

LEARNING BY KNOWLEDGE-INTENSIVE FIRMS*

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DISCOVERING EXPERTISE

The General Manager of the Garden Company (a pseudonym) invited John Dutton and me to advise him about what he called their 'lot-size problem.' He was wondering, he said, whether Garden was making products in economically efficient quantities.

We had no idea what a strange but memorable experience this would be!

The General Manager proposed that we start with a tour of their largest plant, and assigned someone to guide us. Our guide took us first to the model shop, which produced jigs and patterns for use in the main plant. In the model shop, a skilled craftsman would start with a raw piece of metal, work on it with several different machine tools, and end with a finished component. Each successive component differed from those produced before and after, and each craftsman's tasks were shifting continually.

Then our guide took us into the plant itself. To our amazement, we found little difference from the model shop. Many workers were using several different machine tools in succession. Since each worker had several machines, most of the machines were idle at any moment.

Some workers chose to decorate castings' non-functional insides with patterns such as one sees on the doors of bank vaults, each worker inscribing his personal pattern. Quality standards were incredibly high, for the workers saw themselves as artisans who were putting their personal signatures on their products.

In the middle of the plant stood a wooden shack. Nails on the wall of this shack represented the distinct areas of the plant. Hanging on each nail were the production orders awaiting work in one area. We saw workers enter the shack, leaf through the orders, and choose orders to work on. Our guide said orders got processed promptly if they called for tasks the workers enjoyed, whereas orders might hang on the nails for weeks if they called for tasks the workers disliked.

Hoppers of partly finished components jammed the aisles. This, our guide explained, reflected raw-materials shortages, misplaced jigs and patterns, and missing components. After work began on an order, a worker would discover that needed raw material was out-of-stock – the order would have to wait while purchasing got the raw material. Or, a worker would be unable to find

a needed jig, and a search would reveal that a subcontractor had borrowed the jig and not returned it – the order would have to wait while the jig was retrieved or replaced. Or, a product would be partly assembled and then the assemblers would discover that a component was missing – the incomplete assemblies would have to wait until the missing component emerged from production. Any of these problems might arise more than once during production of a single order. As one result, Garden was taking an average of nine months to deliver standard products that incorporated only a few hours of direct labour.

The plant tour left John and me rolling our eyes in wonder. We could not have imagined less efficient methods or greater disorder. It was hard to believe that Garden could even be making a profit! Yet the main building appeared in good condition, the office areas looked clean, and the General Manager's office had luxurious furnishings.

We told the General Manager that the plant had no lot-size problem, but we wondered whether he would not prefer to have one. A lot-size problem implied that machines would be set up for mass production and that workers would repeat specialized tasks. We suggested, however, that Garden would gain more direct benefit from production and inventory control than from mass production. A computer-based control system could keep raw materials in stock, monitor the progress of production, reduce delays, and make sure that jigs and patterns were available. Inventories could be much lower, machine usage could be much higher, and customers could receive their orders much more quickly.

The General Manager asked for estimates. We told him a control system would have a payback period of roughly two years and the inventory savings alone would cut production costs by at least ten per cent. To this, he responded, 'Why should we want to do that? Ten per cent of our production costs is only one per cent of our revenues.' He then produced Garden's financial statements for the previous year. After-tax profits had been \$40 million on sales of \$83.5 million. 'And that,' he crowed, 'was a year in which we had a strike for ten months!'

He went on to explain that Garden made every effort to avoid direct competition. Over a third of Garden's personnel were engineers who were good at designing new products that no other firm was producing. Garden's policy was to continue making a product only as long as its gross margin exceeded 75 per cent of sales. When competition drove a gross margin below 75 per cent, Garden would stop offering that product for sale. The average gross margin across all products exceeded 90 per cent.

Allowing for the corporate tax rate of 52 per cent, we surmised that Garden employed expert tax accountants as well as expert engineers.

John and I had received several lessons in business ... and the General Manager had not even charged us tuition!

Garden's high profits did not arise from fine steel, unusually skilled craftsmen, or exceptional capital equipment. Its marketing was ordinary. Although Garden delivered high quality, it used no esoteric production technologies, and it often subcontracted production to a broad array of machine shops. It was this subcontracting that had enabled Garden to earn

high profits despite a long strike. The profits also did not come from managerial competence of the sort most production firms cultivate. In that domain, Garden appeared utterly incompetent.

The remarkable profits sprang from technical and strategic expertise. The key labour inputs came not from the machinists in the plant, but from the engineers and managers in the office building. These people had created monopolistic opportunities for Garden over and over again. Garden was the only producer of many of its products, and the dominant producer of all of them.

Garden's key input was expertise. It was a knowledge-intensive firm (KIF).

