An approach for identifying value in business processes

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Abstract *Many organizations are embarking upon knowledge management initiatives to enhance their competitiveness. While there has been a significant amount of multidisciplinary research in this area, the evidence from surveys of practitioners indicate that a large proportion of company projects focus on the implementation of technology-based solutions without consideration of the structural and contextual issues. Many academic authors have presented a variety of different models for knowledge management but have often failed to relate these to the requirements of practitioners. This paper presents a model of knowledge management derived from a synthesis of current literature. The model emphasizes the need for knowledge evaluation within a knowledge management approach and describes, using a case study, how this might be achieved.*

Keywords *Knowledge management, Economic processes, Banking*

Introduction

The competitive opportunity enabled by knowledge management (KM) is potentially ground breaking for many organizations. Toffler (1990) suggests that today's society has been distinguished by, and rapidly changed into, a "knowledge-based society". Nonaka et al. (2000) point out that "management scholars today consider knowledge and the capability to create and utilize knowledge to be the most important source of a firm's sustainable competitive advantage". Although academics and scholars have addressed a variety of KM issues, the take-up by industry has been slow. This is exemplified by Ruggles (1998) who reports that although the agenda for many companies is to address key socio-technical issues, the KM projects underway are predominated by the application of technology. This is supported by Schultze and Boland Jr. (2000) who state that "Organizations seeking ways to manage their knowledge assets are increasingly turning to information technology for solutions". Gray (2000) also views knowledge management systems (KMS) as a class of information system that enables the identification of "knowledgeable individuals" within an organization.

Although it can be acknowledged that there is a recognized role for information technologies (IT) in a KM program (Zack, 1999), and that the technologies may play an integral part in the processes of KM, the knowledge management system (KMS) itself is far more complex. This is supported by Meso and Smith (2000) who suggest that organizational knowledge management systems (OKMS) are complex combinations of technology and organizational infrastructure, corporate culture, knowledge and people. Therefore, slow take-up is inevitable in such a complex domain that seeks to address both tacit and explicit knowledge, formal structural

arrangements and organizational routines, within specific cultural contexts for different competitive objectives, at a variety of levels of granularity. This complexity provides a significant challenge for academics and practitioners. Although substantial progress has been made, much of the work is far removed from practice and has been reduced by many to arguments on "knowledge" definitions. While these academic debates provide foundation for the formulation of conceptual frameworks it is of little utility to industry. There is, therefore, a requirement to develop a synthesis of current work, to integrate KM research areas that appear fragmented (from an application perspective), and locate this in a framework that will facilitate future empirical evaluation and testing. This forms the objective of this paper.

The first section provides a comprehensive, but not exhaustive, review of KM models and presents an abstract conceptual model based on a synthesis of the literature. The second section describes an approach for evaluating the knowledge embedded within business processes. This approach entitled "knowledge value added" (KVA) (Housel, 1995), gravitates towards the requirements of practitioners and specifically addresses the knowledge evaluation (KE) aspect of the integrated model presented in the second section. The final section of the paper describes the application of the KVA approach to the processes of a credit card division of a leading UK bank. The results highlight the difficulties encountered and the amendments made to facilitate the successful application of the method as well as outlining its applicability to other organizations.

KM models

The aim of this section is to review the prevalent models of KM found in the literature and to identify the key emerging dimensions. These dimensions will form the foundation of an integrated conceptual model.

Hedlund and Nonaka (1993) present a model that differentiates between tacit knowledge and articulated knowledge. This is a common theme throughout the literature. In addition to the tacit-explicit dimension however, the model is extended to include four different levels of carriers, or "agents", of knowledge in organizations: individual, group, organization, inter-organizational domain. Nonaka and Takcuchi (1995) reiterate the tacit-explicit dimension but focus on the processes for knowledge conversion between these knowledge types. These processes include socialization, combination, externalization, and internalization:

- **Socialization** refers to the process of sharing experiences to create new tacit knowledge.

- **Externalization** is the process of articulating tacit knowledge into explicit knowledge.

- **Combination** is the process of converting explicit knowledge into more complex sets of explicit knowledge.

- **Internalization** is the process of embodying explicit knowledge into the organization's tacit knowledge.

Nonaka and Takouchi (1995) view the process as a spiral, operating at the individual, group, organization, and inter-organizational levels. The model assumes that tacit knowledge can be transferred through a process of socialization into tacit knowledge and then become explicit knowledge through a process of externalization. Also, the model assumes that explicit knowledge can be transferred into tacit knowledge through a process of internalization, and that explicit knowledge can be transferred to others, through a process of combination. Although, this model is rather simplistic, extreme difficulty exists in forming and transforming knowledge in the organization.

