The Knowledge Value Chain®: How to Fix It When It Breaks

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T.W. Powell

THE knowledgeagency®

New York, New York, USA

The Knowledge Value Chain: How to Fix It When It Breaks

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Abstract

This paper applies the "value chain" model developed by Michael Porter and others to knowledge-based processes. Parallels are drawn between knowledge development/application and other value-added processes such as manufacturing. As in manufacturing, the Knowledge Value Chain is described as a series of States (stages of processing), with a series of Action Steps required to move from each stage of processing to the next. An example involving the highest levels of strategy in a major US firm is described. Various implications of the model are drawn, including those that use the model to diagnose common problems in the development and application of knowledge.

Background

I had recently joined the Board of the Society of Competitive Intelligence Professionals (SCIP) when I was approached by a new member, who was also new to the field of competitive intelligence (CI). She asked me, "What do CI people actually do?" I began explaining to her the value-adding transformation of data to information to knowledge, and finally the communication to someone with the authority and power to do something about it (a "decision-maker"). I advised her that thinking of it like any other manufacturing process would help de-mystify the process, and give her a grounding in the "real world". Then I began to diagram, on the back of an envelope, the beginnings of what later became the fuller version of the Knowledge Value Chain presented here.

An early version of the KVC was published as the "business intelligence value chain" in my chapter "Analysis in Business Planning and Strategy Formulation" in Gilad and Herring's compendium *The Art and Science of Business Intelligence Analysis* (JAI Press, 1996). As far as I can recall, the first time I used the term "knowledge value chain" to refer to this model was in a workshop I developed and gave in 1998.[1]

Introduction

Virtually all of us reading these words are "knowledge workers"—in doing our jobs, we read articles and journals, search databases, talk to people, think about and summarize what we've found, and communicate our findings to decision-makers. But the *process* by which this occurs is not well-defined or understood, either by cognitive scientists or by business process experts. Yet the knowledge-creating process stands at the heart of modern organizational competitiveness.

We must understand the knowledge process before we can attempt to improve on it. We must peer into the "black box" of knowledge work and attempt to see what is inside, and how it works. Why? Simply put, the productivity of the knowledge worker is seen by experts[2] as the single most important factor in the competitiveness of the modern organization. And productivity is best enhanced when work processes are broken into their basic elements.[3]

We must find some way to turn *information* into *business value*. Stated that way, this transformation sounds magical, like the transformation of lead into gold that the

medieval alchemists struggled to achieve. Their struggle, though ultimately futile, was not entirely in vain, since as a by-product it seeded the body of knowledge that eventually became modern chemistry. That's because the alchemists developed a systematic process to document their tests and findings, and to catalog and share these findings.

Definitions

In defining the Knowledge Value Chain, we need to define each term that goes into it. Let's start in the middle, and work our way out.

Creating *value* is ultimately what organizations are all about. In business, we measure value by a number of metrics, each of which is valid when used in the right context. These include:

- financial measures like revenues and profits;
- stock price (known in polite circles as "shareholder value");
- innovation, for example the number of new patents granted;
- other more complex and sophisticated measures such as the Balanced Scorecard developed by Nolan and Norton, and Economic Value Added® (EVA) developed by Stern and Stewart. These include a mix of measures like customer satisfaction and production quality.

Non-business organizations have similar measures of effectiveness and efficiency.

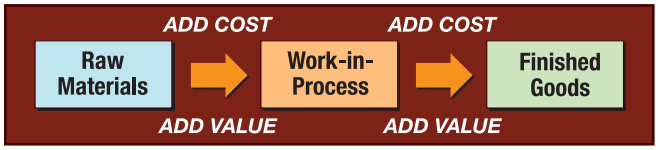

Figure 1: A simple manufacturing value chain

The *value chain* model was popularized by Michael Porter in his 1985 book *Competitive Advantage*[4]. We'll define it here as *a series of related activities that together produce end-user benefits*.[5] A simple example of a value chain is manufacturing. Here there is a defined series of steps in which raw materials are transformed into work-in-process at various stages of completion, and then into finished goods ready to be packaged and shipped. Each stage of processing adds both costs and value (defined here as the purchase price paid by the end user.) Each step should add more value than cost—and if not, that step needs to be re-engineered in some way.

