

***Knowledge Management:
Philosophy, Process, Pitfalls, and Performance***

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Knowledge Management: Philosophy, Process, Pitfalls, and Performance

According to a leading scholar of management James Brian Quinn (1992), “the capacity to manage human intellect—and to transform intellectual output into a service or a group of services embodied in a product—is fast becoming the critical executive skill of this era”. According to the pointy-haired boss of the Dilbert cartoon, his company’s success will be driven by “redesigning processes to enable enterprise integration of knowledge resources and tools.” The first statement is a serious, thoughtful and eminently reasonable statement about a belief in the transformation of management. The second assertion is a farcical caricature of that belief that is soon doused by Wally’s response, “is it okay if I do nothing?” Leave it to Scott Adams and his alter egos to gut the sanctity from the latest management fad. Indeed, any manager attempting to deal with the reality of knowledge management is faced with a cold hard fact—few managers know what they are doing when it comes to the management of their firm’s knowledge base. Most, like Wally, hope to get away by doing nothing. And, provided their knowledge management is not measurable in terms of business outcomes, they can indeed get away by doing nothing. However, they will not be able to get away with this for much longer. Our research clearly shows that, whilst knowledge itself is difficult to measure, it does have clear impact on business outcomes. More critically, there are good proxies in terms of innovative outputs that we can use to measure whether management is doing a good or poor job at managing their firm’s knowledge base.

Introduction

The notion of knowledge as a critical component of organizational success has been around for quite a long time. Economists like Joseph Schumpeter (1934) were writing in the early part of the 20th century about how managerial legerdemain was a decisive component in explaining the rise of American and British corporate dynasties. Today ‘legerdemain’ has evolved into the creation of constellations of competences that can be configured and reconfigured to deliver value to a market place with customer desires that change more rapidly than they did in the days of Schumpeter. And the need for knowledge management has also grown from a recognition that inflexible organizational structures cannot cope when the ground is shifting as rapidly as it does in today’s markets.

The problem faced by managers is that as customers and markets have changed over the last 70 years, the organizational components that need to be managed have become less and less visible. Consider an analogy with physics. Newtonian physics concerned itself with visible phenomenon—an object falling in a vacuum or the orbit of a body in frictionless space. Overtime physicists found that such simple models could not explain more complex phenomenon and with the concurrent development of better measurement instruments began delving into the subatomic realm of neutrons and electrons. This was sufficient to keep people busy for a while and led to the development of nuclear power plants, medical instrumentation and, of course, weapons. However, this reached its limit as more thorny phenomena were studied and more complex instrumentation was developed. Physicists soon found themselves operating in the mystical realm of strings, dark matter and Einstein’s

“spooky action at a distance.” Few, if any, of these concepts can be articulated in anything but sets of equations and their direct measurement is well nigh impossible. Instead, physicists rely on indirect measurement of specific event outcomes from which it can be inferred that one or other model is correct.

The evolution of physics from the study of observable phenomena with tangible parts to unobservable (but relevant) intangible phenomena with probabilistic parts parallels the demands now facing managers. And management researchers are faced with the added complication that we have not been able to do sophisticated experimentation on organizations. Executives are now confronted with a very serious and currently ‘unmanageable’ imperative—*the management of a completely invisible asset*. A task made all the more difficult by tried and true managerial maxim that you cannot manage what you cannot measure! This fact is complicated further by the confusion between data management and knowledge management that has been perpetrated by IT consultants selling knowledge management systems. *Data is information. Knowledge, or know-how, has to do with the process of learning, understanding and applying information.* As noted philosopher Gilbert Ryle (1945) states, “learning *how* or improving in ability is not like learning *that* or acquiring information”. By definition, true knowledge is systemic and non-codified. As soon as it becomes codified and transmittable it ceases to be knowledge and becomes data. It can only become new knowledge when combined in some unique way leading to an actionable outcome. It is this fundamental and embedded characteristic of knowledge that makes its management so frustratingly difficult.

The trouble that managers face in developing and integrating knowledge management practices is that an effective knowledge management system is in itself a complex combination of a series of organizational subsystems which are themselves complex (and only one of which has a strong information technology dimension). We can think of a firm’s true knowledge management system as embodying at least four components:

1. A **database subsystem** that allows managers and employees to share the right information in a timely and efficient fashion;
2. An **organizational language subsystem** that allows individuals to understand the meaning of things. This can include understanding information by decoding what they receive from the database, codifying their own knowledge into readily usable data for other users and the systemic language that allows people in an organization to recognize deeper meaning behind verbal and physical communication;
3. A **networking subsystem** that allows individuals to source and acquire information and knowledge from sources both internal and external to the firm. Networking subsystems operate on both formal and informal levels;
4. The **transfer subsystem** whereby systemic knowledge is either directly transferred between individuals or new knowledge is created by the unique combination of information with the individual’s experience base. In many ways this is the most critical subsystem.

If managed in a way that facilitates knowledge development, sharing and utilization, the ultimate outcome of this combination of subsystems is greater innovative output, either in terms of new products or services or better operational performance.

Our research provides a general and specific look at firm's knowledge systems and the impact that they have on the ability of the organization to generate innovation and financial performance from these underlying subsystems. In its general form, our research surveyed the knowledge management processes of 317 firms across a wide range of consumer, industrial, service and manufacturing sectors using a self-completion questionnaire (the survey research). This work allows us to paint a generic picture of the relationship between networking, knowledge creation, innovation and financial and market performance. In its specific form, we investigated the knowledge management systems of six firms from the following sectors: advertising, business services, executive search, legal services, engineering design and automobile industries. This was done using a combination of internal surveys and structured interviews (the case research). In both forms, the questionnaires and interviews covered a range of concepts that were central to organizational knowledge management such as formal and informal networking, absorptive capacity (Cohen and Levinthal, 1990), quality of problem solving (Ginsberg, 1994) and innovation (Leonard Barton, 1995, Nonaka and Takeuchi, 1995).