Nonaka et al. (2000) extend this model to include three elements of knowledge creation: the SECI process, Ba, and the moderator of the knowledge creating process. The first element of the model SECI process places an emphasis on "knowledge conversion" which is the creation of knowledge through explicit and tacit knowledge interactions. The second element of the model, Ba, refers to the context for knowledge creation "a shared context in which knowledge is shared, created and utilized". The last element of the model is knowledge assets that are "firm-specific resources that are indispensable to create values for the firm". These firm-

specific resources include: experiential knowledge assets (or shared tacit knowledge), conceptual knowledge assets (explicit knowledge built upon concepts held by customers and members of the organization, e.g. new product concepts), systemic knowledge assets (packaged explicit knowledge, e.g. specifications or manuals), routine knowledge assets (the tacit assets embedded in actions, e.g. organizational routines). The central focus of Nonaka *et al.*'s (2000) work is the processes of conversion between tacit and explicit knowledge and the cultural context within which this knowledge creation occurs.

Boisot (1987) presents a variant of the tacit-explicit dimension. In this model knowledge is considered to be either codified or uncodified, and as diffused or undiffused, within an organization. Codified refers to the knowledge structured for transmission purposes (e.g. financial data). Uncodified refers to knowledge that is difficult to structure and transmit (e.g. experience). The diffused-undiffused dimension refers to the extent to which knowledge can be shared. These dimensions provide a framework for the classification of knowledge types (priority, personal, public, common sense).

Bhatt (2000) provides a model that conceptualizes some discrete phases of a knowledge development cycle:

(1) knowledge creation (Nonaka, 1994);

(2) knowledge adoption (Alder, 1989; Alder *et al.*, 1999);

(3) knowledge distribution (Prahalad and Hamel, 1990); and

(4) knowledge review and revision (Crossan *et al.*, 1999).

Because creating the required knowledge (the first phase) for competitive advantage is difficult many organizations adopt knowledge (the second phase) to fulfill their needs. This was evident by the volume of benchmarking initiatives throughout the 1990s. Knowledge adoption minimizes the commitment of organizational resources by adopting knowledge from leading organizations. Caution has to be taken in this approach. It is possible for companies to fail to progress past the labeling stage of their projects (Safayani *et al.*, 1991; Plenert, 1993) and focus upon the adoption of organizational artifacts (Schien, 1984). Therefore, the strategy of benchmarking for improvement could be argued to be flawed, as it is highly unlikely that the institutional and contextual variables of both companies will remain constant to permit the transfer of practice from one organization to another.

The third phase of knowledge development cycle is knowledge distribution. In addition to the arguments for knowledge conversion and codification, the organizational structure plays an important role in distributing knowledge. Where the organizational structure is centralized or has formal authority, knowledge sharing and distribution is difficult (Huber, 1991; Savary, 1999). When the organizational structure is decentralized or has informal authority, the sharing and distribution of knowledge would be enabled. (Broadbent and Lofgren, 1993; Savary, 1999). The structure of the organization therefore plays a key role in the successful distribution of knowledge within the firm.

Knowledge review and revision is the last phase of the cycle and is especially important for organizations. Adopted or created knowledge needs to be evaluated to establish its appropriateness within a particular organizational context. However, a drawback of Bhatt's (2000) model is that it does not determine a specific direction for the knowledge development phases.

A model of KM

It is possible to identify some emerging themes from the models presented in the literature to create an integrated model. The majority of work undertaken to date has been dedicated to distinguishing between tacit and explicit knowledge (Polyani, 1966; Boisot, 1987; Nonaka, 1994; Nonaka and Takcuchi, 1995; Bhatt, 2000; Nonaka *et al.*, 2000) and the role of tacit and explicit knowledge in the creation of new knowledge. A key aspect of an abstract integrated model is therefore knowledge creation. It is also important however to identify other sources of knowledge and to differentiate between knowledge adoption and knowledge adaptation. The

former occurs when the organization focuses on acquiring knowledge from external sources due to complexity, insufficiency, or risk associated with knowledge creation. However, as indicated earlier, knowledge adoption is risky without the appropriate adaptation to the specific organizational context. The final prevalent theme is for knowledge to be distributed and embodied within the firm. This knowledge embodiment can be defined as the ability of the organization to codify, distribute, transfer, and translate the adapted knowledge into practice. All these entities require knowledge evaluation to be undertaken at each and every stage of the approach. Developing this capability, however, requires an organizational context where individuals are encouraged to share, capture, and use knowledge. These themes are synthesized and represented by the model shown in Figure 1.

As shown in Figure 1 the process for KM is highly dependant upon the organizational context. Knowledge evaluation at each stage ensures that the embodied knowledge resulting from the process can be aligned with the strategic intent of the firm and with the existing structure, infrastructure and culture (organizational context).

It is possible, however, to envisage different contexts at different levels of granularity within the organization. For example, it is possible to apply this model to each of the standard "operate" processes suggested by Smart et al. (1999). The objectives of "fulfilling orders" are likely to be different from "developing products" and from "getting orders". Therefore, although these objectives should collectively contribute to the overall strategic intent of the firm, they will each have different knowledge requirements. It is therefore possible to conceptualize the convergence of a model of standard business processes with a standard model of KM (Figure 2).

Although the model suggested in Figure 1 seems a plausible proposition it is necessary to describe "how" knowledge can be identified at the process level. The following section, focusing on the evaluation component, will address this issue. The approach described, entitled "knowledge value added" (KVA), focuses on the evaluation of knowledge within business processes.

