



KNOWLEDGE INC.

The Executive Report on Knowledge, Technology & Performance

Measuring and Managing Knowledge Capital

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[Knowledge Executive Report](#)

June, 1999

Indiscriminate discarding of knowledge assets, whether in the form of accumulated employee training or legacy software, has origins in ideas proposed over a century ago about the value of capital and labor.

These theories claim that only capital assets increased the productivity of labor. Consequently, the productivity of an enterprise is measured only in terms of the productivity of its capital, such as Return-on-Assets or Return-on-Investment. The providers of capital are then entitled to the surplus, called profit or rent. If knowledge happens to be necessary for labor to make better uses of capital, that becomes the justification for a higher wage rate for labor. By this reasoning, those performing the actual labor are not entitled to collect rent from the knowledge they have accumulated. Labor can receive only fair compensation for the time worked. The most they are allowed to claim is to be awarded premium wages and a bonus here or there.

The above reasoning is not only misleading, but results in judging the value of employees on the basis of their wages, rather than how fast they accumulate useful knowledge. The productivity of labor is not only a matter of wages. Productivity comes from knowledge capital aggregated in the employee's head in the form of useful training and company-relevant experience.

The Individual's Point of View

Let me illustrate this by an example. You hire an untrained person who meets entry level requirements, such as literacy, a work ethic and socially acceptable behavior traits. His or her wage will be based on prevailing wage rates for entry level skills. Ten years later, that person becomes a manager or expert, earning three times the entry level wages. How does a firm justify spending three times more on the identical person?

The accumulation of company-specific knowledge explains the difference. During

those ten years, the organization invested anywhere from a year's to several years of salary in helping the employee to function more effectively. Hardly any of that expense shows up as a direct cost. Most of it is in the form of attending meetings, having phone conversations, keeping up with company gossip and making errors which, if corrected, can be charged to learning. None of that contributes to anything the customer is willing to pay for. Industrial engineers call such expense "overhead." I call it money spent on an accumulation of company-specific knowledge capital. If organizations spend their money well, employees with ten years of accumulated knowledge will be worth more than what the company pays them. In that way, the company will be recovering the investment on its knowledge capital as incremental profits.

Let us look at the same situation from the standpoint of the employee. To increase his earning capacity, the employee counts on the company investing in developing his skills beyond whatever investments he makes on his own, such as reading books, attending courses and involvement in professional activities. However, working for the company consumes most of the time available to do this. The best way of raising one's earning potential is to enhance what shows up on the resume as experience that is not company-specific. It would then be desirable for a person to acquire marketable knowledge that has greater value than his compensation. If that happens, employees will be able to recover their investments in knowledge by getting promoted to higher paying positions. If that does not happen, they can hope to find better paying employment elsewhere. They can then collect incremental profits on their knowledge assets in the form of the difference in the wage rate they could not get from their current employer.

If you replace the word "software" wherever the word "knowledge" was used above, you will find the statements to hold true except that open systems software will increase the capacity for knowledge accumulation at a faster rate, whether seen from the standpoint of the firm or the employee. If a corporation's investment in people increases the value of people faster than their salaries, everybody gains. The corporation creates employee value added. The employee acquires knowledge capital on which he can collect added income.

Tragedy occurs when none of the above works out. This takes place when the corporation practices and teaches obsolete skills. Then the employee is not marketable, except at depressed wages. The recent waves of layoffs from "re-engineering" have not increased unemployment among information workers. They find other jobs, but with lower compensation. An aerospace engineer could end up as a manager of a copy shop, working 30% longer hours for 40% less. It is possible to calculate the "fair" price for the new compensation by writing off the engineer's accumulated knowledge capital in aerodynamics and structural design to zero.

The cost to develop information workers, which I define as an overhead expense for acquiring company-specific knowledge, is very often much greater than the depreciation of the fixed assets and greater than profits for most corporations. The

time has come for enterprises to manage knowledge capital as perhaps their most significant asset.

The marketable knowledge an information worker acquires during his lifetime is the only means to increase his earnings. The potential lifetime earning capacity of a recently graduated engineer, with a starting salary of \$40,000 and real income growing at 4% per annum, is \$6 million. Without the added value, from continually acquired knowledge, the lifetime earnings would be 67% less. This explains why it is necessary for individual information workers to start managing their own knowledge capital for maximum returns to themselves as well as to their employers.

The Corporate Point of View

The calculation of the Economic Value-Added makes it possible to count the worth of the people who possess the accumulated knowledge about a company. These are the carriers of Knowledge Capital®. They are the people who leave the workplace every night and may never return while storing in their heads knowledge acquired while receiving full pay.