Knowledge intensity has diverse meanings, partly because people use different definitions of knowledge. The next section of this article gives my conclusions about such issues. Two following sections then make empirically based observations about the activities inside KIFs. The first of these sections reviews the kinds of work experts do, and explains why experts find learning hard. The ensuing section then describes organizational learning: KIFs learn by managing training and personnel turnover, and by creating physical capital, routines, organizational culture, and social capital. To see the results of learning, the fifth section looks at KIFs' long-term strategic development, including multinational expansion.

WHAT IS A KIF?

The term *knowledge-intensive* imitates economists' labelling of firms as capital-intensive or labour-intensive. These labels describe the relative importance of capital and labour as production inputs. In a capital-intensive firm, capital has more importance than labour; in a labour-intensive firm, labour has the greater importance. By analogy, labelling a firm as knowledge-intensive implies that knowledge has more importance than other inputs.

Although the terms capital-intensive, labour-intensive and knowledge-intensive refer to inputs, capital, labour and knowledge also may be outputs. Why is it useful to classify firms by their inputs? A study of office-equipment or software companies groups firms by their outputs. Such a study emphasizes similarities and differences across customers and distribution channels, and it makes a good basis for analysing relations with customers or competitors. By contrast, a study of meat packers or machine shops groups firms by their inputs. By emphasizing similarities and differences across raw materials and personnel, such a study makes a good basis for analysing internal structure and operations. Input classes highlight the effects of resource availabilities, and their determinants, such as governmental policies. As well, Sveiby and Risling (1986) argued that KIFs call for new definitions of ownership and new ways of controlling the uses of capital. Traditional notions of ownership, they said, assume that financial or physical capital dominates labour, whereas human capital dominates in KIFs.

Assessing the importance of knowledge is harder than comparing capital and labour, however. Economists compare capital and labour by expressing them in monetary units, but market prices mainly reflect values that many

firms share. At best, prices reflect those aspects of inputs that could transfer readily from one firm to another. Prices ignore inputs' importance for intrafirm activities or for activities that are idiosyncratic to a single firm. Since much knowledge has disparate values in different situations, monetary measures of knowledge are elusive and undependable.

Knowledge itself is almost as ambiguous an idea as value or importance, and it has many guises (Winter, 1987). During a dozen seminars aimed at research about knowledge-intensive firms, almost every speaker devoted time to his or her preferred definition of knowledge. Such discussions have led me to five conclusions.

1. *A KIF may not be information-intensive.* Knowledge is a stock of expertise, not a flow of information. Thus, knowledge relates to information in the way that assets relate to income (Machlup, 1962, took another view). Some activities draw on extensive knowledge without processing large amounts of current information – management consulting, for example. Conversely, a firm can process much information without using much knowledge. For instance, Automatic Data Processing (ADP) produces payroll cheques. ADP processes vast amounts of information, but it is probably more capital-intensive than knowledge-intensive. Producing a payroll cheque requires little expertise, and many people have this expertise.

The distinction between a KIF and an information-intensive firm can be hard to draw. From one perspective, ADP merely processes data for other firms, using mainly capital in the forms of computers and software. From another perspective, ADP succeeds because it does its specialized task better than its customers can do it themselves. This superior performance may come from both expertise and returns to scale, so expertise and large scale reinforce each other.

2. *In deciding whether a firm is knowledge-intensive, one ought to weigh its emphasis on esoteric expertise instead of widely shared knowledge.* Everybody has knowledge, most of it widely shared, but some idiosyncratic and personal. If one defines knowledge broadly to encompass what everybody knows, every firm can appear knowledge-intensive. One loses the value of focusing on a special category of firms. Similarly, every firm has some unusual expertise. To make the KIF a useful category, exceptional expertise must make an important contribution. One should not label a firm as knowledge-intensive unless exceptional and valuable expertise dominates commonplace knowledge.

Some forms of expertise may be hard to measure separately from their effects. Why, for example, does one attribute strategic expertise to the Garden Company? One might label Garden a KIF because it employed so many engineers. But many firms employ more engineers with less remarkable results, and Garden's products embodied no technological miracles. These engineers were unusual because they were using their knowledge in ways that gave Garden extraordinary strategic advantages.

Managerial expertise may pose special problems in this regard. It would make no sense to measure managerial expertise by the fraction of employees who are managers or by the wages paid to managers. To judge managers expert, one has to look either at the managers' behaviours or at the results

of their behaviours. Do their firms produce unusually high profits? Do the managers show interpersonal skill?

