

# Knowledge Management Metrics via a Balanced Scorecard Methodology

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## Abstract

*IT professionals are finding that more of their IT investments are being measured against a knowledge management (KM) metric. Those who want to deploy foundation technologies such as groupware, CRM or decision support tools, but fail to justify them on the basis of their contribution to KM, may find it difficult to get funding unless they can frame them within the KM context. Determining KM's pervasiveness and impact is analogous to measuring the contribution of marketing, employee development, or any other management or organizational competency. This paper addresses the problem of developing measurement models for KM metrics and discusses what current KM metrics are in use, and examine their sustainability and soundness in assessing knowledge utilization and retention of generating revenue. The paper will then discuss the use of a Balanced Scorecard approach to determine a business-oriented relationship between strategic KM usage and IT strategy and implementation.*

## 1. Introduction

*"Knowledge has become the key economic resource and the dominate – and perhaps even the only- source of competitive advantage." -- Peter Drucker, Managing in a Time of Great Change [5].*

Knowledge management can be defined a set of processes for transferring intellectual capital to value – processes such as innovation and knowledge creation and knowledge acquisition, organization, application, sharing, and replenishment [15]. The definition of knowledge is complex and controversial, and can be interpreted in many different ways. Much of the knowledge management literature sees knowledge in very broad terms, covering basically all the "software" of an organization. This involves the structured data, patents, programs and procedures, as well as the more intangible knowledge, and capabilities of the people. It can also include the way that organizations function, communicate, analyze situations, come up with novel solutions to problems and develop new ways of doing

business. It can also involve issues of culture, custom, values and skills as well as its relationships with its suppliers and customers. Knowledge management is a strategic, systematic program to capitalize on what an organization "knows" [15].

The interest in KM stems from a number of economic facts in today's environment. These facts include:

- Long-run shifts in advanced industrial economies which have led to the increasingly widespread perception of knowledge as an important organizational asset.
- The rise of occupations based on the creation and use of knowledge.
- The convergence of information and communication technologies, and the advent of new tools such as Intranets and groupware systems.
- Theoretical developments - for example, the resource-based view of the firm - which emphasize the importance of unique and inimitable assets such as tacit knowledge.
- A new wave approach to packaging and promoting consultancy services in the wake of the rise and fall of Business Process Reengineering (BPR) [16].

Organizational requirements for KM involves leveraging intellectual capital, not just retaining it, which requires attention to what have been recognized as "knowledge enablers," i.e., structures and attributes that must be in place for a successful knowledge management program. Besides technology, these enablers include content, learning, culture and leadership [16]. In order to measure KM, some attention needs to be paid to measurement of the enabling factors as well.

## 2. Research Objectives and Methodology

This early stage research in progress was initiated by a commercial client request for assistance in justifying their IT investment in their KM initiative at the corporate level. The objective of this research was to provide a set of metrics, containing both qualitative and quantitative components, to aid this corporation in its understanding of the KM initiative and its IT investments in relation to the company's strategic direction. The research question

is: What set of industry standard metrics, containing both hard and soft elements, can be adapted for use in KM initiatives?

Therefore, the initial research methodology has been to explore literature on current KM metrics and examine from published research how KM is viewed in organizations to examine the sustainability and soundness in metrics that assess knowledge utilization and retention of generating revenue. This was to enable the researcher to focus on deductive model development, and from that, create an extension of the Balanced Scorecard framework in terms of its perspectives to cover KM metrics. The continued research goal is to tie the KM perspectives suggested in this research to the original intent of a Balanced Scorecard as to show the relationship to strategy.

### 3. Review of Current KM Metrics

#### 3.1. How is KM Measured?

Although the focus on corporate culture and organizational change may extend the timeframe for a knowledge management program, only measurable benefits justify increased duration and cost in the eyes of senior management. Those benefits include better preparation for implementation and the ability to take advantage of existing technology.

Knowledge management investments are thus likely to include the extension of existing enterprise software to eliminate barriers between transactional applications and repositories of corporate knowledge. Increasingly, companies will exploit corporate knowledge and provide it to users within the context of business problems, a more effective alternative to simply storing this content in and accessing it from a centralized knowledge repository [6]. Given that there is no clear single activity that is knowledge management, it is more how and when knowledge management is integrated into organizational activities that can be measured.

