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Measuring knowledge management as a strategic resource

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Abstract

This paper reviews the existing research on the measurement of the value of knowledge and the impact of KMS on organizations in the Information Systems, Finances and Management literatures to try and derive a better understanding of the strategic value of knowledge. The papers argues that the focus of existing metrics is at the operational rather than the strategic level and subsequently does not provide a sound basis to determine strategic value, a metric important in Finance. The paper proposes that the strategic value of knowledge can be derived from an aggregated sum of the metrics at the operational level supplemented by some measure of the alignment of knowledge value aggregates with strategic goals and plans and another measure of the opportunity cost of tacit knowledge. An exploratory exemplar of a Thai company is used to illustrate the framework.

Key Words

Knowledge, knowledge management, strategy, measurement, metrics

INTRODUCTION

Managing organizational knowledge is considered to be a strategic asset (Bollinger and Smith, 2001; Michalisin et al 1997; and de Hoog and van der Spek, 1997). In fact since 1980 much has been written about the strategic value that organizations gain from knowledge and other intangible assets. It has been well argued that new knowledge adds considerable value within an organization. However we are still unsure about what the real measure of that added value is. How does an organization put a value on knowledge? The problem lies in the non-existence of standards of measuring value from knowledge. This problem was highlighted by Kankanhalli and Tan (2004) who noted the lack of studies focusing on evaluation of Knowledge Management (KM) strategy and highlighted the lack of standards which has lead to a proliferation of measures and difficulty in comparing the outcomes. This paper reports an analysis of strategy and the meaning of value in relation to KM and knowledge management systems (KMS) proposing another view of value which will go someway towards creating the set of standards urgently needed to support new investment in IT. The paper defines the strategic value of KM and suggests a new conceptual framework against which organizations can evaluate strategic value.

KNOWLEDGE AS A STRATEGIC ASSET

Strategic alignment and strategic governance are the keys to ensuring that your enterprise is fully exploiting your competencies, technologies, and competitive advantages for maximum impact in your target markets. The characteristics of a strategic asset or resources are defined as one being valuable, rare, inimitable and non-substitutable (Bollinger and Smith, 2001). They argue that knowledge meets these criteria and conclude that if organizations want to remain competitive they should develop mechanisms for capturing relevant knowledge and disseminating it accurately, consistently, concisely and in a timely manner to all who need it. Bollinger and Smithy also argue that strategic assets are the critical determinants of an organisation's ability to maintain a sustainable competitive advantage. However, how do we know what the value of that knowledge is as a strategic resource or asset. We know considerable detail about the estimated price value, and cost value of knowledge. Typical business metrics focus on these elements. For example, Weiss, Capozzi and Prusak (2004) argue that an organization

employing more than 1000 employees might easily incur a cost of more than \$6 million per year in lost productivity as employees fail to find existing knowledge; they need, or waste time searching for non-existent knowledge that is available but cannot be located. They also note that one Fortune 50 manufacturing organization in the USA spent \$22 million developing a database for their 3 million documents? However do we know that that strategy was effective and created value for the organisation?

Horwitch and Armacost (2002) argue that the strategic worth of knowledge management lies in their ability to open new markets, eg they note the \$1.5 million that was traced by an account director in British Telecom to his team's use of the BT Knowledge Management System, Intellact. However strategy is more than just market growth. However Kochhar (1997) argues that the possession of a source of sustained competitive advantage is not sufficient to obtain improved value. Knowledge management is a conscious strategy for moving the right knowledge to the right people at the right time to assist sharing and enabling the information to be translated into action to improve the organizational performance (O'Dell and Grayson 1997). Valuable corporate knowledge can be viewed as highly complex and fluid, with inherent difficulties in managing it from traditional thinking perspectives (Allee 1997). Alstete (2003) states that a knowledge management process that incorporates a solid planning model with concerns about strategic knowledge asset security seems to be needed in today's world of multiple threats from competitors and others who seek to steal or destroy knowledge assets¹.

Measuring the knowledge asset, therefore, means putting a value on people, both as individuals and more importantly on their collective capability, and other factors such as the embedded intelligence in an organisation's computer systems. Today's financial accounting practices must bear some of the blame for our inadequacy of measuring the knowledge asset. Their techniques for valuing physical assets are highly refined, yet most company accounts tell you little about information assets, yet alone knowledge assets.