They possess something for which they have spent untold hours listening and talking while delivering nothing of tangible value to paying customers. Their brains have become repositories of an accumulation of insights on how "things work here" - something that is often labeled by the vague expression "company culture." Their heads carry a share of the company's Knowledge Capital, which makes them a shareholder of the most important asset a firm owns even though it never shows up on any financial reports. Every such shareholder of knowledge assets in fact becomes a manager, because information acquisition and information utilization is the essence of all managerial acts.

The term "management" is used here as applicable to every information activity that is not directly engaged in the generation of revenues. I define customers as the people from whom you collect cash. When some corporate staff unit declares that it caters to other staffers as "customers", that is just a misnomer. They are overhead and therefore remain a part of "management" regardless of their claims. If a newly hired factory worker spends half a day in general orientation and indoctrination meetings that means he partakes in a managerial activity. The work of an executive secretary can be also seen as managerial, since this job involves information gathering, storage and dissemination tasks. Meetings, training, consultations, giving advice, accounting, administration, interviewing or correcting quality defects by this definition are all managerial functions because if they would be fully accounted for, they would be charged to "overhead" and not to direct costs of sales.

In a typical company an average employee spends at least one third of his time acquiring intra-company information that is unrelated to the delivery of goods or services. Employees in managerial and staff positions expend all of their time on tasks not directly related to the delivery of goods or services. More than 25% of payroll dollars in a knowledge-intensive enterprise, and well over 50% of the payroll

dollars in most government agencies, are expended on information activities that should be recorded as managerial overhead.

This learning and talking and listening are expensive. They reduce corporate profits. But if that accumulation is ultimately convertible in greater productivity for the enterprise, then the expense was worth it by earning a return on the Knowledge Capital investment.

Consider the costs of managerial knowledge accumulated by an employee over a ten-year period. With full costs of employment at about \$60,000 per annum, the decade-long exposure to managerial information would result in knowledge inputs costing about \$150,000. What would be then the measurable outputs from all of that accumulated knowledge? >Calculating Knowledge Capital

The Economic Value-Added has been previously shown as the net result of all managerial activities. Economic Value-Added is the net surplus economic value created by the firm, since the suppliers, the tax authorities, all labor, and all shareholder expenses are already fully accounted for.

The creation of Economic Value-Added is something that defies the laws of conservation of energy. These laws state that output of any system in the Universe can never be greater than its input. Delivering a positive Economic Value-Added must be therefore an act of creativity that springs forth from something that is intangible, as if it were an artistic conception. The source of this creative energy is Knowledge Capital. This ephemeral element can be quantified only indirectly by observing how much Economic Value-Added it yields.

Another way of looking at the same phenomenon is to infer the value of Knowledge Capital from its periodic yield. If Economic Value-Added is the interest earned from an accumulation of knowledge residing with the firm, then the value of this principal can be calculated by dividing the Economic Value-Added by the price one pays for such capital.

Mergers and acquisitions of companies have made the pricing of all capital explicit. The Standard & Poor's 500 companies, which account for approximately seventy percent of the value of all publicly traded U.S. companies had fixed assets worth an estimated \$1.2 trillion at year-end 1995, while showing a market value of \$4.6 trillion. This suggests that there are intangible assets, generally acknowledged to be the knowledge assets of a firm, approaching \$3.4 trillion that need a better understanding.

Valuation Attempts

Over the last two decades numerous attempts have been made to find ways to reflect intangible knowledge assets on financial reports. Perhaps the best known firm that publishes supplemental financial reports on its intangible assets is Sweden's Skandia Insurance Company. It accounts for its intellectual capital by documenting assets not recognized by generally accepted accounting practices. This is accomplished by

issuing a supplementary report unconnected with the official financial statement. The supplement includes a valuation of its computer systems, experience with work processes, trademarks, customer lists and an assessment of employee competence.

Unfortunately, the attempts to assign a valuation to software assets, trademarks, experience and employee know-how have run so far into the difficult problem of pricing such assets. It is now widely understood that the costs of acquiring knowledge and the profit-generation potentials of such knowledge are unrelated. The value of intellectual property is in its use, not in its costs. This means that they are only worth what a customer is willing to pay for.

Two movies made with the identical actors, for the same \$50 million budget, will have totally different valuations depending on whether the audiences like one but not the other. The same applies to software, new ventures, inventions and employee training. This is why numerous attempts that have been made to report the intellectual properties of a firm on its balance sheet have faltered.

Knowledge assets become reflected in the financial accounts only after there is a merger or acquisition at substantial premiums over book value. When that happens, it becomes identified by a non-descriptive phrase allowance for good will. Thereupon it becomes subject to depreciation accounting exactly as if it were tangible equipment.