A recent Platinum Technologies study found that only 20 percent of KM programs have used some form of metrics on how business performance is influenced. This may be that traditionalist management who use ROI for calculations have to find an appropriate equation for KM [24]. Platinum Technologies developed a method that was two parts "hard" measurement and one part "soft" measurement. By consolidating and better managing the different delivery channels for sales and marketing, Platinum significantly reduced the costs of maintaining and distributing collateral. This represents a hard and indisputable measure. The other third-the "soft" measure-resulted from increases in sales productivity, a measure

with less clear impact on revenue. Senior management appreciated the difference between these hard and soft measures, especially the lesser emphasis on a metric that could be easily contested. This appreciation needs to be considered when assessing harder metric methods like return on investment (ROI) [24].

#### 3.2. When is KM Measured?

Figure 1 emerged from observing the numerous organizations that participated in an American Productivity and Quality Center (APQC) project [2] and how they measure the value of knowledge management. In the earliest stages of knowledge management implementation, formal measurement rarely takes place, nor is it required. As KM becomes more structured and widespread and companies move into Stages Two, Three, and Four, the need for measurement steadily increases. As KM becomes institutionalized--a way of doing business--the importance of KM-specific measures diminishes, and the need to measure the effectiveness of knowledge-intensive business processes replaces them.

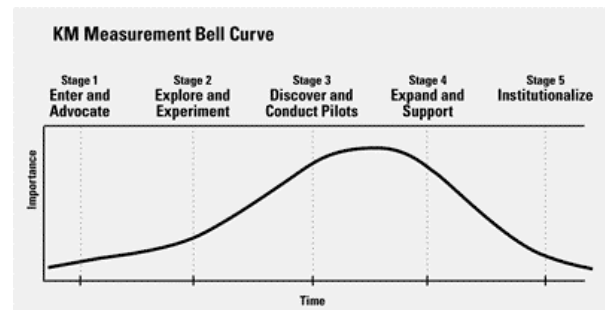


Figure 1. APQC Project

According to the APQC, the key here is to begin to ensure that direct business value is perceived by the organization as a result of the knowledge-enabling projects. The APQC KM Measurement Bell Curve can be seen to parallel the five stages of the IT Balanced Scorecard (BSC) Maturity Model developed by Van Grembergen and Saull [35]), in that as the use of KM matures in the organization, defined and managed measurement processes develop and become linked to business process cycles.

As seen from the APQC data, it is important to establish a mechanism to capture the hard and soft lessons learned in the knowledge management pilots, with their initial IT investments, as these will be the building blocks for the later KM implementations [2].

### 4. Diversity of KM in Practice

The economic facts listed in the Introduction section may help to explain the breadth of interest in Knowledge Management ranging across many different industrial sectors. They also can help to explain the diversity in the actual practices which have been labeled as Knowledge Management [16]. Although such practices share a common interest in targeting knowledge rather than information or data, they tend to perform distinctively different functions depending on the business context. Therefore, measuring the impact of these different functions on the business potentially requires different approaches.

One can distinguish between at least four different types of knowledge management [3, 28]:

#### 1. Valuing knowledge

This is a major concern within financial institutions - for example, the Skandia organization - and in management accounting areas. Knowledge is viewed as 'intellectual capital', and the focus is on quantifying and recognizing the value of the organization's knowledge-base. An example of this area:

- **PLS-Consult**, Denmark. Categorizes customers according to value of knowledge contribution to the firm. Follows up in management information system.

#### 2. Exploiting intellectual property

This appeals to firms with a strong science and R&D base - typified by a number of pharmaceutical firms, the Buckman Labs organization, and so on - which are looking beyond the conventional approach based on patents etc. to more effective ways of tapping into the commercial value of their existing knowledge-base. An example of this area:

- **Boeing 777 USA**. First "paperless" development of aircraft. Included customers in design teams. More than 200 teams with wide range of skills both designed and constructed sub parts, rather than usual organization design team, construction team. Suppliers world-wide used same digital databases as Boeing.

#### 3. Capturing project-based learning

As firms increasingly move towards innovation and project-based organization, many are recognizing the need to capture the learning from individual projects and make it available throughout the organization. Consultancies, professional service firms, aerospace companies etc., are in the vanguard of developing systems to codify and communicate such knowledge. The client who initiated this research effort also looks at KM in this respect. An example of this area:

- **McKinsey and Bain & Co**. These two management consulting firms have developed "knowledge databases" that contain experiences from every assignment including names of team members and client reactions. Each team must appoint a "historian" to document the work.