3. *Even after excluding widely shared knowledge, one has to decide how broadly to define expertise.* One can define expertise broadly, recognize many people as experts, and see the expertise embedded in many machines and routines. This strategy makes KIFs less special, but it removes some blinkers caused by stereotypes about expertise, and it increases the generality of findings about KIFs. Alternatively, one can acknowledge only the legitimated expertise of people who have extensive formal education, and can emphasize high-tech machines and unusual routines. This second strategy makes KIFs appear more special, but produces findings that generalize only to the few firms that use such expertise intensively. It also accepts stereotypes about expertise.

These definitional strategies have political overtones. A broad definition of expertise obscures the influence of social class and social legitimacy, whereas a narrow definition highlights the influence of social class and social legitimacy. Legitimated expertise is normally an upper-middle-class possession. Legitimated experts usually earn salaries high enough to put them into the upper-middle class. They normally gain their expertise through formal higher education, which entails at least the expense of forgone income. Higher education also may give experts entry into recognized professions.

Even jobs widely regarded as unskilled may entail much knowledge (Kusterer, 1978). Skilled trades may be as esoteric and difficult to enter as the professions (Ekstedt, 1989). Yet, people put other labels – such as know-how or skill or understanding – on expertise learned through primary school or on-the-job experience.

Sweden has spawned much of the public discussion and research about KIFs. In 1983, Sveiby started writing about 'knowledge companies' in one of Sweden's most prominent periodicals, and Swedish business executives expressed strong interest in this topic. Sveiby and Risling followed in 1986 with a book that became a non-fiction best-seller. Probably this interest reflects Sweden's high incomes and high educational levels.

4. *An expert may not be a professional, and a KIF may not be a professional firm.* Professionals have specialized expertise that they gain through training or experience, and KIFs may employ people who have specialized expertise. Thus, KIFs may be professional firms.

Many KIFs are not professional firms, however. One reason is that not all experts belong to recognized professions. A profession has at least four properties besides expertise: an ethical code, cohesion, collegial enforcement of standards, and autonomy (Schriesheim *et al.*, 1977). Professionals' ethical codes require them to serve clients unemotionally and impersonally, without self-interest. Professionals identify strongly with their professions, more strongly than with their clients or their employers. They not only observe professional standards, they believe that only members of their professions have the competence and ethics to enforce these standards. Similarly, professionals insist that outsiders cannot properly supervise their activities.

Management consulting and software engineering, for example, do not qualify as recognized professions. Without doubt, those who do these jobs

well have rare expertise. Nevertheless, the ultimate judges of their expertise are their clients or their supervisors, and their employers set and enforce their ethical codes and performance standards. Similarly, despite talk about professional management, managers do not belong to a professional body that enforces an ethical code and insists that its values and standards supersede those of managers' employers. Employers appoint managers without regard for the candidates' memberships in external bodies. Strong loyalty to a professional body would contradict managers' roles as custodians of their employing firms.

Sveiby and Lloyd (1987) divided 'knowhow companies' into categories reflecting their managerial or technical expertise. They pointed to law firms as examples of high technical but low managerial expertise. To illustrate firms with high managerial and low technical expertise, they cited McDonald's fast-food chain. On the other hand, Ekstedt (1988; 1989, pp. 3-9) contrasted 'knowledge companies' with industrial companies, high-technology companies, and service companies 'such as hamburger chains'. In his schema, both high-technology companies and knowledge companies have high knowledge intensity, but high-technology companies have a higher intensity of real capital than do knowledge companies.

Professional firms can exploit and must allow for all five properties of professions, not merely expertise. Health-maintenance organizations, for instance, must accept doctors' codes of ethics and must allow medical societies to adjudicate some issues. KIFs form a broader category, in which many issues reflect labour markets, interpersonal networks, and experts' individuality, self-interest, and social standing.

Yet, it could be that most KIFs have nearly all the properties that authors have assigned to professional firms. For example, Hinings *et al.* (1991, pp. 376, 390) wrote:

Bucher and Stelling (1969) suggested that organizations dominated by professionals had a number of special characteristics, including professionals building their own roles rather than fitting into preset roles, spontaneous internal differentiation based on work interests, competition and conflict for resources and high levels of political activity. . . . The *distribution of authority* has long been identified as unique in an autonomous professional organization because of its emphasis on collegiality, peer evaluation and autonomy, informality, and flexibility of structure (Bucher and Stelling, 1969; Montagna, 1968; Ritzer and Walczak, 1986).

Professionals are not the only experts who build their own roles, divide work to suit their own interests, compete for resources, or emphasize autonomy, collegiality, informality and flexible structures. Other occupations share these traditions, and some experts have enough demand for their services that they can obtain autonomy without support from a recognized profession.

There is another reason KIFs may not be professional firms.

5. *KIFs' knowledge may not be in individual people.* Besides the knowledge held by individual people, one can find knowledge in: (a) capital such as plant,

equipment, or financial instruments; (b) firms' routines and cultures; and (c) professional cultures.