It seems to me that if companies were allowed to record their knowledge capital in the valuation of their shareholder equity as a matter of accounting routine, many of the inconsistencies which currently show up in accounting and tax treatment of company valuation would vanish. > >Pricing Knowledge Capital

It is the risk-adjusted interest in future earnings, in excess of the cost of capital, which an investor is willing to pay for as the value of any intangible assets. Since investors cannot differentiate between the price of capital for financial or knowledge investments because they are intermingled, I use the identical price for all capital as a first approximation. This yields a simple equation:

$$\text{Knowledge Capital} = \text{Economic Value-Added} / \text{Price of Capital}$$

This relation makes it possible to prepare a revised Balance Sheet for any firm, by adding a line item Knowledge Capital on the Asset side of the ledger, and by increasing (or decreasing) the reported valuation of Shareholder Equity by the identical amount.

Abbott Laboratories

Abbott Laboratories is an example of a company that has successfully kept accumulating Knowledge Capital faster than Equity Capital. It has a stock market valuation that is a large multiple of its financial assets. The earning capacity of Abbott Laboratories and its productivity is gaining not because it is hoarding financial assets, but because it is using the capabilities of employees more

effectively. A great deal of investment analysis is concerned with indicators such as the Market-to-Book ratios, where the term Book Value refers to the Shareholder Equity. Stocks are overvalued if the Market Value of shares rises materially above a trend line for the Book Values. However, if one adds the valuation of Knowledge Capital to the valuation of Equity Capital, the market valuation of a firm such as Abbott Laboratories will turn out to be not only consistent over an extended time period, but also rationally explainable.

I have analyzed a number of corporations using this method and find that adding Knowledge Capital to book value Equity Capital shows a good correlation with the prices investors are willing to pay for shares of knowledge-intensive enterprises. > >Growing Knowledge Capital > One can view Knowledge Capital as the result of a stream of expenses that have aided an organization to become more effective over a period of many years. Meetings are not necessarily wasted, because they may contribute to greater employee awareness. Training is useful if it is put to good use by making it possible to reach higher levels of quality and productivity. Software can become immortal if it is not discarded, but reused over and over again.

Almost everything that counts as an accumulation of knowledge is usually paid for and written off as an overhead expense and charged against current profits. This decreases profits, increases expenses and diminishes Information Productivity unless management sets out deliberately to treat all overhead expense as a potential investment in Knowledge Capital. Every manager should therefore monitor what portion of its Sales, General & Administrative plus Research & Development expense is frittered away as a one-time happening and how much of it can be seen as an asset with a residual value.

In the case of Abbott Laboratories, that is an important question since more than a half of its stock value is derived from its gains in Knowledge Capital. The answer can be found in computing the firm's Overhead-to-Asset Conversion Efficiency.

From 1992 through 1997 the cumulative sum of all Sales, General & Administrative expenses for Abbott Laboratories increased by \$16.8 billion. During that period Knowledge Capital has grown by \$31.8 billion. This then defines the Overhead-to-Asset Conversion Efficiency as 189%. It means that all of the overhead expenses have been expended for the benefit of long-term utility and at the same time created greater value-added than cost. (A way of displaying this steady trend is shown in the chart on this page.)

Abbott Laboratories has succeeded in generating Knowledge Capital faster than its S.G.&A. plus R&D expenses. This firm is highly profitable because its accumulated knowledge can be reapplied without further expense. Its current S.G.&A. plus R&D is indeed lower than most of its competitors, because the company does not have to pay for all of it in every fiscal year. It re-cycles S.G.&A. plus R&D at a very low cost, which saves on expenses and increases the value of each employee. This is why Knowledge Recycling may become the next management buzzword. Much of the attraction of the recently introduced Java language may have its origins in the

general perception that elements of all computer applications should be reusable by making them capable of running on any computer, on any operating system in any network environment.

I have analyzed the Overhead-to-Asset Conversion Efficiency of hundreds of companies and found that a surprising number of companies suffer from negative conversion efficiency. As they cut S.G.&A. and R&D during re-engineering, their long-term Information Productivity® declines because their attrition of Knowledge Capital proceeds at a faster rate than the savings generated from wholesale dismissals of people. There seems to be a trade-off between indiscriminate cost cutting and the demoralization of valuable employees that leads to a suicidal death spiral.

One of the most efficient instances of Overhead-to-Asset Conversion Efficiency is Microsoft Corp. In the period from 1986 through 1995 it gained \$8.3 billion in Knowledge Capital while expending only \$10.5 billion for S.G.&A. plus R&D. To explain Microsoft's extraordinary Overhead-to-Asset Conversion Efficiency of 79% one has to understand that Knowledge Capital does not need to reside exclusively in the heads of employees. It also occupies the mind-share of customers who have expended their own time and money to become habituated to Microsoft products.

Software as Knowledge Capital

Over 40% of all computer budgets is expended on software "maintenance." This involves continuous refurbishing of old programs. It consumes large amounts of money to repair poorly designed and badly organized translations of business processes into software code.