#### 4. Managing knowledge workers

The shift towards knowledge work in many sectors creates problems for traditional ways of managing and motivating employees. In many firms Knowledge Management reflects managers' desire to increase the productivity of knowledge workers, breaking down some of the barriers to knowledge-sharing which are associated with 'professionalism' [3]. An example of this area:

- **Analog Devices**, USA. CEO Ray Stata initiated break down of functional barriers and competitive atmosphere and created a collaborative knowledge sharing culture from the top. Encourages "community of inquirers" rather than "community of advocates".

### 5. KM and IT Investment

The impact of KM on IT investment can be related to the expense of each KM initiative will have on increased costs of deployed services and technology tools. Based on a 2001 survey of 566 respondents done together by KM magazine and market research firm IDC, these survey results estimate that an average KM budget will increase from \$632,000 in 2000 to more than \$1 million in 2002. These figures fall lower than expected, according to IDC, because two-fifths of the respondents represented companies with 500 or fewer employees, which shows the pervasiveness of the KM concept into the reaches of the small and medium size businesses. Past data that emphasized larger companies showed an average budget of \$2.7 million in 2000.

IDC believes from this survey that the budgets specifically designated for "knowledge management" initiatives decrease as these efforts become part of other technology or business process investments [6]. For example, a company may perceive itself as investing in a customer service solution, though one with significant knowledge management capability, rather than categorize this investment as a KM initiative. This again shows a need for measuring KM and associated IT investment in a way to show its role in the organizational structure, benefiting business processes.

Measuring these roles via the Balanced Scorecard approach has already been established for evaluating IT and its investments, as Gold [10] and Willcocks [36]

have already indicated in a conceptual manner and that has been further developed by Van Grembergen and Van Bruggen [32], Van Grembergen and Timmerman [34] and Van Grembergen [31]. Extending this Balanced Scorecard approach to the KM environment would assist companies in understanding the use of KM in relation to their knowledge capital resources, including IT implementation.

## 6. Connection between KM Metrics Development and a Business Process View of KM

Irrespective of the terms used, the practical management objectives of measuring KM are similar: to find out how well the organization has converted human capital (individual learning/team capabilities) to structural capital (organizational knowledge or 'what is left when people go home', such as documented processes and knowledge bases) and thereby moved from tacit to explicit knowledge, and reduced the risk of losing valuable knowledge if people leave the organization. Loss of 'corporate memory' as a result of downsizing is one of the prime reasons given for adopting formal KM practices. Other factors often mentioned include global competition and the pace of change; organizations see KM as a means of avoiding repetition of mistakes, reducing duplication of effort, saving time on problem-solving, stimulating innovation and creativity, and getting closer to their customers [4].

For all the interest and money spent on KM there seems to be relatively few attempts to actually quantify the impact and results in business terms. The rationale is that knowledge exists in the context of its use [29]. Superior knowledge management frees companies to operate on fewer assets, collect their cash faster and have less volatility. The challenge is to make sure that the scope and the goal of the process is clear and focused, by providing a method to display indicators that measure objectives and are focused on the mission as set by the management. Given that KM requires a mix of technical, organizational and interpersonal skills: the mix and emphasis varies according to responsibilities, but everyone involved needs to be able to understand the business and communicate business needs effectively, one approach to do this for KM could be the Balanced Scorecard.

Van Grembergen and Timmerman [34] and Martinson et al [18] were some of the first to have suggested that the Balanced Scorecard can be the foundation for the strategic management of information systems in organizations. Martinson et al [18] use the balanced scorecard metrics to guide attainment of

efficiency and effectiveness not only of information systems development but also of the use of the resulting information systems products in the operation of the business. They propose adaptations of the balanced scorecard framework based on the premise that IT is essentially an internal support function within an organization in contrast to the original framework, which focussed on the impact of the business on the external market. The same analogy might be used for KM, given knowledge supports the activities of the organization.

## 7. Contribution of Balanced Scorecard to Knowledge Management Metrics

### 7.1 Rationale for Balanced Scorecard in KM

In their book *The Balanced Scorecard*, Kaplan and Norton [14] set forth a hypothesis about the chain of cause and effect that leads to strategic success. This cause-and-effect hypothesis could be fundamental to understanding KM metrics in a way that the balanced scorecard prescribes. Although the balanced scorecard can form the foundation for organizational strategic success, it is not sufficient in itself. Along with strategies, there must be initiatives, such as business process improvement efforts, to steer the organization in the right direction and improve KM implementation.