People convert their knowledge to physical forms when they write books or computer programs, design buildings or machines, produce violins or hybrid corn, or create financial instruments such as mutual-fund shares (Ekstedt, 1988; 1989). Conversely, people may gain knowledge by reading books, studying buildings, buying shares, or running computer programs.

People also translate their knowledge into firms' routines, job descriptions, plans, strategies and cultures. Nelson and Winter (1982) treated behavioural routines as the very essence of organizations – the means by which firms can produce predictable results while adapting to social and technological changes. Simultaneously, Deal and Kennedy (1982) and Peters and Waterman (1982) were saying it is cultures that perform these functions.

Describing McDonald's as a firm with low technical expertise overlooks the expertise in McDonald's technology and organization. McDonald's success stems from its ability to deliver a consistent quality in diverse environments and despite high turnover of low-skilled people. To get such results, the firm operates extensive training programmes and conducts research about production techniques and customers' tastes. Although training at Hamburger University may give McDonald's managers more skill than those at most restaurants, McDonald's managers may have no more skill than those in most production firms. Ceaseless expansion forces McDonald's to concentrate training on new managers. Also, McDonald's substitutes technology and routines for in-person management.

Professional cultures too carry valuable knowledge. For instance, lawyers live amid conflict. Lawyers' culture not only supports conflict, it shows them how to conflict to maximum effect and with minimum damage to their egos and reputations. Lawyers strive to advocate their clients' interests even when this might produce injustice, and they depend on conflict to foster justice by exposing all sides. Lawyers try to keep their roles as advocates for their clients separate from their interpersonal relations as members of the legal profession. They observe behavioural codes strictly and much of their conflict concerns interpretations of and conformity to behavioural codes. When lawyers cannot themselves resolve disagreements, they seek help from above – judges in courts or superiors in law firms. The legal profession also serves as micro environments in which lawyers can cultivate long-term reputations. Some lawyers seek reputations as tough negotiators who yield little and demand much. To nurture such reputations, they may refuse to make concessions that their clients want to make.

A Starting Point

Debates about how KIFs differ from other firms persuaded me to focus on firms that would be knowledge-intensive by almost anyone's definition. As a starting point, I defined an expert as someone with formal education and experience equivalent to a doctoral degree, and a KIF as a firm in which such experts are at least one-third of the personnel. Later, Lawrence Rosenberg pointed out that some expertise takes non-human forms. Some KIFs

may even hold most of their expertise in non-human forms, but I have not studied such firms.

I have not been distinguishing firms from other organizations because many KIFs operate at the boundary between government and private enterprise. They are not-for-profit firms that work mainly or exclusively for government agencies.

Although I have interviewed in eight firms satisfying the above criteria, three stand out as excellent examples.

The Rand Corporation and Arthur D. Little are the two firms that came immediately to mind when I first began thinking about the *knowledge-intensive firm*. The Rand Corporation is the prototypic think tank, located near the beach in Santa Monica. Staffed by PhDs, Rand mainly makes policy studies: Rand's personnel evaluate current policies and generate policy alternatives. Rand holds long-term contracts from the US Air Force and the US Army, and it receives short-term grants or contracts from many federal agencies. Its reports are ubiquitous in Washington, D.C.

On the other coast, in a wooded campus near Harvard and MIT, Arthur D. Little is the oldest American consulting firm and an exemplary one. A. D. Little has 21 offices and roughly 1500 consultants. In a typical year, they complete over 5000 projects in 60 countries. The project topics range from product technology, to operations management, to economic development and strategic planning.

Partners in Wachtell, Lipton, Rosen and Katz make more money than those in any other American law firm: it is to Wachtell, Lipton that other lawyers turn when they need the very best and they do not care how much it costs. Moreover, not only the partners do well at Wachtell, Lipton: surveys of junior lawyers have repeatedly said Wachtell, Lipton is the best place to work.

Although quite unlike each other, all three firms share similarities, as do the other firms I have studied. Large fractions of their people have advanced degrees. They process information slowly in comparison to information-intensive firms. Their capital equipment is mainly general-purpose office space, office machines and computers, although A. D. Little also has laboratories.

My observations come mainly from interviews. Indeed, 'interview' seems an inadequate label for fascinating conversations with very intelligent, perceptive, articulate people. I had only to point to a few issues that interested me, and they would begin to extrapolate – telling me who else I should interview, what issues *ought* to interest me, where my assumptions seemed wrong, and how their worlds look to them. I often found myself discussing topics or trying frameworks I had not considered before walking into a room.

Are KIFs Peculiar?

One critic complained that all my examples describe peculiar firms that exist solely because their environments have uncorrectable problems. An answer to this charge has three parts.

