematically. It has accumulated a great deal of industrial experience and professional knowledge, and those knowledge assets must be classified, synthesised, and deployed to employees so that competitive advantages can be maintained by the organisation. However the company lacks a bona fide empirical system to sort, store, and apply knowledge and incorporate KM into the routine flow of operations.

The company's service operations consist of three core processes: initial sales, auditor provision, and audit and evaluation. The initial sales process involves understanding the needs and certification requirements of the clients, looking into the applicable accreditation and certification rules, preparing all of the plans and presentations as in the proposal and finally soliciting and completing the service contracts from the clients. The auditor provision process comprises understanding all the applicable auditor qualifications and competences, and then coordinating with clients to assign the audit team consisting of the lead auditor and supporting auditors so that both certification requirements and customer needs are satisfied. The audit and evaluation process begins with preparing the audit plan in detail, performing the onsite audit, closing the audit findings and reporting and then issuing the accredited certificates. The proposed KM model was introduced initially for two of the three core business processes. The first process – initial sales – was selected as it requires the least learning time in enabling new staff to complete sales orders and service contracts. The second process – auditor provision – was not selected as the learning time requirement for new staff to designate an auditor team is not significantly different from the other two processes. The third process – audit and evaluation – was selected as it requires the most learning time in enabling new staff to complete audit services for the clients. Immediately prior to personnel training and KM implementation, a KVA survey regarding each process was conducted. One year after KM implementation a follow-up survey was conducted to gauge differences in KVA.

Design of the KVA survey

The KVA survey was based on business process analysis and cost accounting of the case company, a leading certification body that provides auditing services. A partial approach was adopted to implement the proposed empirical KM model for selected processes, and a task force of subject-matter experts (SMEs) was employed to determine or review various measurements such as required learning time for mastering the selected processes, the degree and extent of knowledge provision in each process and the assigned monetary values of knowledge costs and returns in the KVA survey. The SMEs were process managers, independent process auditors, process-related accountants and the staff responsible for KM in the case company. In general the following steps based on the learning time method (Housel and Bell, 2001) were adopted for surveying KVA:



- (1) Evaluate core processes and select processes to be studied. To hold a management review meeting to identify processes that are the least and most challenging to learn, and also due to cost constraints, KM implementation proposed in this study focused on comparisons of the least challenging process, initial sales, and the most challenging process, audit and evaluation.
- (2) Estimate learning time. For example managers in the case company allocate average person-months for new staff to master core processes.
- (3) Estimate the number of staff members participating in each core process, including both part-time and full-time staff.
- (4) Assign degree and extent of knowledge provision (i.e. 0-100 per cent). In this part of the case study SMEs were consulted to explain the amount of process knowledge associated with the current processes; thus we were able to identify the actual extent of working knowledge embedded within each process.
- (5) Calculate the quantity of knowledge used. The amount of knowledge used within each process is equal to “relative learning time” (step 2) multiplied by number of staff (step 3) and the percentage of knowledge provision (step 4).
- (6) Obtain the total knowledge usage by adding the products of steps 3 and 4, to step 5.
- (7) Obtain the distributed use of knowledge among these three processes in percentages, and adopt these percentages to allocate monetary value of knowledge in step 8.
- (8) Estimate the monetary value of knowledge for each core process. For this study a focus group discussion on annual revenue and the percentage of knowledge used in step 7 were used to identify contributions to revenue from the use of knowledge.
- (9) Derive the KM costs from each core process. To measure the costs consumed by generating process knowledge, a focus group discussion on relative annual expenses for collecting, storing, providing, and using knowledge was used in this study.
- (10) Calculate the return on knowledge (ROK). This measurement identifies the return generated by the knowledge assets associated with each core process.

Details of the calculations are shown in Table I. Three core processes, the corresponding KM activities, and attributes of the company selected for the case study are identified and compared.

Results and discussion

In this section the application model is presented, followed by the results of the KVA analysis that was conducted after introducing the empirical KM application to the case study company. Finally findings from applying the system model and comparing pre- and post-implementation KVA analyses are addressed.