SOLUTIONS TO THE VALUE PROPOSITION FOR KNOWLEDGE MANAGEMENT

In the literature three co-existing yet emphatically different sets of measures and metrics exist with regards to the value of knowledge and knowledge management in organizations. In the Finance literature the focus is on Strategic Value analysis (SVA). In Information systems the approach uses accounting measures and other metrics to measure the impact of the implementation of KMS and KMI. In management the focus has been on process. After a brief review of all three, a framework is suggested that has a more strategic focus albeit one that relies on the micro measures already alluded to and a framework that brings the value proposition into a broadened perspective.

Strategic Value analysis

Strategic Value Analysis (Kochhar 1997) underlies the success and competitiveness of leading Japanese companies such as Toyota. First created as an engineering product design methodology in the United States, it was subsequently taken up by Japanese companies who developed and enhanced the technique into a major managerial tool incorporating accounting information, and used it to reduce product cost and improve product functionality and value for customers (Yoshikawa et al (2002). In recent years it has been expanded as a means of re-engineering overhead areas, structuring decisions and identifying decision alternatives and developing strategic performance measurements. Yoshikawa et al (2002) argue that KM unleashes value through process clarification, process efficiency, business model flexibility, market insights, customer loyalty and productivity increases. They argue that any measure of the impact of KM is not easy at the operational level but translate to unique competitive advantages, measurable at the macro financial analytic level of the organization, and this becomes some measure of its impact strategically.

Market and company financial data are used to make a distinction between operating value and strategic value. Operating value (OV) is based on current profitability (NOI) and operating capital (OC). More precisely:

$$OV = PV \text{ of } NOI + OC.$$

Since investors value both current and potential future profitability, their expectations of future profits are built into the share price. From that, strategic value (SV) is determined as the difference between market value (MV) and operating value, or:

$$SV = MV - OV.$$

By determining strategic capital (SC), i.e., capital not used in calculating NOI, and subtracting that from strategic value, we get the value added on strategic capital (SCVA), or:

$$SCVA = SV - SC.$$

The difference between actual and strategic value can be explained best by analogy. Within a retail bank a banking customer can have a checking account, savings account and car loan. This customer provides a certain regular profit to the bank each month, generated by transaction fees and the investment spread between the bank's borrowing and lending rates and the rates the customer pays. Banks expect their customers to remain with the bank for a number of years, thereby creating a continuing income stream. The net present value of this continuing income stream represents that customer's LTV--the lifetime value loss suffered if that customer defected to another bank.

Suppose that in addition to these accounts, this customer also has a home mortgage at a competitive bank. For the competitor bank, the profit on the home loan represents the customer's actual value. However, to the initial bank, it is only an unrealized potential. The expected profit from that home loan represents one aspect of this customer's strategic value to the initial bank. In addition, if this customer owns a computer and a modem and does not participate in the initial bank's home banking services or if the customer is presently studying with substantial potential income, then each of these factors also represents different aspects of strategic value to the bank. In terms of knowledge the inability of an organization to engage in successful knowledge transfer or to eek out the value of tacit knowledge, represents an opportunity costs that affects the strategic value of that knowledge to the organization.

There is another aspect of the strategic value of knowledge to an enterprise - competitiveness improvement. This represents business value that could be derived if you could convince the customer or the employee to give it to your organization rather than to a competitor, or knowledge to your organization rather than it remaining inert. That difference between actual and strategic value can be added to by knowledge.

By extension then we would argue that the value of knowledge can be added into the equation. Operating value (OV) is based on current profitability (NOI) and operating capital (OC). More precisely:

$$OV = PV \text{ of } NOI + OC.$$

Since investors value both current and potential future profitability, their expectations of future profits are built into the share price. From that, strategic value (SV) is determined as the difference between market value (MV) and operating value, or:

$$SV = MV - OV.$$

However, operating value can be more precisely defined in terms of the assets that create that value. In effect operating values from the cost perceptive ignores the costs specific to the type of resources. Operating costs are affected by the cost of fixed assets, mostly capital, plus variable costs such as disposable assets, intangibles and the costs of labour. Within this definition the problems, already identified in previous research discussion about intangibles, is the nature and cost of knowledge. There is both the opportunity cost of tacit knowledge being inert, the opportunity cost of access of tacit knowledge by competitors and the actual costs of maintaining employees with the explicit knowledge needed by the organization. In addition there is the transfer cost of both explicit knowledge and the transfer cost of tacit knowledge when exposed. Finally there are the costs of knowledge capture, knowledge audits and knowledge exchange. Each becomes a cost because each represents an opportunity cost of non-disclosure or forgone disclosure.