Knowledge value-added (KVA)

KVA assumes that the most basic activity of humans, technology, firms and industries is that they change inputs into outputs. It assumes that units of change, or complexity, are universal

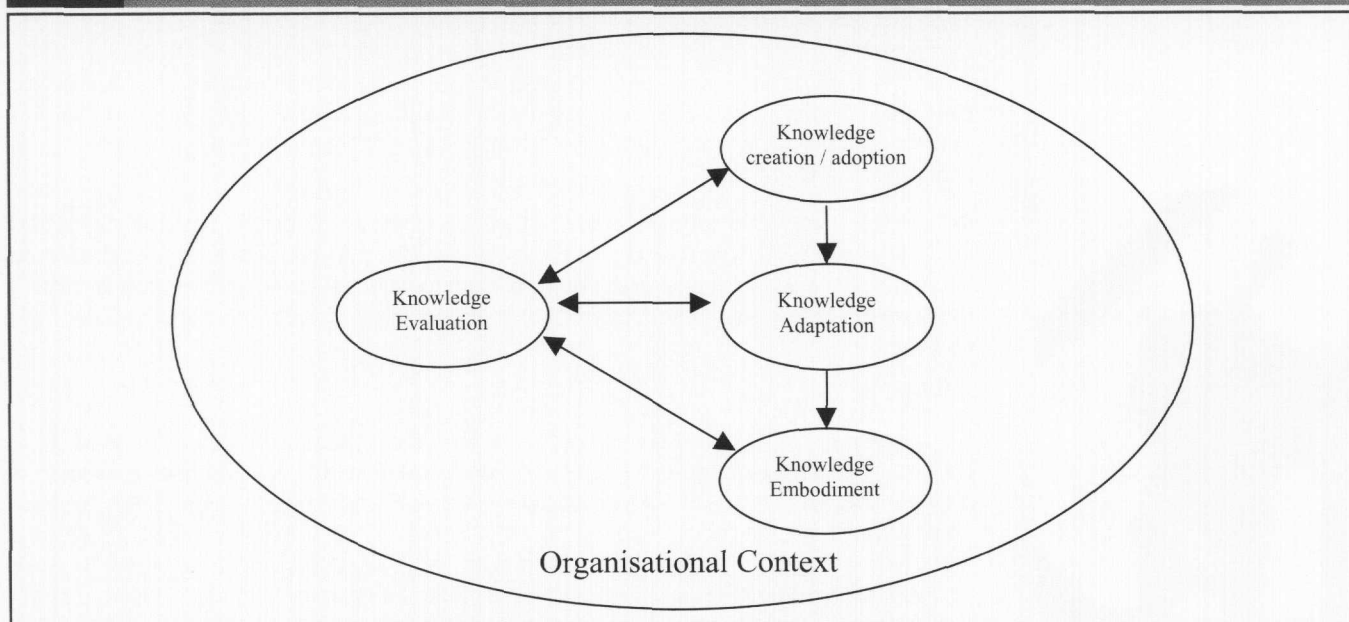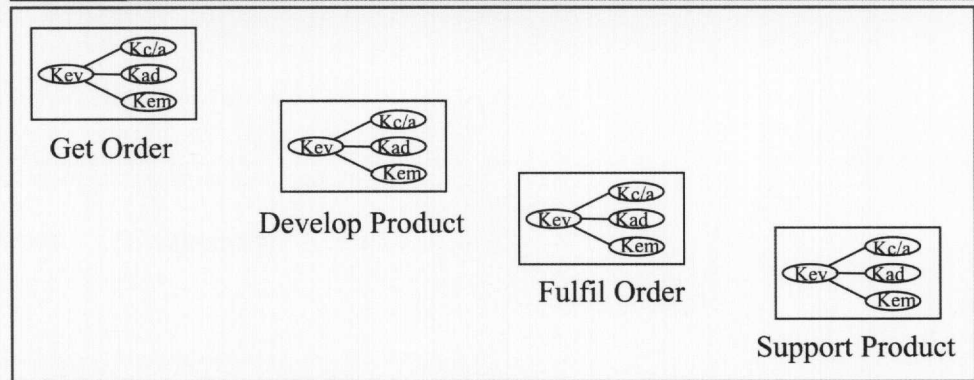Figure 1 Conceptual model of knowledge management