A car manufacturer, for example, buys a lot of raw materials—sheet steel, various plastics, glass, rubber—and component parts like headlights, microchips, and so on (see Figure 1). The total cost of these parts, plus the labor to put them all together, plus the ownership and maintenance of the factory and machines, plus the costs of the dealer network, plus all the advertising and promotions, and so on—all has to total less than the price the finished car itself sells for. If it does not, we have to re-engineer these parts or steps to cut the costs. Or raise the price of the car model. If neither of these works, the car model is phased out, and ideally replaced with one that is (more) profitable.

The *knowledge value chain* is simply the application of the value chain model to knowledge development and usage. In short, it is a process model of how data becomes intelligence, and eventually becomes part of a business result or benefit. The balance of this paper will define this KVC process.

The Knowledge Value Chain

The knowledge value chain (KVC) comprises two major sets of activities, *knowledge acquisition* and *knowledge application*. This reflects the division of labor in knowledge work that has evolved in large, complex organizations. Here, *knowledge professionals* are

primarily tasked with knowledge acquisition and development, and *decision-makers* apply the resulting knowledge to make better business decisions, plan and execute actions, and thereby achieve business results.

The KVC model contains an alternating series of "states" and "actions". Each state is a *stage of processing*, a work-in-process (like a partially-built car would be in an auto factory). Each action is the *transformation* needed to move to the next stage of processing.

There are a total of *seven process states* and *seven action steps*. Each action step has as its "input" the state preceding it, and as its "output" the state following it. Each of the seven steps is an opportunity to add value—or to fail to do so, or even destroy value, if it is omitted or executed poorly. Each step is thus a potential *fail point*, at which we need to determine whether we are sufficiently controlling quality.

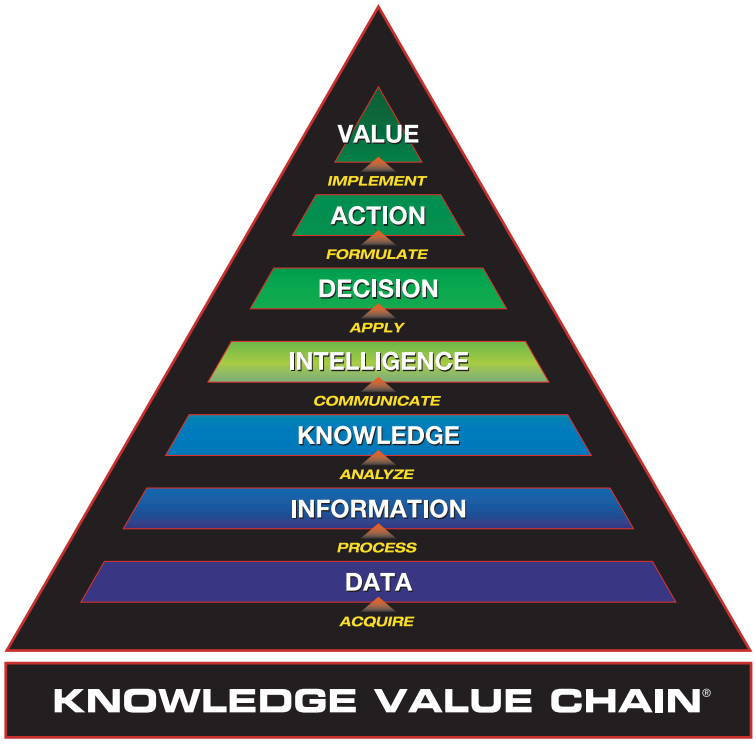

Figure 2: The Knowledge Value Chain

The KVC model (see Figure 2) starts with a planning process that begins at the top of the KVC—*How will value be created?*—and goes "in reverse" down through the steps. This results in a shared understanding between the knowledge professional and decision-maker as to how the effort will proceed. The quality of this step is essential to the whole rest of the process. If this part is flawed (rushed, for example—or skipped entirely), the remainder of the process cannot achieve the level of value-enhancement possible.

To use our car manufacturing analogy, in some cases great expense and time are spent designing and manufacturing cars that ultimately fail in the marketplace because the "decisions maker"—in this case, the consumer—does not want them. By contrast, the Honda Accord is legendary in automobile history for two reasons: (1) it was one of the best-selling models year after year, and (2) massive amounts of consumer research went into defining the car's features before it was even designed. There is a direct correlation between these two.