First, all firms *are* peculiar: we should look for and celebrate their individuality. There are many ways to solve most problems, more opportunities

than anyone can pursue, many criteria for judging what is best. It is as important to see how individuals differ – whether individual people, or individual organizations, or individual societies – as to see what they have in common. It is as important to understand complexities as simplicities.

Second, successful firms *cause* their environments to have uncorrectable problems. Firms and their environments change symbiotically. Not only must an environment be hospitable to a KIF, but the existence of a KIF induces its environment to assume that it exists. For example, US military services reassign personnel every two or three years. As a result, military personnel have little experience in their successive jobs, know little of tasks' histories or traditions, and cannot manage long-term projects effectively. Long-term projects would founder if they depended on military personnel. By providing civilian specialists who can have long tenures, the Rand Corporation and the Aerospace Corporation help the military to manage long-term projects, and they reduce the costs of retraining. Yet, having the services of Rand and Aerospace may have kept the military from developing other ways to manage long-term projects and other personnel policies.

Third, I have sought out the most successful firms, and all exceptionally successful firms exploit peculiarities. A modal firm in a competitive industry makes low profits, and it does not survive long. High profits and long survival come from monopolistic competition. Monopolistic competition arises from firms' developing distinctive competencies and mirroring their environments' unusual needs and capabilities.

Wachtell, Lipton shows how exceptional success may feed on peculiarities. The firm's founding partners had disliked their experiences in other law firms: they agreed to follow some unusual policies that would produce a better work environment. These policies have fostered collaboration and given the firm an edge in attracting new lawyers. The founding partners came from a less-well-known law school whose graduates had restricted job opportunities: much better than its reputation, this school supplied highly talented lawyers during the early years. A crisis during the firm's second year led the partners to adopt an unusual policy: Wachtell, Lipton never agrees to represent clients for long periods. This policy has had unforeseen long-term consequences for the types of cases the firm handles.

Success reinforces success, and excellence itself fends off competition. Today, with elegant offices on New York's Park Avenue, Wachtell, Lipton can choose among the top graduates from law schools across America. Potential clients offer the firm four to eight times as many cases than it can handle: it can pick the cases that look most interesting and best suit its abilities. The cases that potential clients bring are non-routine ones that involve large sums, and they often concern immediate threats. Such cases draw attention, as do Wachtell, Lipton's legal innovations.

EXPERTS' WORK

Interactions Between Creating, Applying, and Preserving

The experts in KIFs gather information through interviews or reading; they analyse and interpret this information; and they make written and oral

reports to clients and colleagues (Rhenman, 1973, p.161). An observer cannot overlook the strong, overt similarities across people, sites and projects.

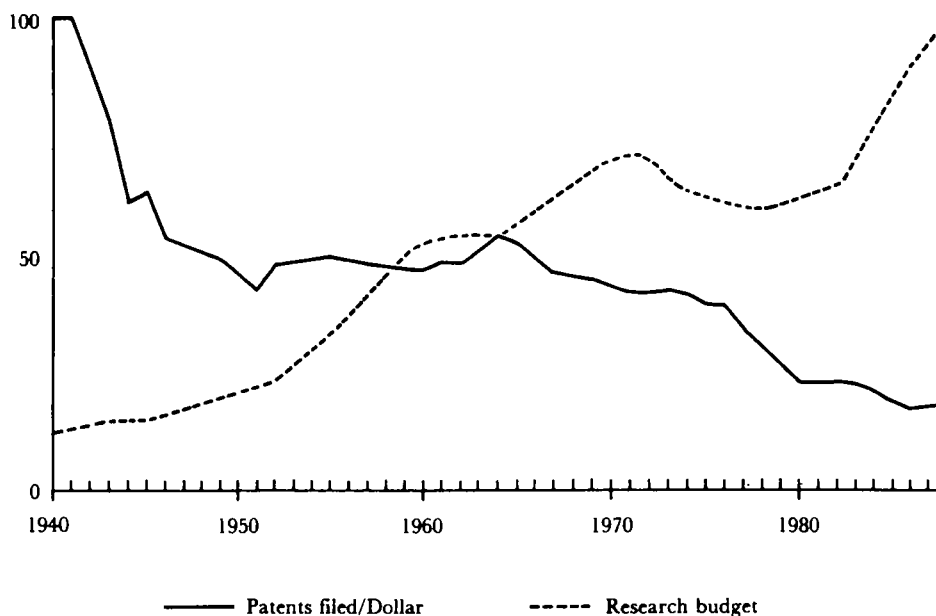
Nevertheless, experts themselves describe their activities diversely. Some say that they are applying old knowledge to new problems, others that they are creating new knowledge, and still others that they are preserving knowledge that already exists. Experts who see themselves as producing new knowledge emphasize the recency or originality of their data and the differences between their findings and those of predecessors. They may classify such work either as basic scientific research or as applied research on markets, products, or processes. Other experts see their work mainly as applying existing knowledge to current problems. For instance, when most lawyers do research, they analyse and interpret previous cases and they emphasize the continuity over time of knowledge and its meaning. To gain acceptance of their rulings, most judges de-emphasize the innovative quality of their reasoning.