Figure 2 Knowledge management model with a business process context

units and can be described in a common language based on the knowledge required to reproduce the changes. KVA further assumes that firms are open systems that rely on performance feedback to self-organize in reaching their goals. The implications of this assumption are that if management is provided concurrent feedback on their utilization of knowledge assets, they will self-organize to produce the best outcomes for the firm.
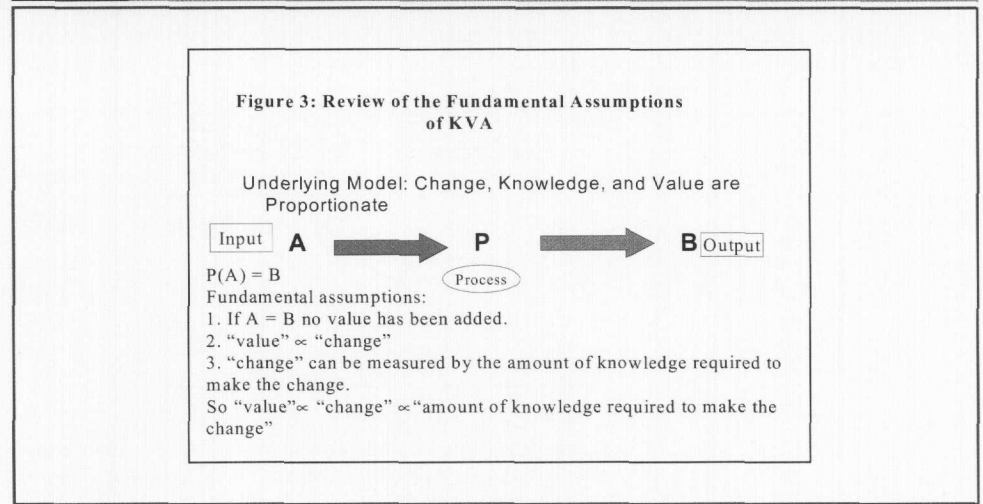
The theoretical antecedents of KVA are derived from a more general theory of business based on a computational complexity or thermodynamics. Businesses are open systems that exchange information, substance, and energy with their environments. As such, businesses have the capability, through their processes, to change the structure of raw material inputs (i.e. substance, energy, information) into final products/services. In the language of thermodynamics, this change in structure can be measured in terms of the corresponding change in entropy, when an input state a is transformed into output state b by process P i.e. $b = P(a)$.

KVA is based on "value-added", therefore, it is important to emphasize that a change in entropy when state a is transformed into state b depends only on a and b and does not depend on process P. This means that any process that P changes a into b introduces the same change in entropy or, in a business context, adds the same value. For example if a process is fully or partially automated via the use of electronic commerce technology, then the amount of entropy or value added by the technology can be measured precisely as long as a is changed into b. Therefore, it follows that if business process P is such that output b is equal to input a, i.e. $b = P(a) = a$, then no value is added by process P. In other words, "no changes = no value added". Therefore, consequently, it is possible to argue that the amount of value-added by process P can be associated (proportionally) with the corresponding change in entropy. This relationship, while fundamental, does not provide a practical way to calculate the value-added by process P, i.e. the entropy increment. A simplification of this logic is offered in Figure 3.

Now a way to "calculate" the value-added by process P is suggested. Within the subject of thermodynamics the parallelism between transformation of substances and information processing has been established (Li and Vitanyi, 1993). If a substance is transformed from state a to state b, then the difference of the entropies, i.e. $\Delta E = E(b) - E(a)$, is proportional to the amount of thermodynamic work required for the change. Therefore, it could be applied that, the amount of thermodynamic work required to transform string ("word") x into string y by the "most efficient computer" equipped with the "most efficient program" is proportional to length of the shortest program to execute this transformation, i.e. to $C(y/x)$ the conditional complexity (C) of output y given input x (Li and Vitanyi, 1993). Conditional complexity, $C(y/x)$, can be viewed in the business context as the shortest description of the process, i.e. effectively, the value added by the process.

This concept can be applied to calculating the value-added by business processes (as well as the electronic commerce technology deployed within those processes) by calculating the entropy or complexity caused by the process (and the technology supporting it) to transform an

Figure 3: Review of the Fundamental Assumptions of KVA

Underlying Model: Change, Knowledge, and Value are Proportionate

Input **A** → **P** (Process) → **B** Output

$P(A) = B$

Fundamental assumptions:
1. If A = B no value has been added.
2. "value" ∝ "change"
3. "change" can be measured by the amount of knowledge required to make the change.

So "value" ∝ "change" ∝ "amount of knowledge required to make the change"

input to its process output. To accomplish this, we will employ the parallelism between business processes and computing. Assume that process, P, can be fully specified, i.e. can be formally described as a set of instructions in formal language:

(1) there is a universal computer U equipped with program p;

(2) there is a one-to-one map from $\{a\}$ to $\{x\}$, where $\{a\}$ is the set of all possible inputs to process P, and $\{x\}$ is the set of all possible inputs to computer U; and

(3) there is a one-to-one map from $\{b\}$ to $\{y\}$, where $\{b\}$ is the set of all possible outputs from process P, and $\{y\}$ is the set of all possible outputs from U acting on $\{x\}$ by virtue of p, such that $U(p, x) = y$, if and only if $P(a) = b$.

Next, we must define the value-added by process P using the established correspondence between processes and their computer representations. It follows that the value-added by process P when it transforms a into b is proportional to $C(y/x)$ where x and y correspond to a and b as previously defined. The value-added by P will vary due to the level of detail in the description of P captured by the maps defined in point (2) above.

Another way to estimate or "calculate" the amount of knowledge contained within a core process, is to estimate how long it would take the average person to learn how to produce the outputs of a process (Housel and Kanevsky, 1998; Housel and Bell, 2001). Learning time has been a subject of study in various fields such as, psychology, education, human resource management, and cognitive psychology. In the context of KVA, learning time is a convenient way to estimate the amount of knowledge in processes and their supporting technology. The basic assumption is that the average time it takes to learn a process with predetermined outputs is proportionate to the amount of knowledge acquired and that this is in turn proportionate to the change produced by the process. Since, knowledge in the KVA context is proportionate to value added, it follows that learning time is proportionate to value added also (see Figure 4).