In what follows we discuss this work in detail. The next section outlines the general findings of the survey research. The emphasis here is on getting a general picture of what matters with respect to knowledge and innovation. We find that a relatively simple approach provides a clear framework for thinking about knowledge in the context of firm performance. A subtle but important implication of this is that firms need not necessarily measure knowledge directly to manage it. We show that we can measure knowledge indirectly by measuring certain firm processes (i.e., problem solving and decision making) or outcomes (i.e., innovative outputs) that serve as proxies for knowledge creation.

The case research then focuses on the lessons that we have discovered about the management of knowledge systems at a micro level. We find that managers give in to numerous deadly traps because they fail to understand the true implications of the fundamental intangibility of knowledge. This fact, combined with the persistent pressure managers face for quick performance, lead to poor decisions by those responsible for creating knowledge strategies. However, by recognizing that these natural traps exist, managers are better able to avoid the pitfalls and build effective knowledge management systems that meet the specific needs of their business.

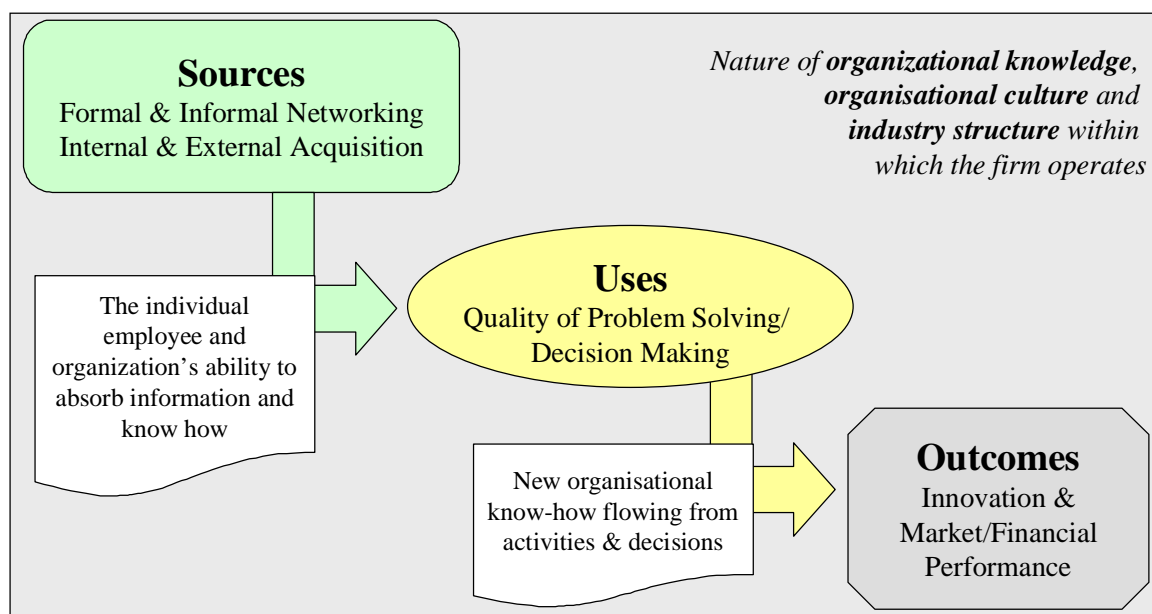
The General Process of Knowledge Creation and Innovation

A simple way of thinking about the knowledge creation process is with a sources-uses-outcomes approach as exhibited in figure 1.¹ This approach looks at knowledge creation in three ways. First, there must be *sources of information and know-how* on which an individual's knowledge base is built. These sources arise from the internal and external

¹ The individual measures for the constructs discussed in subsequent paragraphs are described in more detail in the appendix.

network opportunities open to the individual attempting to generate and utilize a knowledge base. Operationally, it is measured by the level of information and knowledge that is acquired from an individual's formal and informal networking activities. Second, the organization and individual must have **absorptive capacities** for internalizing and integrating the information and know-how being extracted from the 'network' of contacts and sources. According to Cohen and Levinthal (1990), absorptive capacity is the ability to recognize, absorb and assimilate new external information. We adapt the authors' conceptual definitions to derive the following measures: active information and knowledge sourcing, recording and sharing, and knowledge accumulation behaviors (such as participating in conference, updating skills through training and self-learning, and keeping abreast with the latest technology). In addition to individual level measures, organizational level measures are also obtained by investigating the extent to which the firm has policies and procedures that encourage and develop individuals' absorptive capacity. Third, because knowledge is 'actionable', it must be created through application. Hence, the catalyst of the knowledge creation process is the organizational problem solving context in which we investigate whether the acquired information and know-how influences the **quality of the decision making process**. Specifically, we look at whether information and knowledge is utilized to generate higher levels of comprehensiveness (more thorough analysis of options), creativity (application of novel solutions), consensus (shared commitment to implement chosen options) and new knowledge (new ideas, insights, better problem solving processes and new ways of thinking) in decision making.

Figure 1: The Process of Knowledge Creation and Innovation



From this process, the organization puts itself in the position to generate knowledge-based outcomes; i.e., **innovation**. In our parlance, innovation is defined as a mixture of process and product outputs that include new or modified products and services, patents, new marketing techniques, new managerial tools and administrative processes, licenses and wider

thought leadership represented by things like presentations at conferences and publication. It is these outputs—and not the simple fact that know-how is created—that generate better financial and sales **performance**. Performance is measured as three-year market share, profits, profit growth and sales growth (all relative to competitors).

Another characteristic of this approach is recognition of the environmental milieu in which knowledge creation is taking place. There are two contexts that are important. The first is the simple **market/industry context**. This is most critical in determining basic structural factors that might affect the pool of available knowledge and innovation and the networking limitations as well as providing benchmarks for actual and potential innovative and market/financial performance. The second context is the **information and know-how context**. Certain business environments will have different information and knowledge structures in terms of the codifiability, teachability, observability, complexity, and cross-functionality of know-how and information (Zander and Kogut, 1995). For example, a legal firm tends to operate in a world with observable, teachable and function specific precedents that are driven by the nature of the legal system. This might be usefully contrasted with the different world in which, say, an advertising agency operates.