Likewise, a failure of intelligence planning can result in a mis-match between the intelligence process and the business goals it serves. For example, you might spend a lot of time and/or resources researching a problem that turns out not to warrant the urgency you gave it. On the other hand, something of great importance to the business could be overlooked, if that importance is not clearly communicated.

Both examples derive from a failure to achieve shared understanding at the outset. The project planning phase should produce "shared understanding" on these basic project parameters:

- the time frame;
- the budget (if any);
- the use that is to be made of the information; and
- any sensitivities that may exist around the project.

Action Step 1. Acquire Data

Then, and only then, can the knowledge worker go off and begin to *acquire* data. Data are the equivalent of "facts and figures", the points around which we will eventually build our analysis. (When we say "acquire", we are speaking of any method of obtaining data, including—but not limited to—its purchase for a fee.) This can involve speaking to people on the phone, going online, looking at printed sources, and so on. (Exactly where and how to acquire data is a long discussion beyond the scope of this paper. This is the subject of another of my books, *Analyzing the Competition*.)

Given the proliferation of data that exists, often this step involves *selecting* and *filtering* a bounded set of data from a much larger data universe. Capturing data from Google searches into an Excel spreadsheet is an example.

Having acquired the data, the analysis can begin…almost.

Action Step 2. Process Data

Before analyzing the data, there is almost always an interim step that involves *processing*—cleaning, organizing, and otherwise preparing the data so that it can be analyzed properly. This step may involve, for example, entering data into a computer. For another example, a digitally-recorded phone conversation might need to be run through voice-recognition software and entered into a word processor before it can be analyzed.

Numeric data points can be entered into a spreadsheet, and trends lines and charts drawn. Publications in a foreign language must be translated into the analyst's native tongue. Facts need to be checked and validated. Sources need to be vetted. "Outliers"—data points that lie far outside the general trend of the data—need to be examined, and decisions made as to whether they are valid and should be included, or whether they are spurious and should be dropped from the data set.

Action Step 3. Analyze Information

The processed data is called *information*, and only now is it ready to be analyzed. During the *analysis* phase, we transform information into *knowledge* in the following ways:

- by giving it *context*—what are the circumstances surrounding it?
- by assessing its *relevance* to our organization—what does it mean *for us*?
- by drawing *implications* for action—what do we recommend be done about it?
- by outlining *options* and alternatives, and
- by *reducing* the amount of information to an amount able to be understood and acted on by the decision-maker.

In this fast-paced and information-cluttered world, attention and focus are two very precious commodities for even the "highest-bandwidth" decision-maker. It is the analyst's job to produce both *attention* and *focus*.

Action Step 4. Communicate Knowledge

In this most crucial step, knowledge that heretofore has been in the mind of the knowledge professional is transmitted to a decision-maker (or, more typically, a decision-making team). This typically happens by a combination of means including e-mails, formal written reports, slide presentations, and personal briefings. In effect, this step reproduces (in a compressed form) the knowledge-building process in the decision-makers who are at the same time grappling with some business problem. Here, though, the process must be accelerated and concentrated—and that too is part of the knowledge professional's role.

A successful communication gives the right amount of material, summarized and organized well, and with analysis, conclusions, recommendations, data sources, and any qualifications needed on the quality of the data or likelihood of outcomes predicted ("If present trends continue…", "Experts predict that…", etc.) A successful communication produces *insight* in the decision-makers, and *credibility* for the knowledge professional.

This transferred knowledge is now intelligence, *defined as knowledge in the hands of someone with the capability of acting on it*. Once this hand-off to a decision-maker is made, too often a knowledge worker will consider the job done—and, in an active sense, this is true. But in the sense of value-creation, the process to this point has not yet created business value, since nothing has yet been achieved with the information.

Knowledge professionals who seek to improve their effectiveness benefit greatly from knowing what happens after this knowledge transfer. Only by knowing what is done with the knowledge that we give to decision-makers will we be able to improve our work product and processes. Just as market researchers need to find out what happens to products once they go into general market release, the knowledge professional needs to understand the balance of the process, after he/she ceases to be directly involved.

Action Step 5. Apply Intelligence

Decision-makers do just that—take intelligence, and use it to make decisions for the organization, most often working in a team. These decisions typically involve resource allocations—where to invest, where to pull back, etc.