The distinction between creating knowledge and applying it is often hard to make. Lawyers may be more successful if they reinterpret precedent cases imaginatively, or if they conceive original strategies. The Garden Company's engineers were applying known techniques, but they were applying them to products no one else had imagined. Basic research may have direct applicability, and applied research may contribute fundamental knowledge. When it comes to systems as complex as a human body or an economy, people may only be able to create valid knowledge by trying to apply it (Starbuck, 1976, pp. 1100-3).

To my surprise, several experts described themselves as memory cells. They said their jobs are to preserve information that their clients have difficulty preserving. As mentioned above, because the US military services rotate assignments frequently, military personnel lack job experience and cannot manage long-term projects. Also, military wage scales are too low to attract and retain highly educated experts. To compensate, the military services sign contracts with KIFs that provide long-term continuity of management and expertise. These KIFs employ civilian experts who do not rotate assignments frequently and who either manage long-term projects directly or advise military managers. There may be enough of these KIFs to make up a distinct, long-term-memory industry.

Creating, applying and preserving intertwine and complement each other. At least over long periods, merely storing knowledge does not preserve it. For old knowledge to have meaning, people must relate it to their current problems and activities. They have to translate it into contemporary language and frame it within current issues. Effective preserving looks much like applying. As time passes and social and technological changes add up, the needed translations grow larger, and applying knowledge comes to look more like creating knowledge.

For new knowledge to have meaning, people must fit it into their current beliefs and perspectives; and familiarity with existing knowledge signals expertise. Evaluators assess completed research partly by its applicability and they judge research proposals partly by the researchers' mastery of past research. Thus, Rand Corporation, which depends on research grants for



Notes: Vertical axes are nominal. Graphs show moving averages. Data are in constant dollars.

Figure 1. R&D by a large chemical firm

some of its income, makes elaborate literature searches before writing proposals. Rand also employs public-information staff, who highlight the relevance of research findings. Similarly, A. D. Little's executives believe that having credibility with clients requires their firm to specialize in certain industries, technologies and functions. They want new experts to have had several years experience in one of these industries and functions or technologies.

Ambiguity about the meaning of knowledge creation implies a weak tie, if any, between knowledge creation and knowledge intensity. Clearly, more input does not always produce more output. For example, Brooks (1975) pointed out how rare are the skills needed to create operating systems for computers. Adding more people to such a programming project does not accelerate it. On the contrary, more people may slow a project down, by forcing the experts with rare skills to spend more time co-ordinating, communicating and observing bureaucratic routines. An example of another kind concerns R&D by a large chemical firm. As figure 1 shows, this firm has spent more and more on R&D but incremental dollars have yielded fewer and fewer patent filings.

Learning

Because experts are learned, one expects them to value learning highly. Nonetheless, many experts resist new ideas.

Such resistance has several bases. First, clients or even other experts may interpret experts' need to learn as evidence of deficient knowledge. Thus,

experts find it risky to discuss their learning needs with clients or colleagues. Second, many experts get paid by the hour, and many others have to account carefully for their uses of time. Explicit learning reduces the time available for billable services. Third, expertise implies specialization, which reduces versatility and limits flexibility. To become experts, people must specialize and move into distinct occupational niches. Required years of education limit entry to these niches; and many experts belong to recognized professions that restrict entrance through licences and examinations. These niches, however, could become evolutionary dead-ends (Beyer, 1981). Fourth, experts' niches are partial monopolies. Like other monopolists, experts hold favourable positions that confer high incomes and social status. These positions also give experts much to lose from social and technological changes. Fifth, expertise entails perceptual filters that keep experts from noticing some social and technological changes (Armstrong, 1985; Starbuck and Dutton, 1973). Even while they are gaining knowledge within their specialities, experts may overlook exciting and relevant events just outside their domains.

Knowledge creation accelerates the social and technological changes in experts' domains (Wolff and Baumol, 1987). Because employers or clients often seek expertise to help them to understand rapid social and technological changes, experts tend to find employment in rapidly changing domains. Thus, most experts are all too aware that expertise needs updating: they have to seek a dynamic stability in which their apparent knowledge evolves while they retain their favourable positions.

Besides, experts' scepticism about new ideas can enhance their learning. Learning is not adaptation, and it requires more subtlety and complexity than mere change. People can change without learning, and too much readiness to discard current knowledge undermines learning. To learn, one must build up knowledge like layers of sediment on a river bottom. To learn effectively, one must accumulate knowledge that has long-term value while replacing the knowledge that lacks long-term value.