The use of learning time to approximate the underlying complexity of a given process is a quick, rough-cut approximation method. This method assumes that the time it takes for an "average

❝ **The average time it takes to learn a process with predetermined outputs is proportionate to the amount of knowledge acquired.** ❞

Figure 4 Learning time, knowledge and value are proportional
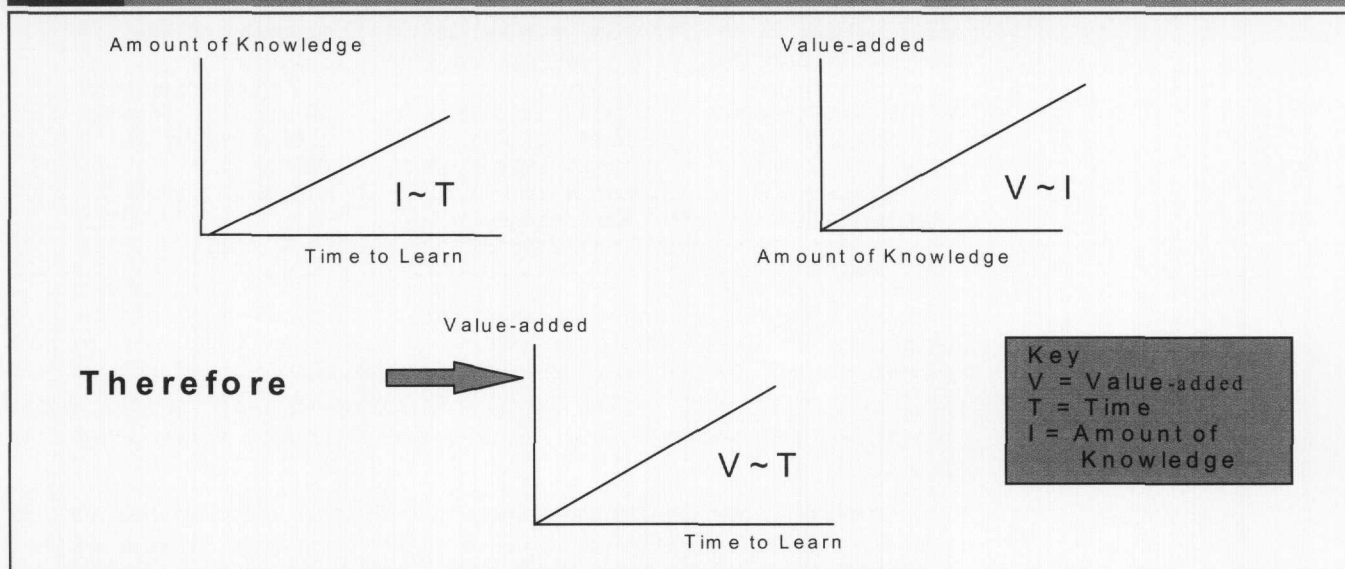
person'' to learn to execute a given process is proportionate to the amount of knowledge acquired, or the process complexity. The assumption is that there is an average learning time across a large sample of learners. Such estimates can be checked against standard training times for given process tasks. They can also be compared with other estimates of knowledge to assess the reliability of the estimates.

These methods of ''calculating'' or assigning value to knowledge, in particular the process of KM, are ''tested'' and assessed through the following case study.

Case study: UK bank

In collaboration with a major UK bank the authors set out to identify the value of the business processes and the relative value of the data used to produce process outputs. The approach was based broadly on the KVA method (Housel, 1995) described in the second section. In discussions with the bank the credit card division was identified as the most appropriate for analysis. This division had already undertaken an analysis of its business processes and had readily available activity based costing (ABC) data. The credit card division is one of the largest in the UK and is a substantial source of bank profitability. It employs over 1,000 staff at two locations in southern England.

Step 1: Identify the business processes

This stage of the KVA approach is to identify the major business processes. In discussions with senior credit card managers the business processes in Table I were identified. The major seven business processes are shown in bold.

Step 2: Identify the knowledge in the processes

The next step of the analysis was to identify learning time within each of these processes. To do this some of the very large processes were decomposed into more manageable sub-processes. These are shown on the indented list in Table I. Applying learning time, as indicated by Housel (1995) was extremely challenging. Some of these processes were highly complex, e.g. disputes and reconciliation had developed an extensive knowledge base that was documented in a series of large files. Learning how to deal with many categories of disputes took years. However, relatively inexperienced staff could assess some categories of disputes. The variation was substantial. It was impossible to assign a general learning time across the sub-process. The alternative of developing a common language was felt to be unfeasible in a division of well over 1,000 staff.