In examining the above framework, we provide a reasonably simple method that shows the validity of the approach. In figure 2 we show a stage-by-stage examination of 317 firms that responded to a mail survey.² These firms represent a cross section of industries that can be simply categorized as: mining and oil refineries (6%), chemicals & pharmaceuticals (11%), primary metals (4%), machinery, equipment, instruments (21%), banking and finance (14%), business services (21%), health and legal services (10%) and engineering and architecture (13%). The sample also consists of a range of firm sizes (measured by the number of employees): small firms (less than 100 staff) make up 40 per cent of the sample, medium sized firms (more than 100, but less than 700 staff) make up a further 30 per cent with the remainder comprising the largest firms.

The categories in figure 2 represent ranked groupings for each 5th of the sample based on the indicated measure. All the other scales are indexed so that the lowest 5th of the sample is given a measure of 1.00. The point of the exercise is to show that as one progresses through the process of sourcing to use to outcomes that firms doing the best sourcing with the best absorption with the best decision making processes are the most innovative and the best financial and market performers. We have eschewed statistical measures for simplicity, however, the picture presented is confirmed by more sophisticated analysis.³

Block A of the figure shows that the greater the level of formal and informal networking the greater is the level of information and know-how stock available to the firm.⁴ Our definition of formal networking includes the use of formal data systems hence it accounts for the database subsystem we discussed earlier. All told, the firms with the least amount of formal and informal networking have know-how and information sources that are 30–40 per cent below the best 1/5th of firms. Information and know-how stock represents the sources of

² The initial mail sample included 2,137 firms.

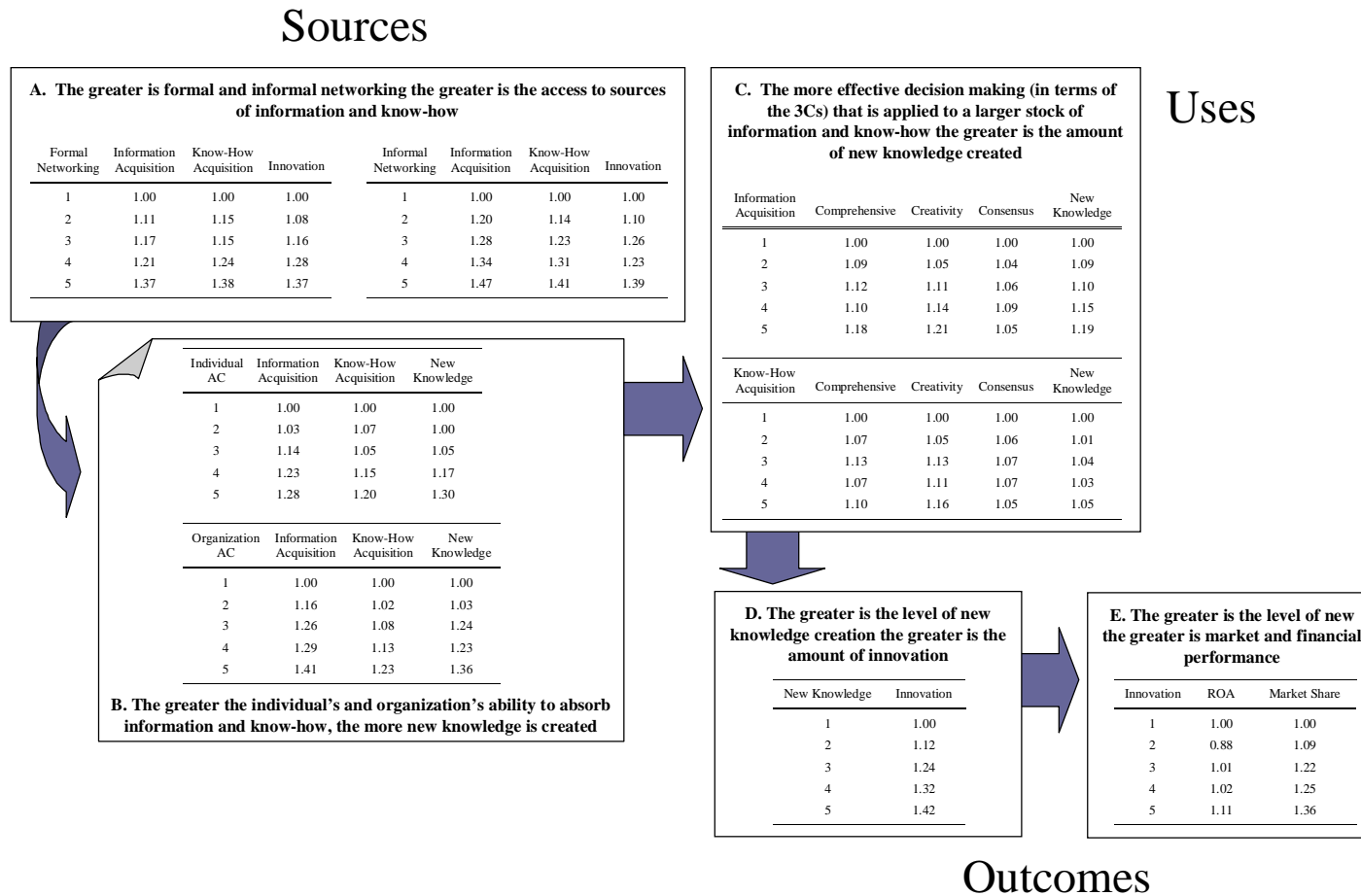
³ Interested readers are referred to Soo (1999) and Soo, Midgley and Devinney (2001).