The key issue that experts, like other learners, confront is how to sift out knowledge that will have little value in the future. For this winnowing, expertise itself evidently confers no advantages. Studies of many fields have consistently found that renowned experts predict future events no more accurately than do informed people (Armstrong, 1985; Ascher, 1978; Camerer and Johnson, 1991). Still, few experts know about such studies, and many experts overestimate their abilities as oracles.

ORGANIZATIONAL LEARNING IN KIFS

Personnel Training and Turnover

Learning generally poses different issues for firms than for individual experts. For example, the need to update leads individual experts to spend time reading or attending conferences or courses. By contrast, senior people in a firm see updating as an activity to manage more than to do. Senior people may assign their juniors to take certain courses, or to read certain journals and to summarize what they read. Senior people sometimes deny certain

juniors permission to attend conferences and tell others that they must attend and report what they heard.

What individuals find hard, firms may find easy, and vice versa. In particular, individual experts learn little from changing firms, whereas organizational learning readily takes the form of personnel changes. KIFs aggressively pursue new experts with wanted knowledge, and they limit the job security of continuing experts. Since most consulting or research projects have short terms, experts must repeatedly renegotiate their relations with their firms and adapt their knowledge and skills to current tasks. Some small consulting firms give new consultants just three months in which to start bringing in enough business to cover their salaries. A would-be consultant who does not meet this target has to seek other employment. Large consulting firms may not treat each consultant as a separate profit centre, but they do ask consultants to account strictly for their time. A. D. Little, for example, expects most consultants to spend 70–75 per cent of their time on activities for which clients are paying, and 20–25 per cent of their time on personal betterment or soliciting new business.

Such development and personnel policies keep expertise closely aligned with environmental opportunities, so rigidity and blind spots may be more troublesome for individual experts than for KIFs. Indeed, such policies make KIFs faddish; and efforts to stay on the cutting edges of rapid technological and social changes accentuate this faddishness.

The policies also make boundaries porous. Just as KIFs may hire experts from their clients or customers, KIFs' clients or customers may add expertise by hiring KIFs' personnel (Stinchcombe and Heimer, 1988). Experts at the forefront of social or technological change usually have many job opportunities. Replacing experts solely to update expertise weakens loyalty to the firm and adds variance to organizational culture. The social networks that make it easy to adopt new ideas also make in-house ideas accessible to other firms, as does the ease of transmitting information. Thus, KIFs find it hard to keep unique expertise exclusive.

Stinchcombe and Heimer (1988) described successful software firms as 'precarious monopolies.' They are monopolies insofar as they exhibit unusual abilities. Niches evolve naturally as individuals and small groups concentrate on specific streams of innovation. The firms also strive explicitly to develop and maintain unusual abilities. Unusual abilities help the firms to market their services and to avoid head-on competition.

Stinchcombe and Heimer pointed out that these partial monopolies are constantly at risk, both because technological changes may make unusual abilities obsolete and because key experts may depart. Computer technology has been changing especially rapidly, and the software firms' relations with clients and computer manufacturers repeatedly expose their experts to job offers. To sell their services to clients, software firms have to publicize the talents of their key experts, and this publicity creates job opportunities for the touted experts.

Not all KIFs control distinctive domains of knowledge. Professional firms find it especially hard to sustain monopolistic positions. The recognized professions work at keeping their control of knowledge and at preserving their

members' autonomy: firms would run into strong opposition if they would try to convert professional expertise to organizational property. Moreover, many products of professional firms are easy to imitate. For example, Martin Lipton invented the 'poison pill' defence against unfriendly corporate take-overs; but, after other law firms saw a few examples, Watchtell, Lipton was no longer the sole source for poison pills (Powell, 1986).

Several modes of organizational learning do convert individual expertise into organizational property. These conversion processes produce at least three types of organizational property: physical capital, routines and organizational culture. The creation of social capital, such as mutual trust with clients or customers, tends to convert organizational experience into the property of individuals.

Physical Capital

Both KIFs and individuals can gain new expertise by buying capital goods. Computer software affords obvious examples.

Not long ago, expertise was uneven across accountants who handled income taxes. Now, every accountant has low-cost access to software that makes no arithmetical errors, omits nothing, incorporates the latest changes in tax codes, and warns of conditions that might trigger audits by tax authorities.

Lawyers have recently begun to use a computer program, CLARA, to help them do legal research. CLARA helps small law firms to compete more effectively against large firms, and helps novice lawyers to produce results comparable to experienced lawyers (Laudon and Laudon, 1991, chapter 4). Although unfinished, CLARA does research almost as well as law professors. On reading of this achievement, one practising lawyer sniffed: 'Too bad; maybe it will get better someday.'