Kaplan and Norton [14] distinguish Financial, Internal, Customer, and Learning and Growth perspectives on organizational processes essential to an overall strategy. In looking at the original Kaplan and Norton [14] implementation, Knowledge Management clearly fits within, if it does not define, the Learning and Growth aspect of their framework. If this is true, Knowledge Management outputs will impact on other processes. This is one reason why the significance in measuring knowledge management benefits or costs to other processes in organizations is an important area for extending the present Kaplan and Norton work [8]. Managers can track measures as they work toward their objectives, and measurement metrics aid in showing how to build internal capacity, such as human capital, tacit knowledge, and a knowledge culture. And a metrics framework keeps measures from being ad hoc, providing a reference point for KM measurement after an implementation.

### 7.2 Use of Perspectives in KM

Perhaps the key to proper initiatives and drivers is selecting the right perspectives, to use the Kaplan and

Norton phrase, to view the interaction between KM and the organizational strategy. This paper suggests that there might be two unique approaches to perspectives that would enhance the measurement of KM in the organization.

**7.2.1. First Approach.** The first approach would be to use the different types of capital available in an organization, as shown in Figure 2, to be the four different scorecard perspectives of how KM is leveraged in the organization. This approach is already in use in areas such as the U.S. government, who is empowered to these KM initiatives by the Clinger-Cohen Act of 1996 (Public Law 104-106), formerly known as the IT Management Reform Act. This Act requires CIOs in government to focus on the core competencies which represent skills and knowledge needed for effective mission support using information technologies. The four capitals which make up a knowledge-centric organization (KCO) are [20]:

- *Human capital* is all individual capabilities, the knowledge, skill and experience of the employees and managers.
- *Intellectual capital* includes the intangibles such as information, knowledge and skills that can be leveraged by an organization to produce an asset of equal or greater importance than land, labor and capital.
- *Structural capital* includes the processes, structures and systems that a firm owns less its people.
- *Social capital* is the goodwill resulting from physical and virtual interchanges between people with like interests and who are willing to share ideas within groups who share their interests.



**Figure 2. Leveraging KM with Balanced Scorecard**

The dynamic mixing of human, intellectual, social and structural capital provides the fuel for creating and using knowledge. In this day and age when retention and recruitment are major concerns in both public and private industry, an organization’s success in leveraging its

knowledge capital will ensure an organization remains competitive. The four capitals shown in the diagram can be directly related to the traditional Balanced Scorecard method in the following manner, shown in Table 1.

**Table 1. KCO Method**

Balanced Scorecard Perspective	Generic measures	Intellectual Capital Perspective	Generic measures
Financial	ROI, EVA	Intellectual	A wide variety of measures exist. See Table 2.
Customer	Satisfaction, retention, market and account share	Social	Social capital was originally defined and measured by the World Bank in terms that related entirely to density of horizontally organized social networks, subsequent investigations have resulted in complicating any such straightforward measurement. A variety of measures exist, one interesting one from Cap Gemini Ernst & Young and Henley College is called the KOPE survey. This covers the following categories: KM strategy and link to business (K), organizational and cultural enablers (O), process enablers (P) and enabling technologies (E). For each of these categories there are between 10 and 13 dimensions. The survey has been designed to allow organizations to identify strengths and weaknesses in their KM practices [30].
Internal	Quality, response time, cost and new product introductions	Structural	Andriessen & Tiessen’s [1] Value Explorer™ is an accounting methodology proposed by KMPG for calculating and allocating value to 5 types of intangibles: (1) Assets and endowments, (2) Skills & tacit knowledge, (3) Collective values and norms, (4) Technology and explicit knowledge, (5) Primary and management processes.
Learning and Growth	Employee satisfaction, IS availability	Human	From the work of Jac Fitz-enz [9], Human Capital Intelligence sets of human capital indicators are collected and bench-marked against a database. Similar to HRCA [12], which calculates the hidden impact of HR related costs which reduce a firm’s profits.

As seen in financial and other ‘hard’ measurements, when it comes to numbers, all sorts of measurements come out of the woodwork. Table 2 is a listing of various IC measurements compiled by Karl Erik Sveiby, one of the predominant academics in this field.