A key factor in any decision is when to make it. Some decisions are *time-driven*; for example, budget decisions. Others are event-driven; for example, what to do when a key executive resigns. Other decisions are neither time- nor event-driven, but are driven by change in some variable; for example a falloff in sales. Absent a pre-defined threshold condition (for example, review sales strategies if sales fall by 5% or more), these latter decisions are problematic precisely because it is not clear when they need to be made.

The process we have described so far is a formal decision-making process. Studies have shown that, while such formal processes are often involved in any major decision, there are also typically informal inputs. These can include the decision-maker's former experiences, informal sources such as a spouse or neighbor, intuition, and a whole host of "externalities" such as political factors.

Significant barriers can come between the presentation of good intelligence and its application. Failures to apply intelligence can include ego ("Not invented here"), group pressure ("They all think it's the way to go, maybe they're right"), and what they psychologists call *cognitive dissonance* ("Don't confuse me with the facts").

Action Step 6. Formulate Action

We are getting closer to the end results, but are not there yet. We need to plan and execute some actions that embody the decision. This step is a major source of "disconnects" in the KVC. For example, in the US our lawmakers and the courts stop at decision-making, and leave it to an array of federal, state, and local agencies to try to implement their decisions. Even when a good decision is made, it can be rendered totally ineffective by the lack of well-executed actions to implement it.

Action Step 7. Implement Actions

Now the actual implementation of the decision and resulting action plan begins. Resources must be committed, goals and timetables must be set, and some way of monitoring the results must be devised. Now, and

only now, are we in a position to gain business results from our original knowledge work.

This is also a key chance to gain some new data. As implementation goes forth, there is an opportunity to gather data of a typically higher quality than in preceding stages. This feedback needs to be put into the cycle at the top, and analyzed quickly in order to provide a "course correction" to the whole process.

For example, in rolling out a new consumer product, test markets are typically conducted. These are "live" product rollouts, but on a scale limited to two or three cities. The costs of product distribution and promotion are much lower than for a full-scale rollout, therefore the risks are much lower. Key things can be learned that can be "fed back" into the actual rollout—including whether that larger rollout should even take place. These include the reactions of customers to using the product, and of retailers to selling the product.

A KVC Illustration

We can use the mnemonic "DIKI-DAV" to guide us through the KVC process. As an illustration, let's apply the KVC model to a company's decision to acquire another. *Project planning* could include a basic definition of the characteristics of a target company of interest: industry, revenues, profitability, market share, distribution, etc. *Data* might include the stock price and trading volume of a potential target. *Information* (processed data) would include trends lines, arrays, and graphs built out of this data. *Knowledge* could include, for example, correlations between the stock price and volume trends with news about the company, and with conditions in the market in general.

Intelligence would result from the analyst's bringing all of this data to the attention of a decision-maker. A *decision* could result to make an offer to acquire the target company. An *action* plan would be formulated to define the terms, process, and support players for the acquisition. The ultimate *value* results from the impact of the acquisition on earnings per share and stock price, and the acquiring company's market share in the affected market.

Typical Disorders of the KVC

As mentioned earlier, the point of understanding the KVC process in detail is to be able to fine-tune it, and to fix it when broken. I'm fortunate to have had the opportunity to study competitive knowledge development first-hand in a range of organizations and industries. In doing so, I've been struck by the fact that knowledge workers across industries and geographies have an amazingly similar set of challenges and problems. I believe that many of these can be readily understood and corrected by using KVC analysis. Several examples follow.

PROBLEM: "We don't know what management wants." This is a common complaint of knowledge workers. Clearly this is an "Action Step 0" (that is, planning stage) problem, because there has been an inadequate dialogue between knowledge professional and decision-maker. As a result, the data to be acquired can't be defined properly, and the whole chain spins off its axle. The reader may chuckle at the words "inadequate dialogue"—indeed, the term dialogue glorifies what is too often an eleventh-hour frantic phone call for help.

POSSIBLE SOLUTION: Make sure a true planning exchange happens before data collection starts. Define the project parameters listed previously. Use a checklist if you're afraid you'll forget something. As a rule, project misunderstandings are best had up front, so they can be corrected early in the process.

PROBLEM: "We have piles of data—but never enough time to analyze it." This is an analysis (Action Step 3) problem, and commonly results from the rush to complete projects. If you fail to process and/or analyze data, you will be tempted to provide unprocessed, un-analyzed data or information to a decision-maker.

