

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 worry about database content and measuring information and knowledge, but that it is just one component of the knowledge management system.

In fact, recent work by Gold et al. indicated that knowledge management should be seen from an organizational capabilities perspective.<sup>16</sup> That is, the ability to apply knowledge in problem solving (i.e., process capability) is just as important as the ability to store knowledge (i.e., infrastructure capability). Indeed, this is one of the compelling lessons of the Buckman Laboratories example.<sup>17</sup> Buckman did not focus on content but rather on making sure that those who needed access to sources of know-how got it and were capable of understanding what to do with it once they had their hands on it.

### **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 of 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.

We observed a set of "knowledge traps" to which even the best firms seemed to fall victim. These pitfalls 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, not a simple process that can be bolted onto business models, as in the case of quality function deployment, business process reengineering, or total quality management. Also, the intangibility of knowledge means that the things that made QFD, BPR, and TQM popular—i.e., their measurement capabilities—are absent. Without good metrics, managers of knowledge-based firms traded measurement for gut instinct, and in the process they allowed themselves to make some simple but critical errors. Following are eight lessons to be learned from these knowledge traps.

***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 had invested in formal systems that failed to develop into a strategic tool for enhanced problem solving simply because: they were cumbersome to use; their content was not useful or relevant enough; and 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 both too complicated (for inputting as well as retrieving data) and inefficient (in terms of the time taken to retrieve a piece of information). More importantly, the information and knowledge stored were not perceived as being comprehensive or sufficiently relevant. In the business services firm, this was attributed to the fact that the people managing the system did not possess adequate "industry or specialist knowledge" to enable them to understand a particular client's problem nor did they possess 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 indeed codified and captured. One of the business services firm's biggest challenges was capturing the intellectual capital that flowed from client projects. The difficulty was the lack of time and incentives allocated for recording knowledge, as illustrated by one associate's statement: "No one is given time to actually do it. 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 does not equate to knowledge management.***

There is a major distinction between the database subsystem and the knowledge management system. Database subsystems are important vehicles for capturing information, but in order for these 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. Firms with more comprehensive and knowledge-friendly *informal networking* systems are better at generating know-how and the innovation and performance outcomes that follow. These results echo McDermott's argument that information technology cannot deliver knowledge management because human relationships are needed to share knowledge that is neither obvious nor easy to document.<sup>18</sup> 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 uses ineffectively, than to invest in the informal networking and transfer subsystems that are essential for what goes into and comes out of these databases.

However, this does not imply that one must nurture informal networking subsystems at the expense of formal systems. Rather, both complement one another and must be developed concurrently. Strong informal linkages supported by comprehensive databases characterize an organizational environment conducive to generating new ideas and innovation. 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 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 argue that “economic action (like all action) is embedded in ongoing networks of personal relationships rather than carried out by atomized actors.”<sup>19</sup> This is supported by the work of Nahapiet and Ghoshal<sup>20</sup> and Cohen and Fields<sup>21</sup> who acknowledge the important role social capital plays in the development of organizational knowledge and innovation. 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 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 interaction. In another example, our research at the legal firm revealed that the grapevine had become a substitute when formal communications had failed. Noted one 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—there is no 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.”

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 co-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*.

***Lesson 4: To ensure that informal networking is less susceptible to randomness, it 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. This is particularly important when knowledge (or best practices) developed in one area of the organization can be applied and utilized in other parts of the organization. All too often organizations fail to account for factors that inhibiting knowledge transfer and diffusion within the firm.

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 they can be re-applied—a reflection of what is sometimes called “internal stickiness.” Internal stickiness can be thought of as “the difficulty of transferring knowledge within the organization” attributable to organizational structures that promote a “silo” mentality,<sup>22</sup> a culture that values personal expertise, and the lack of appropriate rewards and incentives for sharing of understanding.<sup>23</sup> Because the complexity of a problem-solving situation is usually embedded



within group dynamics, it is common for a solution or a new piece of knowledge to stay within the group whose members most easily understand it. Also, the fast-paced working environment of many firms preclude any real opportunities for people to interact beyond 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 noted, 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 remains ad hoc or accidental. A partner whom we interviewed at the advertising agency commented on how lack of time had 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 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) are perpetuated. At the advertising firm, employees were not learning from mistakes simply because they had not instituted regular structured meetings to serve that purpose. The core output of an advertising agency is highly dependent on different areas of expertise—e.g., client management, creative design, and production. This multidisciplinary work environment, coupled with a fast-paced work culture, creates a need for more regular and structured "de-briefing" sessions where people have the opportunity to discuss mistakes made and lessons learned from their projects. As a director at the agency described the current situation: "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 an explicit intention to *build 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