⁴ The appendix contains a more detailed description of the measures.

data and information and knowledge resident in other sources (other people, consultants, advertising agencies, research centers, and so on). Block B shows that the firm's and individual's ability to absorb knowledge and information is also critical to generating a solid base for new knowledge creation. The top 1/5th of firms and individuals in terms of absorptive capacity significantly outperform all others in terms of information and know-how generated from external and internal sources and also in terms on new knowledge created. Block C examines the relationship between the stock of available information and knowledge and the quality of decision-making performance of firms and their ability to create new knowledge. Firms with the largest available stocks of information and knowledge are more likely to create new knowledge with the dominant path being through the level of comprehensiveness and creativity of their decision-making. What is most interesting is that information stocks are more important to new knowledge creation than knowledge stocks. This follows from the fact that new knowledge is something available to the firm through its actions and knowledge embodied in other external and internal sources may be less able to be applied as readily to decision making. Block D shows that firms that create the most new knowledge are the most innovative while Block E takes this to the final financial and market conclusion, the most innovative have the best market share and profit performance relative to competitors (although the market share results are much clearer).

This set of results provides us with a deeper understanding of the role of information and knowledge in influencing specific organizational processes and outcomes. It also provides us with an interesting managerial conclusion. Authors such as Ruggles (1998) have shown that a major stated issue for those attempting to manage knowledge is the measurement of knowledge and determining which knowledge is useful. According to our work, this may be an unnecessary, or at least not fatal, concern for some firms. Because we know the antecedents (networking and absorptive capacity), germinators (decision making quality), and outcomes (innovation) of knowledge creation much of the problem of knowledge systems can be resolved by focusing on creating the right environment for these components to operate effectively. This, of course, does not mean that firms shouldn't attempt to worry about database content and measuring information and knowledge if they can, just that it is one component of the knowledge management system. Indeed, this is one of the compelling lessons of the Buckman Laboratories example (Pan and Scarbrough, 1999). Buckman didn't focus on content but rather on making sure that those who needed access to sources of know-how got it and that they were capable of understanding what to do with it once they had their hands on it.

Figure 2: Performance, Knowledge Creation, Absorption and Networking



The numbers in each column represent the mean indexed measure for each construct. The five rows represent the bottom to the top 20 percentiles of firms. Hence 1=lowest 20%, 2 21%–40%, 3=41%–60%, 4=61%–80%, and 5=81%–100%. All measures are indexed against the bottom one-fifth of the firms.

The constructs are summarized here: *Formal networking*; *Informal networking*; *Information acquisition*–Stock of information acquired from networking; *Know-How acquisition*–Stock of know-how sources acquired from networking; *Individual absorptive capacity (AC)*; *Organizational absorptive capacity (AC)*; *Comprehensiveness*–Comprehensiveness of decision making; *Consensus*–Consensus used in decision making; *Creativity*–Creativity brought to bear in the decision making process; *New Knowledge* created from decision making; *Innovation*–Index of innovative outputs. Two performance measures are presented–*ROA* (Return on assets relative to competitors) and *Market Share*.

For example, in reading the last box it indicates that the bottom one-fifth of innovators has a market share 36 per cent below that of the top one-fifth.

Knowledge Traps: Lessons from the Management of Knowledge

Subsequent to the work described above, we also examined both quantitatively (through internal surveys) and qualitatively (through interviews), the knowledge management practices at six firms. These firms also represent a cross-section of industries. Two of the firms were industrial in orientation with large labor forces—one in automobile engine design and manufacturing and the other in railway engineering design. Three were professional business service organizations that were large in their respective markets and also respected for their financial and service quality performance—one each in legal services, business services, and executive search. The last firm was a small advertising partnership. In total, these firms generated another 357 survey responses and 150 interviews.

Based on this work we noted a set of ‘knowledge traps’ to which even the best firms seemed to fall victim. These traps are ‘managerial’ in that they relate directly to decisions (or non-decisions) made by managers who caught the knowledge management bug but failed to recognize that knowledge management is a philosophy about business operations and not a simple process that can be bolted onto more terrestrial business models, as was the case with quality function deployment, business process reengineering, or total quality management. Also, because of the intangibility of knowledge, the things that made TQM, BPR and QFD popular—i.e., their measurement capabilities—are absent. Without good metrics, managers of knowledge-based firms eschewed measurement for gut instinct and in the process allowed themselves to make some simple but critical errors. In the eight traps we discuss below, we outlined the lessons learned from these six firms and provide a simple roadmap for avoiding the pitfalls associated with the management of the unseen.

Lesson 1: Formal databases must be treated as strategic tools rather than mere storage facilities. An organization’s database subsystem can be an important repository of the wealth of information that resides within the firm, *provided* that it is structured and designed for that purpose. We came across several examples where firms have invested in formal systems that failed to develop into a strategic tool for enhanced problem solving simply because: (1) they were cumbersome to use, (2) their content was not useful or relevant enough and (3) insufficient effort was put into transferring the intellectual capital from the people onto the system. More formally, the database subsystem failed to merge effectively with the other knowledge management subsystems—transfer, language and network.

Both the business services and legal firms examined had in-house database systems that were perceived to be too complicated (for putting in as well as retrieving data) and inefficient (in terms of the time it takes to retrieve a piece of information). More importantly, the information and knowledge stored were perceived as not comprehensive or relevant enough. In the business services firm, this was attributed to the fact that the people managing the system did not possess enough “industry or specialist knowledge” that enabled them to understand a particular client’s problem and the information required to solve it. Finally (and this remains the most difficult aspect of managing formal databases), there must be a concerted effort on part of the organization to ensure that any part of knowledge that is codifiable is in fact codified and captured. Returning to our example of the business services

firm, one of their biggest challenges was capturing the intellectual capital that flowed from client projects. The difficulty was the lack of time and incentives allocated for this activity, as illustrated by an associate's statement – "no one is given time to actually do it (recording knowledge). You come off one client and move onto the next one. That (recording) is the part left undone. It just continues to be on your list and just never gets done. It's not looked on as an important thing".