This reduces the value of the communication, and if done repeatedly calls your credibility as a knowledge professional into question. You must add value though analysis—though it is always good to separately identify "the facts" from your analysis of them.

POSSIBLE SOLUTION: In planning the project, be sure to allow adequate time for processing and analysis. Back-time from the "deliverable" deadline, including the final production, and the analysis to get to the results. Always allow some "slip time", as Murphy's Law is alive and well. ("If something can go wrong, it will. If something cannot possibly go wrong, it still will.")

PROBLEM: "We do great analysis—but management doesn't use it." This communication (Action Step 4) problem results when credibility has not yet been established, or the relationship with the decision-maker has been damaged in some way. Creating a positive relationship and ongoing dialogue with decision-makers is one of the most difficult and important challenges in any knowledge-based process. Knowledge workers and decision-makers co-exist across a "culture gap" that often impedes their communications. Almost everything about them is different. They typically are trained differently, paid differently, dress differently, live and work in different places, and so on. The need for, and difficulty of, bridging that culture gap—thereby gaining trust and credibility—is often underestimated.

POSSIBLE SOLUTION: Do some "market research" with your decision-maker clients. Determine what they find most effective in terms of content, format, and medium of communication. Follow up on projects—what was most useful, what was least useful, what needs to be improved.

PROBLEM: "We do great analysis—but management keeps asking for more." This is an Action Step 5 problem (decision), in that decision-makers may feel that they need a greater level of certainty before making a decision. As a rule, the greater the level of resources to be allocated based on the decision, the greater the level of certainty that decision-makers will seek. Higher stakes require greater assurance. But, paradoxically, a good data collection and analysis effort often raises as many questions as it answers. This leads to the apparent need for more information. Typically, though, the costs and time to produce new analysis (and especially new data) are underestimated, and can impede the smooth flow of decision-making. This can lead to the situation commonly known as "paralysis by analysis".

POSSIBLE SOLUTION: Raise the sensitivity to the trade-offs between greater certainty on the one hand, and greater time, effort, and budget expended on the other. Keep the flow of events moving forward toward decision-making.

PROBLEM: "Once we go into implementation mode, we stop collecting data." The feedback loop (post-KVC) is often ignored, thereby cutting off a source of real-world validation and course-correction for the original decision. The problem may be an organizational one—the issue is handed off from a development team to an implementation team. The latter is less familiar with data collection, may not have the resources for it, and generally does not have the cultural bias toward information gathering that the research people do.

POSSIBLE SOLUTION: Create an ongoing, active communications linkage between the research and implementation teams. Encourage the feeding back of new data into the KVC.

PROBLEM: "We have many KVCs—but they don't link with each other." One key difference between the KVC process and a physical manufacturing process stems from the intangible nature of the KVC "products." In an auto factory, once a bolt has been used in one car, it obviously can't be used in other. But data and information are "non-wasting" assets, they don't get "used up" when used. As such they are infinitely re-usable. Data used in one KVC can be used in another somewhere down the road—and often should be. Too often this doesn't happen due to the boundaries of time and/or organizational structure.

POSSIBLE SOLUTION: Create a macro-view of the various knowledge chains in your organization. Look for opportunities to re-deploy information in ways that enhance value.

Here's an example of how such "knowledge re-deployment" can work. I once conducted a knowledge development workshop with a major pharmaceuticals company. In one of the group exercises, we determined that the competitive product information gathered by scientists at the beginning of the drug development process stayed in the R&D unit. We discovered that many months later, when the drug had completed development, testing, and approval, the same data could be useful to the sales force tasked with moving the product into doctors' offices.

We built a mechanism to systematically transfer the same data (comparative drug effectiveness) from the R&D teams to the sales teams. Building this simple linkage saved the re-creation of the information at a later time and in a different context.

A Tragic Example

Over time, the misuse of knowledge can erode the fundamental value created by a business. A recent example, tragic in its proportions, comes from the Xerox Corporation.

Once upon a time, Xerox was considered a paragon of corporate life in many respects. They had great products, and single-handedly created the market for corporate copiers. They were also leaders in business practice. For example, they pioneered some innovative applications of information—the modern practice of product benchmarking was perfected there.