Table I List of processes and sub-processes

Acquire account	Manage client account	Business sustaining
Manage Client Borrowing	Complaint handling	Support
Credit Management	Lost and stolen	Change management
Manage client repayment	Disputes and reconciliation	**Manage client borrowing (fraud)**
Statement issuing	Branch support	Fraud investigations
Payment processing	Disputes and chargebacks	**Develop**
Unpaid investigation	Manage client	Payment insurance
Missing payments	Estate settlement	
	Card replacement	

Discussion with senior bank staff from the personnel department provided a solution. The bank uses Hay points as a means of job evaluation. Hay points include an element or evaluation of the assessment of the knowledge required to do a job. Thus for example, 90 points was a relatively simple job with little knowledge required, 250 points was a complex job, typically carried out by a graduate.

The personnel department provided us with every Hay point score for each process within our model. There was, as we anticipated, substantial variation. For example, business sustaining had 16 people at 150 points and 6 people at more than 250. We now totaled the number of Hay points per process and then calculated the percentage of Hay points for each process as a percentage of the whole business. This is shown in Table II. This analysis, therefore, provides an indication of how much knowledge is required to carry out a process. It is clear from Table II that managing the client was a crucial process. In fact, this was the largest single department and again dealt with a high variety of tasks.

Step 3: Assessing importance of data item in producing that output

This activity was to identify the important data items within the business. The rationale for this stage was to determine the data items that contributed to the output of each process and hence played an active role in the generation of value.

Three classes of data item, according to importance, were identified. These may be described as: "identifiers", "high value", and "lower value" items (Figure 5). To pilot the approach a focus on the "identifiers" was taken (Table III). This may be regarded the most vital set of data items for two reasons. First, without the identifier set it is impossible to be specific about the customer. Inaccuracy, e.g. multiple addresses, could mean that a customer could receive multiple mailings or receive information on products that they already possess. This is likely to directly affect customer satisfaction and hence the value generated. Second, a large amount of cost is expended in managing the accuracy and consistency of these items across bank

Table II Knowledge per process

Process	Total per process	% total	Process	Total per process	% total
Acquire account	9,483	14	Disputes and reconciliation	695.5	1.05
Manage client borrowing			Branch support	2,300.5	3.47
Credit management	3,237.5	5	Disputes and chargebacks	4,548.4	6.85
Manage client borrowing fraud			Manage client	22,793.5	34.34
Fraud investigations	2,117.7	3.19	Estate settlement	442.8	0.67
Manage client repayment			Card replacement	2,983.9	4.50
Statement issuing	1,422.9	2.14	Develop		
Payment processing	76.5	0.12	Card plus	2,392.4	3.60
Unpaid investigation	214.2	0.32	Payment insurance	925.5	1.39
Missing payments	1,289.05	1.94	Business sustaining		
Manage client account			Support	3,348	5.04
Complaint handling	725.8	1.09	Change management	529	0.80
Lost and stolen	6,846	10.31			

Figure 5   Classes of data item
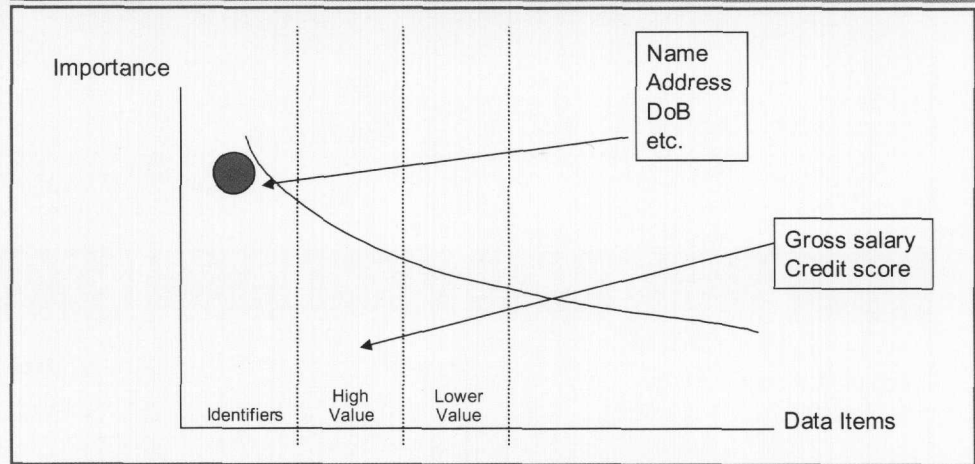
Table III   Data item (identifiers)

Title	Gender	Forename	Initials
Surname	Date of Birth	Address	Home telephone no.