Lesson 2: Managing formal database systems per se do not equate to knowledge management. We need to emphasize the distinction between the database subsystem and the knowledge management system. Database subsystems are important vehicles for capturing information, but in order for these subsystems to be used effectively, they have to be supported by a strong informal networking subsystem. This is because a database subsystem is not a mechanism that develops in isolation. It needs to be subsumed (and developed and augmented) within an organization's networking and transfer subsystems. Our research shows that firms with more comprehensive and knowledge friendly *informal networking* systems are better at generating know-how and the innovation and performance outcomes that follow. However, few managers know how to make the informal structures work. It is much easier to spend a million dollars on formal database subsystems that no one really uses, or use ineffectively, than to invest in the informal networking and transfer subsystems that are essential for what goes into and comes from these databases.

However, this does not imply that one must nurture informal networking subsystems at the expense of formal systems, but rather, both complement one another and must be developed concurrently. Our research revealed that strong informal linkages supported by comprehensive databases characterize an organizational environment conducive to generating new ideas and innovation. It is sufficient to say that effective knowledge management involves managing both formal and informal systems and recognizing that the effectiveness of one can benefit the other.

Lesson 3: Informal networking is an important source of knowledge, but an over-reliance on it can be detrimental. The importance of informal interactions has been argued by many as a crucial element in knowledge exchange, particularly due to the tacit nature of knowledge that makes it difficult for formal codification and transfer. Sociologists such as Granovetter (1992) argue that "economic action (like all action) is embedded in ongoing networks of personal relationships rather than carried out by atomized actors". For many organizations, informal channels of communication have been a rich source of information and knowledge that cannot be found in company databases, manuals or newsletters. A director of the executive search firm in our sample regarded informal networking as a must-have ingredient for his organization: "for this organization to work effectively, you need to network and you need to network across a range of areas within the business. I don't believe there are formal channels that exist in a way that's easy for you to run your business, so you need to have a lot of informal channels of communication".

We also found instances where the informal channels have become the de facto knowledge management system when formal channels have proved inadequate. The inefficiency of the formal database subsystem at the business services firm resulted in many

consultants adopting a “hunting and gathering” approach to information and knowledge sourcing, relying on personal networks developed through previous projects or social interactions. In another example, our research at the legal firm revealed that the grapevine has become a substitute when formal communications have failed. Notes a manager at that firm: “the formal communication channels are not strong, or limited in some respects. It’s probably not an organization which widely shares information about what’s going on, but the informal communication channels (i.e., the grapevine) works fairly well”.

Despite the prevalence and advantages of informal channels, there is an inherent risk of spontaneity—that is, the risk of these informal interactions being too dependent on “chance meetings”. This lack of structure within informal channels can result in important information being lost—in other words, it is not a guarantee that an essential piece of information will be communicated to all relevant parties. We found various instances where information sharing was random and incidental. One attorney articulated how at his firm “information is shared anecdotally and sometimes by sheer luck because sometimes you do it by walking around the floor and asking people. It’s quite surprising what I have found by sheer accident”. This anecdotal sharing may work for smaller firms but as organizations grow in size, it becomes more and more random and people need to rely on the strength of their personal networks. A principal at the business services firm noted that information sharing was becoming increasingly unreliable as the firm experienced rapid growth, thus making it difficult to track the knowledge base of the firm: “information sharing within smaller project teams is very good. Then comes the use of personal networks and beyond that, it is quite difficult to find out who knows what and whom I should approach. So there is a certain amount of luck involved”.

An over-reliance on informal networks as the main source of information and knowledge can be detrimental in the long run, especially for larger organizations where knowing “who’s who” becomes increasingly difficult. This can be seen as a problem where people are unable to locate a particular source of expertise within the firm. This can be counteracted by having in place an effective formal database system that allows employees to search for a piece of information or knowledge, or at least locate the person who may have that knowledge. Hence, to reinforce the previous lesson, formal and informal systems of exchange must exist to support each other. Another guard against the randomness of informal networks (and hence the sharing of information and knowledge) is simply to make them more *structured*, which leads us to the next lesson learned.

Lesson 4: To ensure that informal networking is less susceptible to randomness, they should be made more structured. Because knowledge resides within the individual (or groups of individuals), the challenge for managers is to leverage that individual’s knowledge *across* the organization. In our research, we have come across many instances where solutions or best practices developed in one part of the firm do not travel to other parts where it can be re-applied. Because the complexity of a problem-solving situation is usually embedded in group dynamics, it is quite common for a solution or a new piece of knowledge to stay within a group where it is most easily understood by its members. Also, the fast paced working environment of many firms preclude any real opportunities for people to interact

outside of their immediate work group or team, further reducing the chances of cross divisional sharing. This particular problem can be seen as one of “localized (or divisionalized) problem solving”, a phenomenon that is quite prevalent among the firms that we have studied.

One of the main factors contributing to the problem is a lack of structured time for knowledge sharing. As we mentioned before, the tacit nature of knowledge means that it is most effectively shared or transferred through informal interpersonal interactions. However, when there is no structured time scheduled for such purposes, the sharing of knowledge may be ad hoc or accidental. A partner whom we interviewed at the advertising agency commented on how the lack of time has worked against the general desire for knowledge sharing in his firm: “there’s lots of great little things that we’ve done for clients that we could share with the rest of the agency and we haven’t. It comes down to lack of time more than anything, rather than the lack of will to do it”. A manager at the automobile firm also alluded to the problem of lack of structured time in bemoaning how “people find it difficult to get together and share. Lack of time is often the easy excuse, but what is contributing to our lack of time is our lack of structure to time”.