Therefore we can rewrite the equation of OV to be:

$$OV = PV \text{ of } NOI + OC$$

$$OV = PV \text{ of } NOI + (VFA + VA + VCHR)$$

Where the variable costs of HR can be explicitly measured by productivity (VP) and the value of knowledge (VK).

$$OV = PV \text{ of } NOI + (VFA + VA + \{VP + VK\})$$

In making the value of knowledge an explicit part of the strategic value equation, it makes the value explicit and thus its real strategic value can be assessed. By determining strategic capital (SC), i.e., capital not used in calculating NOI, and subtracting that from strategic value, we get the value added on strategic capital (SCVA), or:

$$SCVA = SV - SC.$$

By substitution this equation can reflect the variables influencing the real value added on strategic capital, a key concern for the actual value of a business.

$$SCVA = [MV - PV \text{ of } NOI + (VFA + VA + \{VP + VK\})] - SC$$

The key to this equation is that any change created by adding value through knowledge will mean not only an increase in the operating value of an organization but also and more importantly the strategic value of the business. Therefore the research on metrics of knowledge and its impact is very important to derive an aggregated view of the value of knowledge. However this type of analysis goes nowhere in understanding what the actual value of knowledge at the strategic level is. It like the next section supports an operational view of business value.

Metrics for KMS and KMI

Kankanalli and Tan (2004) reviewed the operational and strategic metrics in use across industry and in the research literature. Clearly their focus is at the operational level of outputs. These types of impact, they argue, can be measured in terms of effectiveness e.g.

- **KM initiatives:** this considers factors such as how well the organization performs; the extent of customer satisfaction when using the products or services; the increase on the shareholder values; the improvement of effort duplication; how well employees feel about their work, environment, and relationships.
- **Knowledge creation:** This impact is measured in terms of how far the competencies of employees as well as of the organizational core are improved.
- **Knowledge internalization, externalization, combination, socialization:** This criterion will enable managers to look into the KM practices to see whether they are available, effectively utilized and shared.
- **KM capability:** This criterion measures how well the organization anticipates and identifies the opportunity or how fast organization launches their products to market.

The review of these metrics is summarized in Table 1.

Table 1. Selected Studies on Organizational level KM evaluation (Source Kankanalli and Tan (2004))

Impact of	Performance Criteria
Overall KM initiative	KM effectiveness (organizational performance impacts)
KM initiative	Organization performance, customer satisfaction, ROI, shareholder value, reduced duplication of effort, employee satisfaction
Knowledge creation	Economic benefit <ul style="list-style-type: none"> • Worker competence (human capital) • Organization core competence • Task completion time and cost
Knowledge internalization, externalization, combination, socialization + all KM tools use	KM satisfaction (availability, effectiveness of knowledge, KM at task, directorate, across organization, knowledge sharing)
KM capability: Knowledge infrastructure, Knowledge process	Organization effectiveness <ul style="list-style-type: none"> • Innovation and commercialization, coordination of unit • Anticipate and identify opportunities • Speed and adaptation to market • Avoid redundancy and streamline
IT knowledge relatedness	Market based performance Tobin's Q

However, these metrics are not really strategy focused. They determine the operational level metrics of application implementation. In an attempt to deal with this, researchers in Management have used an alternative focus. Boudreau (2003), DeNisi, Hitt and Jackson (2003), Evans and Wurster (1998,1999), Rayport and Sviokla (1995), Seely-Brown and Duguid (2000), and Wiig (1997) amongst many researchers argue that not only is the systematic measurement of knowledge important in supporting decision about human capital, about finance and share prices but it also signals how knowledge is valued. They argue that researchers have to look beyond merely developing measures; they argue that knowledge measurement should articulate test and reinforce connections between knowledge and competitive advantage. They acknowledge that there is no shortage of measures of intellectual capital (Bontis, Dragonetti, Jacobsen and Roos 1999, Petrash 1996 and Barsky and Marchant 2000). What they argue is needed is a set of measures to assess the role of knowledge in the organization's value chain.