But it didn't last—it almost never does. First, the copier market was invaded by high-quality, lower-cost models from Canon and other (mostly Japanese) manufacturers. Xerox tried to reposition itself as an information technology company—right before the technology crash of 2000. After peaking at $63 in 1998, Xerox stock crashed with the dot-coms in 2000, when it traded below $4. At that time, Xerox developed serious credit problems, and was rumored to be going bankrupt. (The stock has recently recovered to some extent, and has been trading at around 25% of its pre-bust high.)

By most accounts, Xerox's organizational (mis-)use of knowledge is at least one key factor in their fall from grace. During the 1970s, scientists at their Palo Alto Research Center (PARC) were responsible for a stunning series of key inventions of the digital age: the laser printer (1971); Ethernet (1973); the graphic user interface, or GUI (1975); the personal computer (1977); and the portable computer (1978).[6] Yet in each case, Xerox was ultimately unable to use these inventions to create a dominant position for itself in the commercial marketplace. Its knowledge, in short, was not translated into value.

What's worse, in each case another company *was* able to do so. For example, Steve Jobs was able to emulate the Xerox Star computer GUI technology to create the subsequent breakout success of the Apple Macintosh. IBM (now Lexmark) and Hewlett-Packard took most of the share of the laser printer market. Ethernet was commercialized by Intel, Digital Equipment, and 3Com.

The core problem Xerox had was a variation on the knowledge professional-decision maker *culture gap* described earlier. The scientists at PARC were removed from the company's primary decision-makers, both physically and culturally. The PARC scientists had a shirt-sleeve Silicon Valley culture long before it was fashionable in the East, and were driven by creativity—and even fun. The Connecticut-based decision-makers worked in a button-down, bottom-line environment heavily pressured by Wall Street earnings expectations. They were skeptical of the new ideas from the Wild Westerners, and refused to adequately fund the commercial development of these key technologies. This created the opportunity gaps that other companies were able to successfully exploit.

This series of decisions not to enter new markets, overlaid with drastically changing conditions in Xerox's core copier market, created long-term strategic problems from which the company still has not recovered.

It may never fully recover.

Key Implications

Now that we understand the KVC process in principle, how can we apply it to solve problems? What lessons and implications can we draw? Some of these are as follows:

- *Knowledge is a linear process.* In contrast to some "cyclical" models of knowledge development, KVC is a linear model. Like manufacturing, it uses a series of steps to define a final product. The key lesson here is that *you must understand the destination before you start the journey*. And that destination is not simply the approval of your decision-maker client (though that may be a good real-world proxy for the true payoff.) The true payoff is the final business outcome that will result from the whole process.

- *Knowledge is a serial process.* These states and actions are "wired in series". *When one link in the value chain is broken, by definition the chain itself is broken.* A failure at any step is replicated in all later steps. For example, a great analysis of faulty data will produce a misguided conclusion. The old adage "garbage in, garbage out" makes this point very succinctly.

- *Each step in the KVC is integral and essential.* If you short-circuit the process (which you might be tempted to do, to save time or other resources), you will fail to create value—or possibly even destroy value. The classic example is when a decision is made without sufficient information to support it. The result is more a matter of luck than of strategic management. While it is possible to succeed in the short term under these conditions, over the long haul the odds are stacked heavily against doing it repeatedly.

- *Knowledge value chains interact.* In the pharmaceuticals case mentioned above, a single data set was employed in two otherwise separate KVCs. You need to map out these various KVC processes, formally if possible, in order to identify and improve these interactions. As an example, when you finish a project for a decision-maker, it is helpful to routinely inquire as to who else would find the information useful (with, of course, your client's consent).

- *Knowledge creation is like manufacturing.* I state this here as a conclusion, though admittedly it was more accurately a hypothesis going into this series of propositions. However, to the extent that it is true, we can then use the many insights into manufacturing that have been gathered by students of that discipline.

Manufacturing concepts that we can "borrow" in the study of knowledge-based processes include:

- *Incremental value added.* Each of the seven transformation steps can be examined separately, and some assessment made of its incremental cost and value-added. Though it may not be possible to do this on a strictly quantitative basis, at least at first, the exercise will still yield important insights.