An additional 10% of all computer budgets is expended on new projects. A close examination of proposals will show that much of the financial justification for starting anew is to reduce expenditures for maintenance. If someone would try to sell a house that requires an annual upkeep equal to a half of the purchase price, nobody would buy it. A rapidly deteriorating capital asset is not worth much. Yet, the very high ratio of life-cycle maintenance costs to the original acquisition cost demonstrates that today's application software is one of the flimsiest artifacts that management will ever buy.

The idea of constructing software to qualify as a high-residual value, low-maintenance capital asset has never been accepted. According to Prof. Howard Rubin "...if CIOs were judged the way CFOs are, they would be in big trouble because they do not know what are their assets." In a survey of 2,000 firms, 80% had no idea of the size and quality of their software portfolio. Which means that a big part of the millions of lines of code they own are poorly utilized. It is clear that software managers do not have the incentives to invest in an architecture that is durable in the long run. The computer people, the vendors and the consultants also prefer whatever is new, fashionable and quick.

The reason for the flimsiness of the application software can be found in the lack of understanding by most executives that software has become an increasingly significant store of a corporation's Knowledge Capital. While a comptroller may question the reasons for getting rid of old forklift trucks, when it comes to software it will be written off without any examination as to its reuse. Software expenses are now wasted because management uncritically accepts the view that software is largely unrecoverable every time technology, organization or business practices suffer from major changes.

The existing methods of accounting do not recognize that for most corporations the accumulation of expenditures for software over a ten-year period will exceed the value of Shareholder Equity in about 30% of cases. As long as software is treated as an expense that must realize short-term returns, corporations will be paying for software that performs similar business functions many times over without the benefit of any reuse.

Software asset management is perhaps one of the most exciting new opportunities for accelerating the accumulation of Knowledge Capital because it represents an encapsulation of accumulated expert knowledge that can be purchased in the open market at a fraction of its original cost.

Software should be seen as one of the best means for accumulating and preserving an enormous amount of information about the ways a corporation functions. It should be recognized as a knowledge asset so that it can be managed as something that keeps growing in value steadily, reliably and safely. It must be designed for evolutionary growth instead of keeping it alive by patching it up until such time when a sudden convulsion makes it necessary to replace it without much delay.

Management must insist that applications software be preserved by means of technical designs that accommodate rapid changes in computer technologies. Management should demand delivery of software applications that take advantage of innovations in operating systems, adapt to revisions in organization structure and take advantage of any streamlining of business practices

Key Insights

If a company scraps 100 forklift trucks before they are depreciated, that will be recorded as a loss. If 1,000 employees with career-life learning costs of at least \$150 million leave a corporation, none of the financial reports will reflect that. When knowledgeable employees leave, they are written off as having no value even though during their years of employment the corporation paid for all of the knowledge they acquired on the job.

The existing methods and concepts of accounting, budgeting and planning are biased against anything that is not a tangible asset. No wonder that many prior attempts to calculate the productivity of "information" have foundered on the reluctance of the current stakeholders to be subjected to the sort of measurements that were

previously reserved only for the laboring classes.

The reasons for the preservation of accounting methods that were suitable for the industrial era is for students of corporate power politics to debate. It should suffice to remind us that when industrialization induced a shift from the extraction of funds from feudal land possessions to earning profits on invested capital, most of the assumptions about how to measure performance had to change.

When the expenses for acquiring information capabilities cease to be an arbitrary budget allocation and become the means for gaining Knowledge Capital, much of what is presently accepted as management of information will have to shift from a largely technological view of efficiency to an asset management perspective.

Analysis of corporate financial statements now shows conclusively that effective information management could have a greater impact on overall corporate performance than efficient financial management.

The two hundred years of the dominance of financial capital in the corporate world is now history. The era of information and knowledge management has arrived. The information age is now a reality, because it can now be planned, budgeted and controlled as a corporate input and not merely as a technology investment.

Knowledge-based strategies cannot be developed unless they are linked to measures of performance, yet traditional financial indicators offer little help in this regard. It was the dependency on traditional capital-efficiency based measures of performance that explains why information finds practically no place among the typical performance metrics that are examined by corporate executives, auditors and investors.

Yet, accumulations of information and knowledge are implicitly recognized every day when companies are bought at a large multiple of their financial valuation. What's missing is a way of making information and knowledge an explicit measure of performance. Time has come for those responsible for "information management" to rise to the challenge of placing the management of Knowledge Capital high on the agenda of every organization.

This article is a preview of Paul Strassmann's forthcoming book Knowledge Capital (Fall 1999). It is the 3rd volume of his trilogy ([The Squandered Computer](#), 1997, was volume 1 and [Information Productivity](#), which will be available July 1, is volume 2). The article is based on extensive client engagements and ongoing consulting work to provide corporations with assessments of their Information Productivity, I.T. Spending and Knowledge Capital. To learn more about these activities, visit Strassmann's Web site:

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