Results of the KM applications

Results regarding the implementation of the proposed model for sharing organisational knowledge are presented below:



Table I.
Pre-implementation KVA
analysis

Core process	Initial sales	Auditor provision	Audit and evaluation	Total
1. Level of learning difficulty (easiest = 1, hardest = 3)	1	2	3	
2. Relative learning time (total = ten months)	2.5	4	7.5	14
3. Number of staff	65	48	98	211
4. Percentage of knowledge provision (%)	40	40	30	
5. Quantity of knowledge used within information system by products of steps 2, 3 and 4	65	77	220	362
6. Total usage of knowledge by adding products of steps 3 and 4 to step 5	227.5	268.8	955.5	1,451.80
7. Distributed knowledge (%)	15.67	18.52	65.81	100
8. Value generated from knowledge (million NT\$)	3.12	3.68	13.08	19.88
9. Annual expense of knowledge usage (million NT\$)	12.05	9.85	24.99	46.89
10. Return on knowledge (ROK) (%)	28.85	37.37	52.36	

- (1) As illustrated in Figure 4 an electronic knowledge application process was established to manage expert knowledge within the organisation. For example a manager's exclusive and implicit knowledge on how to prepare and conduct an annual quality review meeting was recorded fully using a documentary process.
- (2) As illustrated in Figure 5 an online knowledge forum was used to manage strategic knowledge within the organisation. The best set of business goals in a company's business plan is formed primarily from shared conclusions resulting from an online forum comprising representative managers from each department.
- (3) As illustrated in Figure 6 an online newsgroup was used to manage self-study knowledge continuously generated from work experiences of employees within the organisation. Online cyberspace was provided for all employees to exchange knowledge and experiences through daily operational events in a news format.
- (4) As illustrated in Figure 7 an electronic knowledge asset management system was established to manage the structured body of knowledge within the organisation. Various corporate resources of organisational knowledge were categorised for the case study, and their storage forms were indexed efficiently by a database system that included a knowledge distribution roadmap. This system was expanded to incorporate a keyword search system for employees to retrieve specific organisational information (knowledge).
- (5) A modern hybrid e-learning system (Tsai, 2012) was deployed to strengthen employees' knowledge and minimise learning/training costs. Once the need to learn about a new product was identified, the focal company of the case study employed

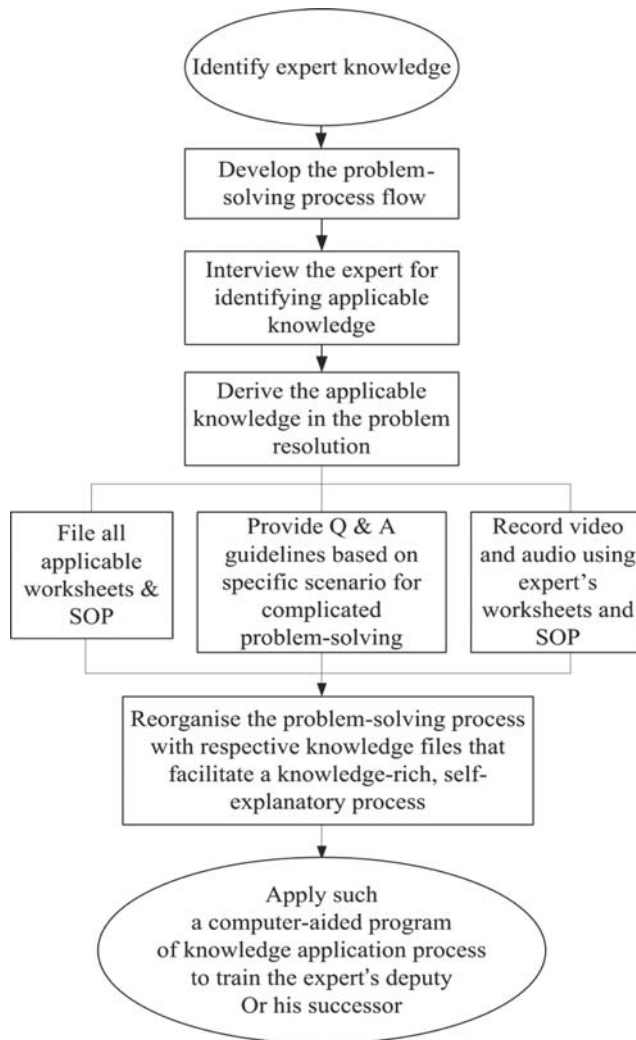


Figure 4.
Knowledge application
process for
individual-implicit
knowledge

a hybrid e-learning system to incorporate related organisational knowledge. Related knowledge was derived from the empirical KM system; it can be produced digitally with the courseware function of the hybrid e-learning system.