**Table 2. Types of Intellectual Capital Measurement [27]**

Authors	Name of	Description
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	Measurement	
Edvinsson and Malone [7]	Skandia Navigator™	Intellectual capital is measured through the analysis of up to 164 metric measures (91 intellectually based and 73 traditional metrics) that cover five components: (1) financial; (2) customer; (3) process; (4) renewal and development; and (5) human.
Lev [17]	Value Chain Scoreboard™	Matrix of non-financial indicators arranged into three categories according to the cycle of development: Discovery/Learning, Implementation, Commercialization.
Roos, Roos, Dragonetti and Edvinsson [22]	IC-Index™	Consolidates all individual indicators representing intellectual properties and components into a single index. Changes in the index are then related to changes in the firm's market valuation.
Pulic [21]	Value Added Intellectual Coefficient (VAIC™)	Measures how much and how efficiently intellectual capital and capital employed create value based on the relationship to three major components: (1) capital employed; (2) human capital; and (3) structural capital.
Sveiby [26]	Intangible Asset Monitor	Management selects indicators, based on the strategic objectives of the firm, to measure four major components of intangible assets: (1) growth (2) renewal; (3) efficiency; and (4) stability.

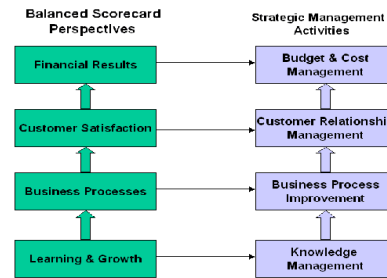
**7.2.2 Second Approach.** The other approach possible in viewing the role of KM in organizational strategy via a balanced scorecard would be to use a resource management based approach, focusing on intellectual capital resources combined with business processes of the organization. This is based on the work of Mouristen et al [19] at the Copenhagen Business School, using the work on intellectual capital balance statements of Sveiby [26]. Table 3 correlates this approach to the Balanced Scorecard perspectives of Kaplan and Norton [12].

**Table 3. Intellectual Capital Resources in a Balanced Scorecard Approach**

Balanced Scorecard Perspective	Generic measures	Intellectual Capital Statements [19]	Generic measures
Financial	ROI, EVA	Employees	Measurement of intellectual capital, as discussed above in Table 3.
Customer	Satisfaction, retention, market and account share	Customers	Customer satisfaction with 'quality of service' and product, related to KM efforts
Internal	Quality, response time, cost and new product introductions	Processes	Internal hours on KM process improvement, average response times for information gathered using KM
Learning and Growth	Employee satisfaction, IS availability	Technology	Investment in KM technology, number of hits on KM project web sites, employee satisfaction with KM project sites

To tie the use of KM into an organization, using either method, the relationship between KM and organizational strategy must be understood and goals clearly defined. Figure 3 demonstrates the relationship between business processes in Balanced Scorecard terminology, and the use of KM in an organization.

Linkage Between Causes and Strategic Activities



**Figure 3. KM Linkage: Cause and Activity**

### 8. Correlating KM Metrics to Strategy

Both of the suggested approaches above make use of such concepts as intellectual capital and the value of core processes in the organization. The rationale for this is that intellectual capital as a concept says more about the future earnings capabilities of a company than any of the conventional performance measures we currently use [23]. Kaplan and Norton [14] discuss using Balanced Scorecard measures for assessing potential investment. In creating a mechanism that ties long-term objectives into measurable metrics, they claim that executives can see the relationship between investment and strategic plans. This can also apply to KM IT investment in creating a KM scorecard that focuses on both current financial impact of intellectual capital on core processes, as well as future earnings capabilities in structural or human capital from an IT investment in KM. This is an area for further research and examination, perhaps in a longer-term organizational study.

### 9. Summary

Measurement has always been seen as a science of precision but the situation in most organizations today is anything but precise. The issues looked for in scorecards, such as customer and employee satisfaction, and in intellectual capital, tends to require less precision and more interest in trends than exact figures.

At the heart of an ideal definition for knowledge capital is creation and provision of "value". Without

linkage to strategic initiatives, reflected through some form of measurement or recording of value, whether it is simply anecdotal or more quantifiable, knowledge management could probably become one more piece of business management hype. On the other hand, a conscious effort in conceptualizing, designing and putting to practice metrics like the ones described above can actually help one realize the true worth of KM.

In regards to IT investment, information technology can help the growth and the retention of organizational knowledge if care is taken to remember that IT here is just a part of the story (corporate culture and work practices being equally relevant) and that the information technologies best suited for this purpose should be expressly designed with knowledge management and organizational capital in full view.

Future directions for this early research in progress include a longitudinal study of an organization implementing KM from scratch to see if this use of Balanced Scorecard perspectives for KM can be correlated with their current strategy.

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