For companies facing a fast paced working environment, this lack of structured time may be even more detrimental as new knowledge becomes lost and mistakes (when not dealt with in a timely fashion) perpetuate. The advertising firm experienced this problem where employees were not learning from their mistakes simply because they have not instituted regular structured meetings to serve that purpose. The core output of an advertising agency is very much dependent on different groups of expertise, e.g., client management, creative design, production, etc. This multi-disciplinary work environment, coupled with a fast paced work culture, creates the need for more regular and structured “de-briefing” sessions where people have the opportunity to discuss mistakes made and lessons learned from their projects. A director at the agency described the current situation as follows: “we sit down every couple of months and look at mistakes instead of learning instantaneously from something that went wrong. I think it’s important to share these things as you’re going along, rather than analyze three months down the line when it’s too late”. An engineer at the railway organization expressed similar concerns that his firm needed to encourage learning by “having internal dedicated time for formal sharing of knowledge”.

Opportunities for knowledge sharing are critical to developing a transfer subsystem and come in many forms—e.g., weekly presentations, breakfast meetings, project de-briefs or mentoring schemes. Merely having these forums on the books is not enough, what is more important is there is an explicit intention to *structure in the time* for employees to learn from each other. A director at the advertising firm emphasized the significance of regular informal interactions that are designed for employees to learn from each other: “I think it would be good if all the creative people (even if just once a week) all got together and discussed the projects they’re working on and got each other’s opinions and feedback. Just a bit of creative interaction”.

The numerous examples presented here reflect both the importance and difficulty of implementing structured knowledge sharing. Most organizations these days exist in a world

of tight schedules, multiple projects and quick turnaround time and in this type of environment, meeting client deadlines is given priority ahead of forums for general learning and knowledge sharing. However, organizations often suffer the consequences of this oversight when they fail to capture and distribute the intellectual capital that is produced from the projects they undertake. This is especially true for service organizations where only a small proportion of their intangible know-how can be codified and the more tacit components will be lost if they are not shared via regular structured interpersonal interactions.

Lesson 5: Senior management may not know the true state of their firm's knowledge systems. In a related discovery we have noticed that there is a distinct difference between the perceptions of more senior managers and their subordinates about the efficacy of their knowledge management systems. With regards to formal database subsystems, senior managers invariably look on the IT systems positively with a mea culpa related to their own failure to use them effectively. More junior managers are cynical about the systems but much more positive about their own abilities to use them to their own benefit. With regards to the less tangible management development activities within the firms—i.e., knowledge sharing practices, training schemes, keeping abreast with the latest product or industry trends, etc.—we found an interesting discrepancy between the perceptions of senior managers and the more junior staff. First, senior managers have a higher perception towards the effectiveness of organizational policies, as compared to lower level executives. To illustrate this, table 1 shows the ratings (on a scale from 1 to 7) given to the organizational incentives for various information and knowledge development activities.⁵ For each case study firm, the survey

Table 1: Assessment of Organizational Incentives for Knowledge Absorption

	Advertising Agency	Executive Search Firm	Legal Services Firm	Engineering Design Firm	Business Services Firm	Automobile Engine Firm
Level 1	3.29	4.54	4.95	3.80	4.90	4.73
Level 2	3.67	3.74	4.60	3.38	3.93	3.45
Level 3	2.25	3.66	4.88	3.11	4.04	3.64
N	18	45	94	85	51	64

respondents are divided into three levels—Level 1 being directors and senior managers, Level 2 comprising of middle management, and Level 3 is predominantly team leaders or officers. Results show that for all measures of organizational incentives, Level 1 managers have given the highest ratings in all cases (with the exception of the advertising firm where

⁵ This number is aggregation of six individual measures—the effectiveness of organizational incentives to (1) seek information, (2) record information, (3) distribute information (4) attend seminars, (5) update skills, and (6) updating knowledge.

Level 2 managers have rated higher). The main insight to be gained from this result is that the attitudes of senior managers are not necessarily the only or best measures of the success of any knowledge management system.

Lesson 6: We can't teach old dogs new tricks. A finding related to lesson 5 is that firms fail to recognize that certain individuals are either innately unable to absorb new knowledge or their personal and organizational incentives make them unlikely to ever want to do so. For example, one firm had invested enormous amounts of money into knowledge and training activities, to little avail. The problem was not the effectiveness of these activities—they were good—but the fact that the average worker in the company had started working there in their late teens and had been on the shop floor for 25 years. For a worker in this company risk taking was discouraged since the level of engineering precision required for success was uncompromisingly high and there was no personal reward for absorbing any new knowledge other than that directly related to these precise requirements. Table 2 repeats the breakdown seen in table 1 with an additional twist by representing the difference between the individual's evaluation of the organizational incentives relative to their own efforts and ability.⁶ The fact that individuals consider their abilities higher, on average, than the

Table 2: Organizational Incentives for Knowledge Absorption Relative to Individual Activities

	Advertising Agency	Executive Search Firm	Legal Services Firm	Engineering Design Firm	Business Services Firm	Automobile Engine Firm
Level 1	0.65	0.16	-0.18	0.91	-0.47	0.15
Level 2	0.96	0.93	-0.01	1.03	0.75	0.36
Level 3	1.02	0.34	0.31	1.16	0.23	0.40
N	18	45	94	85	51	64

organizational incentives is not surprising. What is more surprising is the fact that the highest managerial level is always the lowest on this measure. In the case of all six firms, level 2 and level 3 managers rate their abilities much higher relative to organizational incentives than do level 1 executive. Given that table 1 showed these managers rate the organizational incentives highest, we have a quite interesting problem: senior managers are more likely to believe in the value of organization incentives (which they no doubt instituted) while being far less likely to engage in the activities those incentives are meant to encourage. Middle and junior managers believe in the incentives less but still engage in active knowledge absorbing activities (most likely because it is good for their own career development). This takes us on to lesson 7.

⁶ The individual measure here is identical to that given in footnote four except that the question assesses the individual's actions. The measure in table 2 is the difference between these two assessments, i.e., individual activity minus organization incentives.