Results of the post-implementation KVA survey

As shown in the post-implementation KVA survey (Table II), the knowledge usage performance for audit and evaluation is highest while initial sales is lowest – i.e. when the processes have the most and the least potential for knowledge management or higher knowledge value. For an easier comparison the empirical KM model as proposed was applied to these two processes. One year after implementation the results



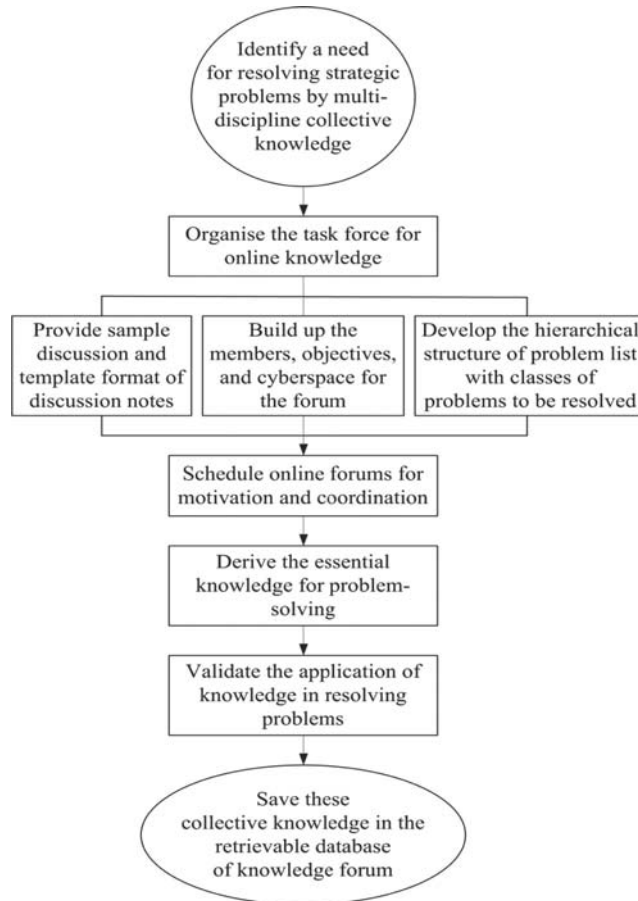


Figure 5.
Knowledge forum for
collective-implicit
knowledge

of the KVA survey, shown in the following Table, revealed an increase in knowledge provision for both processes (from 30-40 to 95 per cent). Initial sales generated a 3.2 per cent improvement on knowledge return, and the process of audit and evaluation yielded an improvement approaching 35 per cent. Moreover the survey indicated that after implementing the empirical KM model, the increase of ROK validated the significant benefits provided to the organisation by the empirical KM model.

Discussion

Despite existing theories a practical application of empirical KM has not been implemented. The empirical KM model presented in this study incorporates various KM principles into an application system. The resulting application extends research by Mas-Machuca and Costa (2012) by addressing the need to integrate KM into the business process and to choose a proper technological infrastructure for KM projects. The current research interest, which is limited to internal knowledge within an organisation, not only meets the prioritised goal of implementing KM in the company