**TABLE I.** 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
<b>N</b>	<b>18</b>	<b>45</b>	<b>94</b>	<b>85</b>	<b>51</b>	<b>64</b>

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.”

These examples reflect both the importance and difficulty of implementing structured knowledge sharing. Most organizations exist in a world of tight schedules, multiple projects, and quick turnaround time. In this environment, meeting client deadlines is given priority ahead of occasions for general learning and knowledge sharing. However, organizations often suffer the consequences of this oversight when they fail to capture and share 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 not shared via regular, structured interpersonal interactions.

***Lesson 5: Senior management may not know the true state of their firm’s knowledge systems.***

There is a distinct difference between the perceptions of senior managers and their subordinates of the efficacy of their knowledge management systems. With regard to formal database subsystems, senior managers invariably look on the IT systems positively but with a *mea culpa* related to their own failure to use them effectively. Junior managers are cynical about the systems but much more positive about their own abilities to use them to their own benefit. With regard to the less-tangible management development activities within the firms—i.e., knowledge-sharing practices, training schemes, and keeping abreast of the latest products or industry trends—we found an interesting discrepancy between the perceptions of senior managers and the more junior staff. Senior managers have

**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
<b>N</b>	<b>18</b>	<b>45</b>	<b>94</b>	<b>85</b>	<b>51</b>	<b>64</b>

a higher perception of the effectiveness of organizational policies, as compared to lower-level executives. Table 1 shows the ratings (on a scale from 1 to 7) given to the organizational incentives for various information and knowledge development activities.<sup>24</sup> For each case study firm, the survey respondents are divided into three levels—Level 1 being directors and senior managers, Level 2 consisting of middle management, and Level 3 being predominantly team leaders or officers. Results show that for all measures of organizational incentives, Level 1 managers gave the highest ratings in all cases (with the exception of the advertising firm where Level 2 managers 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: You 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 in 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 been working there since 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.<sup>25</sup> The fact that the individuals consider their abilities higher, on average, than the 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 executives. Given that Table 1 showed these managers rate the organizational incentives highest, we have an 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).

***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 on 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—a fact reinforced in more organizations with “siloes” organizational structures that promote a culture of personal expertise and direct billing responsibility. 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 went directly to the individual (sometimes even to the detriment of the firm). In the executive search firm, a turnover rate of nearly 40% per year in consultants created a serious problem in maintaining consistency of relationships with corporate clients, and it 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. It 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 indeed 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."<sup>26</sup> 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 it needs to be supported by appropriate mechanisms.***

Creativity is the main driver in new knowledge creation and the generation of innovative outputs. Those firms with the biggest bang from their ability to source and absorb knowledge and information are those that apply it creatively. Because it is in an industry that demands originality, the advertising firm in our sample is well equipped with creative individuals. However, the biggest challenge facing the firm is a lack supporting mechanisms that allow the firm to fully capitalize on its creative potential (i.e., structured time for developing and sharing new ideas). As a manager at the firm explains, "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, "One 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." When creativity is allowed to flourish, it leads to new knowledge and greater innovation. However, it also needs supporting mechanisms to channel that creativity into more effective decision-making processes.

**Conclusion: Knowledge Management Can Be Measured Through Innovative Outputs**

A lot of the initial managerial thinking on knowledge management arose from the IT literature<sup>27</sup> and the sharing and use of data. On the other side, notions of intangible knowledge stocks<sup>28</sup> and their role in fostering innovation<sup>29</sup> have emphasized the role of transfer, understanding, and learning. Our research shows that knowledge management is best understood and managed from the perspective of innovation and intangible asset management rather than IT