Lesson 7: Unless carefully managed, knowledge is a dark power. A major problem for all the firms in our sample is how to generate knowledge that can be capitalized for the firm. Knowledge does not reside in databases and, legal issues of intellectual capital ownership aside, information is at best a comparative advantage for the organization. Knowledge resides in individuals and there is always the problem of who gets the rents from its utilization. In two of the firms studied, we came across instances where knowledge absorption at the individual level (predominantly through informal personal networks) did not contribute to the pool of knowledge available to the organization as a whole and most of the rents were going directly to the individual (sometimes even to the detriment of the firm). In the executive search firm, a turnover rate of nearly forty per cent per year in consultants, created a serious problem in maintaining consistency of relationships with corporate clients, and reduced the likelihood that employees would invest in firm specific know-how. One attorney in the law firm saw this quite clearly: “There is also a culture that is a real hindrance to the sharing of knowledge. I think it comes from some people believing that knowledge is power and because people’s remuneration is very typically based on billings, people will hang on to clients and knowledge and not want to share it”.

The solution to this problem is daunting but not insurmountable and is intertwined with the nature of the transfer and networking subsystems and with where the employee’s loyalty lies. In the case of the advertising agency, business services company, law firm and executive search firm the employees are quite customer focused, rely very heavily on the customer for information and know-how, and generally put loyalty to the customer over loyalty to the firm. The fact that they do so is a conscious policy of their organizations and effective sharing needs to be considered in light of this. As long as knowledge sharing can be shown to improve a specific executive’s relationship with his or her clients, it is more likely to occur and will in fact be sought out. However, in cases where information or knowledge sharing is less tied up with the day-to-day business objectives, formal transfer and networking are less valuable (and more difficult to institute) because the holder of the knowledge needs to understand and trust the receiver of the knowledge. Bob Buckman calls this “virtual trust” (Pan and Scarbrough, 1999). In the case of the engineering and rail services companies this is less relevant as knowledge sharing is not as firmly embedded in their work processes and hence formal administrative intervention is more likely to be effective.

Lesson 8: Creativity in problem solving is the main driver of new knowledge creation and innovation, but this needs to be supported by appropriate mechanisms. The value of knowledge is highly contextual and the way new knowledge is created varies considerably from firm to firm. One can think of generating knowledge by gathering more data (being more comprehensive), being more team based in its usage (using more brains), and by being more creative with the application of the data and knowledge at your disposal (being smarter). Our work shows that, almost without exception, creativity is the main driver in new knowledge creation and the generation of innovative outputs. For some firms (e.g., legal entities and executive search firms) it pays to be more comprehensive. In other firms (e.g., business services operations) being more team driven is critical. But in all cases, those firms with the biggest bang from their ability to source and absorb knowledge and

information are those that apply it creatively. It is simply not the capacity to have more stuff to toss around (e.g., have a bigger database) that matters but the creative ability to apply what is known to a specific application.

In an industry that demands it, being creative has become the *raison d'être* for the advertising firm in our sample. The firm is well equipped for this demand, possessing a creative team that is highly regarded by both internal members of the firm as well as its clients. However, the biggest challenge facing the firm is not the lack of creative ability, but rather, the lack of supporting mechanisms (i.e., lack of structured time for developing and sharing new ideas) that allows the firm to fully capitalize on its potential. A manager at the firm explains that “there is a lot of ability to be innovative but it boils down to a lack of time. Most people here would be more than happy if they had more time to come up with new ideas and be more proactive with the clients”. The executive search firm faces a similar problem whereby its incentive structures have prevented the full realization of its creative talents. According to a director of the firm, “[o]ne thing that we have is people who are capable. It’s not a question of capability, it’s a question of what is rewarded. If everything is based upon outcomes (financial outcomes and transactions), then it’s in everyone’s interests not to worry about quality and just focus on outcomes. We’ve never been comfortable taking people out of the revenue stream and saying forget about your billings, we just want you to develop this new product”. The main message here is that when creativity is allowed to flourish, our results show that this leads to greater new knowledge and innovation. But more critically, our study also reveals that the problem is not the lack of creativity (the firms in our sample all possess intelligent and creative people) but the lack of supporting mechanisms that can channel such creativity into more effective decision making processes.

Conclusion: Knowledge Management Can Be Measured Through Innovative Outputs.

The “School of Knowledge Management”, if there is such a thing, has two parents. On the one side, a lot of the initial managerial thinking arose from the IT literature (e.g., Davenport and Prusak, 1998) and the sharing and use of data. On the other side, notions of intangible knowledge stocks (Itami and Roehl, 1987) and their role in fostering innovation (Nonaka and Takeuchi, 1995) emphasized the role of transfer, understanding and learning. Our work indicates quite clearly that knowledge management is best understood and managed from the perspective of innovation and intangible asset management rather than IT management. Indeed, the impact of knowledge management systems on performance is almost wholly driven by the changes that it has on the organization’s ability to innovate—either in better processes or better products and services. The simple implication of this is that rather than being a new field of management with its own special laws, knowledge management sits well within our understanding of what drives change and motivates innovation.

This creates a convenient solution for managers trying to deal with the intangibility of knowledge. You cannot manage knowledge because you cannot see it. However, as our work shows you can manage the antecedents to knowledge creation—effective formal and informal networking, systems to encourage knowledge absorption, opportunities for the application of learning. You can also manage some of the processes for knowledge

creation—in terms of the comprehensiveness, creativity and consensual nature of your decision-making. Most critically of all, you can *measure* the change in innovative outputs that flows from your knowledge management strategies and practices. Although not perfect, such simple thinking has been shown to dramatically increase the respect for knowledge management, increase the innovative performance of firms and ultimately filter through to the bottom line.