- *Productivity.* The productivity of knowledge-based processes is a primary aspect of competitive differentiation. In manufacturing, productivity is defined as the ratio of output to input (for example, person-hours to produce one automobile), each of which can be measure relatively accurately. While the metrics for knowledge-based process productivity may be considerably more "fuzzy" at present than they are for manufacturing, the concept itself may ultimately prove just as valuable.

- *Quality assurance.* Just as in manufacturing, quality can be built into the knowledge process. The alternative can be to find out when a complete study has been done, and resources expended, that they are the right answers—*but to the wrong questions*. One form of quality assurance, for example, can be establishing frequent touch-points with the decision-maker on the project status (from both sides). This will avoid any "process surprises".

- *Load balancing.* Too often a knowledge process is off-balance in terms of resource assignments. A common example is that too much time is devoted to data collection, and too little to analysis and communications. Load balancing enables you to identify and clear the bottlenecks that may be dragging down the whole process, and to re-allocate resources in order to clear those bottlenecks.

- *Just-in-time (JIT).* JIT manufacturing came into practice because there is a cost of inventory associated with each raw material and purchased component. This cost is, typically, the financing cost of purchasing the item, plus the cost of the physical warehouse space in which it is kept. For information, the inventory cost is typically not the "warehousing" cost—that's almost negligible, outside of the costs associated with hard drives and other media.

  The main cost element associated with information is its *obsolescence cost*—its inexorable tendency to become continually less representative of the "real world"—hence less valuable—over time. The world changes constantly, where information often does not. Any piece of produced information begins to "decay" as soon as it is produced. Some information decays rapidly—"Who wants yesterday's paper?", as the song goes—some less rapidly.

  As a result, it is useful to consider "just-in-time" knowledge—the production of knowledge at the last possible moment, to minimize the risk of obsolescence. (Maybe all those last-minute information requests serve some economic purpose, after all!)

- *Inventory.* The view of information as a highly perishable asset raises other considerations. These issues include: which information should we keep "in inventory"; which should we produce on demand; what is the current value of the information we have in inventory; etc. The nature of the inventory can vary; for example, a current list of sources may prove nearly as valuable as having the sources themselves—assuming those sources are readily retrievable when needed.

- *Auditing.* Physical inventories of raw materials, work-in-process, and finished goods are periodically subjected to structured verification processes called *audits*. Your knowledge inventory should be, too. In this way you can determine what you have, what condition it is in, what you have too much of, where there are gaps, and so on.

Information is different from other "hard" assets in key respects—primarily, in its *intangibility* and *re-usability*[7]. It is nonetheless useful to consider those ways in which information is *similar* to other assets. In this way, many pre-existing management models, some of which are listed above, can be brought to bear on the strategic problem of knowledge productivity.

Conclusion

"The purpose of information is not knowledge. It is being able to take the right action."[8] Too often knowledge workers limit themselves to the production and distribution of knowledge, without considering how it creates value for the organization. This key omission threatens the value of knowledge work—and the careers who perpetuate this way of thinking.

We have presented the Knowledge Value Chain model in the hopes that it will spur enhancements in the productivity of knowledge processes—the key determinant of organizational competitiveness. We do not intend it as a purely theoretical model, but rather for active use on the "front lines" of knowledge about knowledge—in diagnosing and fixing knowledge problems.

Notes

[1]That workshop is covered by a US copyright, and the term "knowledge value chain" itself is covered by a US trademark.

[2]For example, Peter Drucker: "Fifty years from now—if not much sooner—the leadership in the world economy will have moved to the countries and to the industries that have most systematically and most successfully raised knowledge-worker productivity." In *Management Challenges for the 21st Century*, Harper Business, 1999, page 158. I believe the same statement will be applicable to *companies* and *individuals* as well as countries and industries, and that the time frame will be considerably shorter than 50 years.

[3]Frederick Taylor did this for industrial work. See Andrea Gabor, *The Capitalist Philosophers*, Times Business, 2000.

[4]Michael Porter, *Competitive Advantage*, Free Press, 1985.

[5]Note that this is similar to the definition of a *business process*, and indeed the concepts are closely related.

[6]Michael Hiltzik, *Dealers of Lightning*, Harper Business, 1999.

[7]By *intangibility*, we mean that information is essentially "weightless". You can't touch or taste it. By *re-usability*, we mean that it does not become exhausted by being shared. I can give you some information, but still I retain it as well.

[8]Drucker, op. cit., page 130.

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