Boudreau (2003) and De Nisi et al (2003) propose that KM measure relate to three organizational structures: Knowledge stock, the existing level of knowledge at any point in time (includes, patents, financial statements, annual reports, policy documents, other publications, citations, research reports, process and operational manuals, archival directories of organizational experience HR repositories, knowledge flow, the movement of knowledge between entities and knowledge enablers – the levels of organizational investment, structures and activities established by any organization aimed at changing or maintaining knowledge stocks or influencing knowledge flows. These are shown in Table 2.

Table 2 Knowledge Measures (Source: Boudreau (2003))

Stocks	Flows	Enablers
Accounting Augmenting financial statements Patents or publications and their citation patterns Organization experience and competitive rivalry Learning curves Unit-Level Education, Experience and Job Requirements “High-Performance” Work Systems	Performance changes between units of firms Type of alliance reorganization Perceived knowledge flows between units and alliance partners Movement of routines, tools and ideas including patents Perceived information exchanged or awareness of knowledge available in other units Collaboration and information sharing between colleagues Analysis of work products for sources of ideas and information	Geographic and political proximity International and Domestic Organizational and Alliance Design R&D expenditures Absorptive capacity Network attributes (strength, intensity, structure, communication, individual movement) Tacitness

Knowledge flows can be measured, they argue by tracking changes in knowledge stocks. They also argue that metrics such as the number of expatriates can be used as a proxy for market-specific knowledge or knowledge about international management. In addition knowledge flows can be measured using archival data about alliances and partnerships. The levels of shared reality (Levine, Higgins and Choi (2000)) can also measure knowledge flows.

Knowledge enablers facilitate changes in knowledge stocks or flows and are stimulated Boudreau (2003) and De Nisi et al (2003) both argue by geographical and political proximity, by alliance and partnership design, by expenditure on R&D within any organization, and by the absorptive capacity of both individuals and the organization itself. They argue that the level of absorption of knowledge is affected by prior knowledge and by tacitness and networking. How much effort is needed to move knowledge is a measure of its tacitness and this is facilitated by the levels of trust (Fiol 2003) within the organization. With more trust, Fiol argues, less effort is required to move tacit knowledge.

A FRAMEWORK OF STRATEGIC MEASURES OF KNOWLEDGE MANAGEMENT.

The financial analysis of the value of knowledge infers that the inherent value of knowledge increases the strategic value of the business. The question is by how much? K&T show that the use of operational based measures of KM _based systems, data-warehouses, expert systems, Intranets etc can enable some understanding of the metrics possible to determine the value of knowledge. However, they argue strongly that there are no standards in these measurements and subsequently there is no real possibility of comparative assessment of the impact of knowledge within the organization. To illustrate this further, it is informative to review just one measure of knowledge – tacitness. Tan and Libby (1997) used scenarios to measure deviations between employees’ and partner ratings of behaviors relating to managing self. Their focus was accountants. Bergman, Jantunen, and Saksa (2004) tested scenarios framework in an inter-industrial research project resulting in very promising findings about managing tacit, future-oriented knowledge. Zander and Kogut (1995) evaluated tacitness by focusing on ratings about codifiability, complexity and systems dependence of engineers in one case study. Simonin (1997) used a similar tool for managers about alliance partner technologies. Finally Subramaniam and Venkatraman (2001) used ratings of information based on various dichotomies e.g. simple V complex, easy V difficult to document, obvious V subtle etc. In effect there are no standards so comparative studies at the operational level of KM are currently not supportable.

However, such impact we believe begs a larger question, that of strategic impact. Like all accounting and financial measures aggregation is possible and is the way of managerial and cost accounting. However such aggregation has to have a focus. The emphasis on the value of knowledge and the effort put into measuring its value should, we believe, focus on the strategic impact in the same way that that tangible assets are valued strategically by business organizations. Strategy is about a direction, a goal. It is a representation of where the organization wants to be.