Another general conclusion of our work, and something again that highlights the role of innovation, is that knowledge management systems operate very much on a contingency, “horses for courses”, platform. The level of emphasis on the various subsystems differs quite dramatically from firm to firm, even though the basic problem is the same, how to generate and capitalize on knowledge. This is emphasized in the case of the advertising agency given in the box. What this case illustrates is the difficulty faced by an in-between firm—an organization too large for purely informal systems to operate but too small to afford complex and formal corporate systems. However, the firm was moderately successful in that it understood what it needed to know and tried to develop systems that achieved that. If it failed, it was because it did not make knowledge sharing such an overarching priority that it changed the heavy customer deadline focused mentality common in the industry.

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CASE STUDY: Managing Know-How in the Small at ADCO

ADCO, a medium-sized media design-and-execution company, had achieved phenomenal growth since its inception in 1990. With this growth came some unexpected challenges, not the least of which was the fact that it created pressures to design systems that replaced the hands-on management style typical of small start-ups. For Paul Royale, one of the founding partners, the main problems ADCO was grappling with were communication, lack of respect, lack of competences and the lack of a post-project review process. His eyes were opened to the idea of knowledge being regarded as a currency, and that currency being worth something to other people. The problem was to encourage or give an incentive to people to share the knowledge. This was the charge given to him by the seven partner/owners.

Knowledge sharing was particularly important to a company like ADCO that operated in a deadline-driven business where you simply have to do “what the client wants ... when they want it”. Whereas ADCO looked on client management as one of its key strengths, managing internal relationships took something of a back seat. As one director noted, working well with clients did not necessarily extend to working well with colleagues; “...we all work well with clients, but I think internally we are absolutely appalling at sharing how we work...ways of working smarter.” As ADCO grew the informal networking between the partners that made it operate smoothly were put under stress. The model where “...I use other peoples brains for storing information so I know what they did... when it’s relevant to ask them about it” emphasized by one of the partners was becoming increasingly ineffective.

Paul Royale discovered that five levels of knowledge were critical to the agency’s success. The first was *technical expertise*—how to make effective videos and other promotional material. The second was *project management*—the understanding of what it takes to put a major project together for a client. The third area was *understanding client needs and delivering marketing value* for clients. This has historically been the competence that sets ADCO apart from most of its competitors. The fourth realm of knowledge was the *ability to seek out and absorb “what’s new”, fresh and trendy* in the industry. The fifth area of knowledge management, and perhaps the least important, was *the storage and retrieval of on-going internal knowledge development*.

Recognizing that a firm the size of ADCO, with 51 full time employees and an equal number of temporary workers, could not afford complex database systems, Paul Royale focused his efforts on developing formal informal networking and transfer systems that substituted for expensive IT and fit better with the company’s ‘creative’ focus. The result was three initiatives.

The *after-action review (AAR) process* was aimed at facilitating more constructive feedback and eliminating mistakes after the completion of each project. The business directors decided to try it for a period of 3 months to see if it worked. The importance of such reviews, especially their timing, has been emphasized by one director, “we used to sit down every couple of months and look at mistakes instead of learning instantaneously for something that went wrong. I think it’s important to share these things as you’re going along, rather than analyzing them three months down the line when it’s too late”.

Show-and-tell allows people to do a short presentation of work that has been done for certain clients to the rest of the agency. In addition, senior managers give twenty to thirty minute talks on areas they felt would benefit the agency as a whole. The topics discussed have been fairly broad, such as life skills or relationship management skills.

Informal brainstorming sessions have been instituted at the initiation of large client projects. Part of the impetus behind these meetings was the failure of communication between the different client groups. This lack of information sharing was highlighted when the one team wanted to use ‘heat reveal’ promotional material. Because nobody on the team had any experience with the technology they went through a long learning process. In fact it took several weeks of painful and expensive research. In the end the team had found a company that specialized in developing heat-reveal promotional material. When the company was contacted, the team found out that another group at ADCO had worked with this same company several months ago on a promotion for another client.

These informal structures were critical to ADCO’s success. They systematized meetings and interactions and avoided the failure to reuse relevant information and highlighted the sources of knowledge inside the firm. Although many in the company bemoaned the fact that most of the larger mainstream agencies have research departments or a resource libraries that kept them up to date, it was clear that ADCO could not afford to operate such a system and that informal development was more efficient. However, this did not mean that they ignored more formal database systems. Plans were on the books to develop a database of detailed information on each of employee as a way of encouraging people to get to know each other more as well as becoming a source of business-related information. Plans were also in place to update ADCO’s current database—a centralized repository of client names, contact numbers and other very superficial information that is updated by the client service people responsible for their respective clients. However, given the ‘creative’ and ‘informal’ nature of ADCO’s culture it was felt that such systems could not replace the more humanistic approach to knowledge management.

Appendix: Theoretical Constructs

The constructs fall into two general categories: *entropy indices* and *reflective measures*. Formal and informal networking, information and know-how acquisition, and innovation were measured using entropy indices. The benefit of an entropy index is that it provides a single score that measures both breadth and depth, with slightly more emphasis on depth. For example, the measure we used for information acquisition was $\sum_{i=1}^N F_i \ln(1 / F_i)$ where F_i is the frequency of acquisition from i th party (F_i is computed as a percentage of the total frequency score).

The two networking measures spanned: customers, suppliers, competitors, other businesses, sales/distribution agents, universities, other research institutions, government agencies, market research organizations, advertising agencies, consultants, parent companies, overseas business units, other business units and fellow colleagues. The information and know-how sourcing measures included all of these sources plus libraries and published sources and the internet. The innovation construct was based on fourteen items that covered: new and modified products and services, prototype developments, manufacturing and service techniques, administrative and managerial practices, policies and procedures, marketing techniques, patents applied for or received, publications in book, journals or technical outlets, formal presentations at conferences/seminars, and licensing rights sold or purchased.

The absorptive capacity, decision making (comprehensiveness, creativity and consensus), new knowledge and market/financial performance constructs were all created using reflective measures. The Cronbach Alphas for these measures ranged from 0.89 for organizational absorptive capacity to 0.71 for creativity in problem solving with between four (market/financial performance) and seven (absorptive capacity measures) items for each construct.