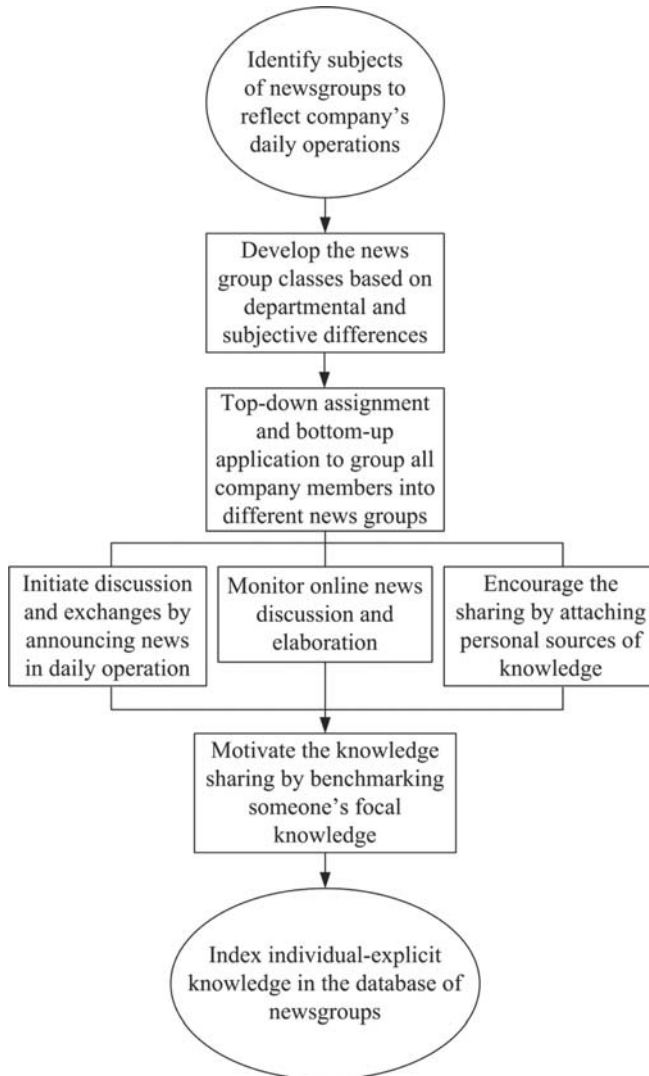


Figure 6.
Newsgroups for
individual-explicit
knowledge

selected for the case study, but it also reflects the fact that most companies are running into difficulties in the transfer of internal organisational knowledge (Andreu and Sieber, 2005). As a result the proposed KM model has been effective and efficient in managing significant amounts of knowledge within the focus company. The benefits of the empirical KM application were validated further by pre- and post-implementation KVA surveys. First we observed an increased percentage of knowledge provision for the selected core processes of initial sales and audit and evaluation. We noted that KM makes organisational knowledge – implicit or explicit – more transparent and accessible so that the knowledge provision and usage are improved. Second KM

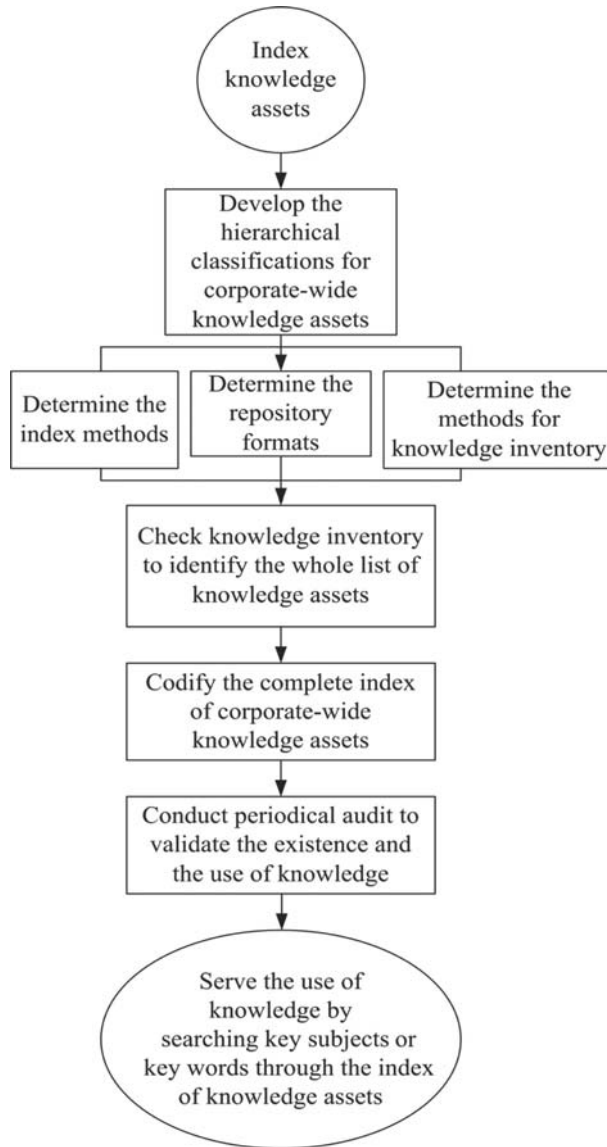


Figure 7.
Knowledge asset management system with knowledge search for collective-explicit knowledge

benefits can transfer easily to other processes once a system is in place. It should be noted that even though the KM processes did not benefit the core process of auditor provision in the case study because the proposed model was applied only to selected core processes (the easiest and hardest to learn) due to time and cost constraints, the generalisation of methodology has been proven applicable to the other business processes. Finally as can be seen through the KVA survey results, costs and benefits of KM correlated significantly to learning time for the selected application; in other words