database systems. This cost is expended without any visibility of their contribution to business processes and hence their value.
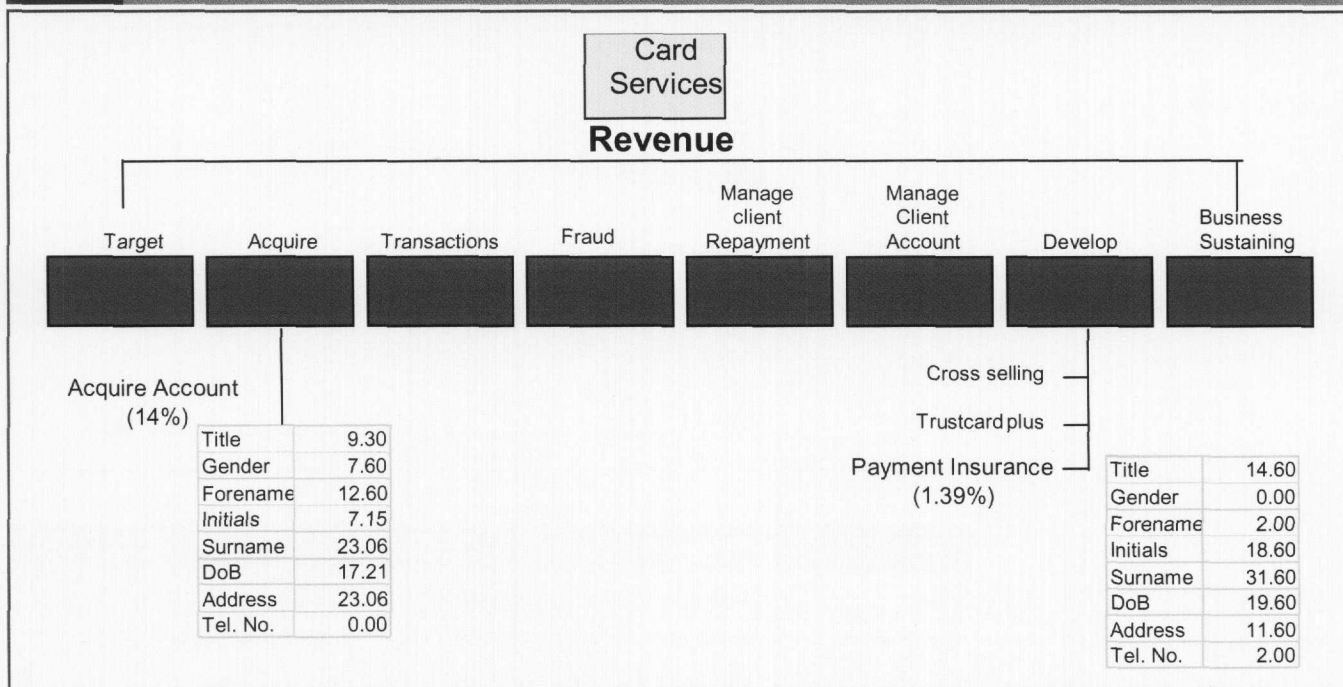
To concentrate on those data items that produced value across the bank, attention was focused on valuing the importance of the identifiers. The first step involved the production of a standard pro-forma for data collection. Personnel from each area where asked to complete the pro-forma. The major outputs of each sub-process were identified and members of the team were asked to rank the relative importance of each of the identifiers in relation to the achievement of each output. The approach was piloted with the ''account acquisition'' and ''payment insurance'' processes. In both cases five key process outputs were identified. The percentage scores for each identifier-output interaction were calculated (Table IV). In effect, this scoring provides the relative importance of each of the identifiers for the higher-level process and therefore enables a judgment on the role that they play in generating value.

The data from this analysis was integrated with the knowledge value derived from applying the modified KVA approach. In summary, the research facilitated the identification of process value, using knowledge as an indicator, and the derivation of the relative importance of key data items in achieving this value (Figure 6). It is therefore possible, taking a systems approach, to derive

Table IV   Value of data items

Outputs	Account acquisition						Payment insurance					
	A	B	C	D	E	Total	A	B	C	D	E	Total
Title	0.00	15.50	15.50	15.50	0.00	9.30	15.00	20.00	20.00	0.00	18.00	14.60
Gender	0.00	15.50	7.00	15.50	0.00	7.60	0.00	0.00	0.00	0.00	0.00	0.00
Forename	0.00	15.50	15.50	15.50	16.50	12.60	10.00	0.00	0.00	0.00	0.00	2.00
Initials	0.00	7.00	15.50	7.00	6.25	7.15	15.00	20.00	20.00	20.00	18.00	18.60
Surname	33.33	15.50	15.50	15.50	35.50	23.06	20.00	20.00	20.00	80.00	18.00	31.60
DoB	33.33	15.50	15.50	15.50	6.25	17.21	40.00	20.00	20.00	0.00	18.00	19.60
Address	33.33	15.50	15.50	15.50	35.50	23.06	0.00	20.00	20.00	0.00	18.00	11.60
Tel No.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	2.00

Card
Services
Revenue

| Target | Acquire | Transactions | Fraud | Manage client Repayment | Manage Client Account | Develop | Business Sustaining |

Cross selling

Trustcard plus

Acquire Account
(14%)

Title	9.30
Gender	7.60
Forename	12.60
Initials	7.15
Surname	23.06
DoB	17.21
Address	23.06
Tel. No.	0.00

Payment Insurance
(1.39%)

Title	14.60
Gender	0.00
Forename	2.00
Initials	18.60
Surname	31.60
DoB	19.60
Address	11.60
Tel. No.	2.00

the value of each of the key data items. Figure 6 illustrates the value of two processes, account acquisition and payment insurance.

From this simple example we can determine the different values identify that different processes have to the business and that within those processes different data items have different levels of importance (different value). We can identify that the data item telephone number is of very little importance in either acquiring an account or in payment insurance whereas surname is crucial for identifying any previous bad debt history.