Strategy forms the basis for organizational planning and is the source for operational planning. Like so much in Information Systems research we seek to understand the operational outcomes and impacts of systems and their derivatives. We are concerned with the micro impact of Intranets and data warehouses and more recently with ERP and CRM systems. We focus on critical success factors and understanding the drivers of failure. We do that well. We have in the literature developed a significant number of conceptual and explanatory models which focus our attention on understanding why we have success or failure at the operational level. However, like business, we must also focus strategically, not on individual strategies built on the strategic impact of knowledge. Explicit knowledge is already valued in any organization. Salaries best represent that knowledge. Any organization which seeks a strategic change in direction or established strategic goals will recruit to bring in the knowledge and skills necessary to meet those goals. However it is the strategic impact associated with the transference of that knowledge and then the tacitness of other knowledge that also impact on strategic outcomes. One reality for strategy is that there should be some focus on the opportunity cost of foregone value and the potential value of tacit knowledge that already exists in organizations. So what of measurement?

Strategic value comes from being able to adapt to change quickly. Strategic value comes from recognizing potential sources of innovation and the extraction and conversion of tacit knowledge. Therefore strategic value is a presumptive measure. It like the financial view of value represents a gross alignment of value derived from the impact of business process. To understand strategic value of knowledge we need to ensure the alignment of organizational strategic goals with organizational planning and operations. The operational value of knowledge can be determined, albeit without standards as yet. However the conversion of aggregated operational value to strategy is not just an accounting exercise. Simply summing the total of all operational value from knowledge neglects two important considerations, the alignment of outcomes to strategic plans and goals and the opportunity cost of foregone value by the non-disclosure and/or use of tacit knowledge.

Measuring the strategic value of knowledge or KMS must involve then three dimensions:

1. The measurement of aggregated operational value derived from knowledge.
2. A measure of the alignment between the value derived operationally and the strategic goals and plans of an organization; and
3. Some measure of the opportunity cost of value foregone by its non-exploitation or disclosure.

In an exploratory case study, as part of a pilot for a much larger study, of a large Asset Management Company in Thailand the framework's propositions were tested with the CEO as part of a much larger study targeting the top 50 companies in Thailand. The CEO noted that "most companies use KM for operational purposes. However their impact is marginal" In essence the CEO argued that the operational impact of KM initiatives derives business value marginally. Each initiative means that a KMS, or data warehouse, or Intranet item etc can derive an incremental level of value based on the success of the initiative. The CEO noted that such use of KM and KMS was in a sense a short-term issue designed to create market confidence and increase the Market Value (MV) of the organization. This can be achieved through aggregation of the marginal revenues derived. However, he also argued that such an impact could also have a minimal effect if the gains in value are only effective in the short term. This CEO argues that effective KM and use of a KMS can only derive real long-term strategic value if they create asset value which increases the capital stock of the organization. In effect he argues that the real strategic benefit of KM and the use of KMS derives from their potential to improve the capital asset basis of an organization. The strategic value of KM then derives from seeing the impact of the use of KM not from the marginal revenue aggregations from the use of various KM systems but rather from the value generated in terms of the strategic goals of the organization in the long term. KM has to foster sustainable business growth in both market value and strategic value through asset accumulation. Therefore there has to be an alignment between what the organizations expectations about the value generated by KM are and the strategic goals.

Finally the CEO commented on the role of foregone benefits and revenues from the lack of use of a KMS and the opportunity cost forgone. He noted that "... opportunities have two impacts. In the short term they are opportunity costs at the margin and their real value is only their addition to any aggregation of marginal revenues in the organization. However, in the long term their impacts can be perceived differently. In the long term their value can contribute to business value as a multiplier. It can generate significant income, but only if it is aligned with strategy". In essence he argues that the alignment of KM initiatives and their outcomes with strategic, long-term goals is the source of sustained growth in business value. Short terms gains cannot constitute alignment as they can be just responses to normal business cycles and not necessarily sustainable.

CONCLUSION

To understand the strategic value of KM and the impact of KM systems it is important that the three measures argued for above are used. This research will continue to test these propositions with more CEOs. The argument that operational measures of Km are exacting enough is challenged in this exploratory study and reflects the wider strategic view that CEO's operate with in their use and assessment of Knowledge Management in organizations. However, such explorations are essential business-wide rather than framing any internal focus of users of Knowledge Management systems. Their focus would most probably be operational and their utility assessed by the measures reviewed by Kankalli and Tan (2004). This suggests that the alignment of strategy and measure effects of Knowledge Management systems needs to be reflected in the perspective of the user. This pilot study will be extended to develop that differentiation.

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