Table II.
Post-implementation
KVA analysis

Core process	Initial sales	Auditor provision	Audit and evaluation	Total
1. Level of learning difficulty (easiest = 1, hardest = 3)	1	2	3	
2. Relative learning time (total = ten months)	2.5	4	7.5	14
3. Number of staff	65	48	98	211
4. Percentage of knowledge provision (%)	95	40	95	
5. Quantity of knowledge used within information system by products of steps 2, 3 and 4	154	77	698	929
6. Total usage of knowledge by adding products of steps 3 and 4 to step 5	316.8	268.8	1,433.30	2,018.90
7. Distributed knowledge amount (%)	15.70	13.31	70.99	100
8. Value generated from knowledge (million NT\$)	3.12	2.65	14.11	19.88
9. Annual expense of knowledge usage (million NT\$)	9.65	9.85	16.29	35.79
10. Return on knowledge (ROK) (%)	32.3	26.9	86.6	55.5

processes requiring more learning time (e.g. audit and evaluation) tended to generate improved costs and benefits in terms of ROK.

Conclusions and managerial implications

This research has focused on the integration of KM application systems within an organisation and the objective of helping the organisation gain knowledge assets during regular operations. The novel research contribution aimed to satisfy the organisational needs by integrating KM into the business process and adopting a hybrid technological infrastructure for KM processes. It targeted intra-organisational knowledge, which has been categorised into explicit-collective, explicit-individual, implicit-collective, and implicit-individual knowledge. It employed a hybrid IT platform to accommodate various applications. The proposed model, which integrates newsgroups, knowledge forums, knowledge asset management systems, and knowledge application processes, is capable of collecting and retrieving organisational knowledge in different forms. Further it is able to improve organisational knowledge management via the validation of KVA methods.

First this study found that an automated operational KM system could overcome typical organisational barriers, such as employees' unwillingness to share their knowledge, complicated documentation associated with collecting knowledge, and insufficient operational procedures. Nevertheless these goals could not be achieved unless the KM application was in line with existing business processes and integrated with a highly automated IT platform. The proposed empirical model reveals that a KM system can effectively accommodate various IT applications, categorise organisational

knowledge, and provide automation for collecting and retrieving knowledge during business processes, as well as overcome the abovementioned barriers.

Second even though many knowledge management models, as well as different theories, have been proposed, there is an increasing trend to integrate various principles, platforms, and applications of a hybrid model. Indeed in a business context, in which organisations are more concerned with practical solutions and justifiable costs/benefits, there is a demand for a hybrid KM implementation model for industrial applications. One of the core objectives of this research is to propose practical integration of IT platforms and KM principles and applications of a hybrid KM model, which deserve more attention and follow-up research regarding their industrial benefits as well as managerial breakthrough.

Third the implicit-individual knowledge that exists within the organisation is a key to enhancing competitiveness and organisational knowledge. However expert knowledge usually exists tacitly, posing a challenge to the promotion of KM. This research proposes a process-oriented multimedia platform that can store and manage tacit knowledge in a more explicit form and thus help the organisation to substantially increase the value of knowledge assets.

Moreover as KVA methods have been widely adopted for evaluating costs and benefits of KM, the validation process of this research illustrates an interesting KVA application which shows that the implementation of KM in those processes characterised by higher levels of learning difficulty creates better costs/benefits rewards from knowledge assets.

Finally the current research is limited to a single case study that represents the organisational context of KM for technical service providers in Taiwan. Due to both cost and time constraints, the proposed KM model was implemented for the comparison of only two processes. For implementation in the future, a larger scale of inter-process correlations should be addressed. Nevertheless the proposed knowledge application process model illustrates that implicit-individual knowledge is of great interest for researchers of tacit knowledge. However the theoretical background, application principles, and validation of a generalisable subject are not the main purposes of this study. In fact they have yet to be covered in a future paper.

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