Discussion

Having presented and tested a model of KM related to business processes the ability to apply the ideas more generally needs to be discussed. The generalization of the case study results lies in the applicability of the three-stage approach that was taken. Each if these stages will now be taken in turn.

Step 1 is concerned with "identifying the business processes". There are a many tools and techniques for identifying business processes and much architecture. Many authors have recognized the importance of defining a business process architecture include Meyer (1993), Kaplan and Murdock (1991), Davenport (1993) and Harvey (1994). In recent years a number of business process architectures, in a variety of sectors have been developed. In a comprehensive evaluation of enterprise reference architectures, Smart *et al.* (1999) point out that "examples of reference architectures can be found for computer integrated manufacturing (CIM) initiatives (AMICE, 1993; Williams, 1994), integrated information systems projects (Scheer, 1993), and for enterprise modeling (CEN, 1990)". Perhaps the most useful of the high

** At each and every stage of the KM process it is important to evaluate knowledge to ensure its relevance to both strategic objectives and organizational context. **

level frameworks is that of CIM-OSA (AMICE, 1989) that differentiates between manage, operate and support processes. An extension of the definition of the operate processes now exists. Smart *et al.* (1999) propose "get order", "develop product/service", "fulfill order" and "support product/service" as a useful starting point for the identification of business processes. These architectures and their developments provide an excellent starting point for the wider applicability of the approach.

Step 2 "identify the knowledge in the processes" is probably the most difficult of the steps to generalize. In the case example there was access to Hay point job evaluation data. This type of data, where jobs are evaluated across a large organization is by no means uncommon. However it cannot be assumed to be in place in all organizations. Although, some assessment needs to be made for knowledge in the processes. Alternatives could be used, for example, a knowledge attribution workshop. This method could begin with the agreed set of business processes and then in the workshop a group of senior managers allocate 100 points across the processes based on how much knowledge is required to carry out that process. This method was validated within the case study in the credit card operation where when senior managers were asked to apportion 100 points across their business processes the result produced was very similar to the Hay point method. A second alternative would be to use salary levels as a proxy for knowledge. However, there could be major drawbacks with this approach, which was indicated within the case study. It was found that there had been a salary drift with some activities historically allocating higher salaries than others even though the level of knowledge required to carry out the process was generally recognized to be less. Whatever approach is taken it is recommended that more than one method should be used so that there is some triangulation of data.

Step 3 consists of "assessing the importance of the data item in producing that output". The categorization of identifiers, high value and lower value is one that could be useful for any company. It could even be argued that for service sector companies the eight identifiers of, title, gender, forename, initials, surname, date of birth, address and telephone number are absolutely crucial. There may be others that could be added for example, e-mail address might displace home address in some Internet companies, a unique customer number or password may be used as an identifier, but the general principle remains, the identifiers are crucial. Without these the company will not be able to identify specific customers. In turn, back office operations will not know the vital importance of the integrity of specific data items. It is recommended that any company undertaking this approach of identifying value in its business processes begins with its identifiers and that the categorizations suggested are an excellent starting point for that analysis.

Conclusion

This paper has highlighted that the majority of work in the KM area is both theoretical and conceptual. A model integrating the key themes emerging from the KM literature has been proposed. This model, although abstract, provides a process that companies may adopt in addressing KM initiatives. An additional concept added to the model is "knowledge evaluation". It is postulated that at each and every stage of the KM process it is important to evaluate knowledge to ensure its relevance to both strategic objectives and organizational context. This is especially important when companies are undertaking benchmarking exercises and are attempting to adopt the practices of best in class companies. While most authors emphasize the importance of organizational context, it has been asserted that context is highly dependant on the level of granularity employed. The context of different "operate" business processes is likely to be different and hence an approach for evaluating the knowledge embedded in business processes is necessary. The approach adopted to achieve this evaluation, the KVA approach, has been described.

The approach was applied at a leading UK bank. Modifications and extensions to the approach, derived from the case study, were necessary. Learning time, while a theoretically useful concept, was difficult to apply at the bank. Hay point data provided a useful alternative as a foundation for establishing the knowledge embedded within business processes. Extending the approach to include an assessment of the role key data items have in achieving the output is a
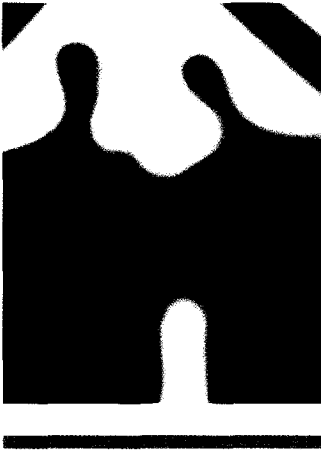
useful exercise. While many organizations have expended large amounts of capital in data warehousing and on managing the integrity of data, few are able to justify the value. Using knowledge as an apportionment method and synthesizing this with the relative importance of data items in achieving the outputs of key processes suggests that this is possible. Finally, an approach that could be used by other organization has been suggested. It is argued throughout the paper that the ability to understand the "value" of the knowledge within business processes is a useful one and will hopefully help and support better utilization of organizational resources.

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