In the short term, KIFs may be able to turn expertise into concrete capital. For instance, decades of experience enabled the large public accounting firms to create systematic auditing procedures. The firms then turned these procedures into checklists that novice accountants and clerical staff can complete. Similarly, Rand Corporation's research occasionally produces databases that have value beyond the projects that created them. Rand tries to exploit these databases by proposing new projects that would draw upon them.

Physical capital may be even harder to protect and retain than are people, however. Physical capital also may be less flexible than either the technologies it uses or the markets it serves. The auditing checklists created by firm A work just as well for firm B, so B can easily take advantage of A's experience.

IntelligenceWare wrote superior programs for artificial-intelligence applications. The firm has been seeking to exploit these programs by adapting them to diverse uses. Over the longer term, competing firms can analyse and imitate IntelligenceWare's programs. Also, because IntelligenceWare's programs are too complex for incremental evolution, experience will eventually force the firm to undertake a drastic rewrite.

Databases can be updated piecemeal, but they too gain or lose currency. At Rand Corporation, Brian Jenkins has compiled a database on terrorism. He began this on his own initiative, but the database became a more general

asset when terrorist acts escalated and Rand began receiving enquiries about terrorism from the press. Although the press's interest in terrorism fluctuates with the incidence of terrorism, such a database requires continual maintenance.

Orlikowski (1988, pp. 179–267) detailed a consulting firm's efforts to capture its experience as software. Over ten years and many projects, consultants built various software 'tools' that help them plan projects and carry them out efficiently. The tools originated separately when consultants saw needs or opportunities, but the firm's general production philosophy implicitly guided these developments and rendered the tools mutually compatible. Also, at first, isolated people used these tools voluntarily, but informal norms gradually made their use widespread and mandatory. Thus, the tools both expressed the firm's culture in tangible form, and reinforced the culture by clarifying its content and generalizing its application. Generalization made the differences among clients' problems less and less important, and it weakened the contributions that clients could make to problem-solving. Generalization also reduced the influence of more-technical consultants and increased the influence of less-technical consultants. In their interviews, the consultants stressed the tools' strong influence on their perceptions of problems and their methods of solving them. Eventually, the firm started to sell the tools to other firms. At that point, the firm's culture, methods, and experience became products that other firms could buy.

The ease of distributing it makes physical capital an effective way to build organizational culture, and it offers firms opportunities to expand their markets. Easy distribution also can cost firms their competitive advantages. Departing employees can easily take forms, manuals, or floppy disks with them. When firms turn physical capital into products that they sell to competitors, knowledge-intensive capital loses the character of being esoteric and advantageous. In this sense, a portable expert system is self-contradictory. Distributing an expert system renders its knowledge no longer esoteric, and thus no longer expert. It is not only tax accountants who now have low-cost access to programs for filing income taxes; millions of non-accountants are using these programs to file their business or personal taxes.

Routines

Firms also learn by creating routines (Nelson and Winter, 1982; Starbuck, 1983), but formalized routines look bureaucratic. Highly educated experts dislike bureaucracy: conflicts between professions and bureaucracies have attracted much research (Schriesheim *et al.*, 1977), and some of these conflicts apply to expertise in general. Most experts want autonomy, they want recognition of their individuality and they want their firms to have egalitarian structures.

Some experts derive independent power from their close ties with clients, so service KIFs with multiple clients look more like loose confederations than bureaucracies. Among the service KIFs, only those having long-term contracts with a very few clients seem able to bureaucratize. Even such KIFs must bureaucratize cautiously, for their expert employees have external job opportunities. Of course, a product KIF such as the Garden Company does

not run into such problems because its experts have little contact with customers.

The KIFs that can enforce bureaucratic routines can draw benefits from them. Impersonal roles make programmes for personnel development possible, and they ease transfers of people to meet shifting tasks. Consistent quality is essential to keeping long-term clients or customers. Bureaucratic clients or customers expect the KIFs they hire to look and behave as they do. For example, the Aerospace Corporation has a seven-layer managerial hierarchy because this structure matches the hierarchy of the US Air Force.

Bhargava (1990) observed that the software firms in which developers interact closely with clients emphasize formalized documentation. These firms devote more effort to planning and systems analysis, to writing user manuals, and to recording the activities carried out and times spent on specific projects. These documents contribute to better client relations and reduce the firms' dependence on developers who might depart.

The Rand Corporation illustrates effective bureaucratization by a KIF. Rand's library staff watch for opportunities to submit proposals, and produce bibliographies to aid technical experts' proposal writing. Some of Rand's experts review others' proposals and reports to assure that they meet Rand's standards for data gathering and statistical analysis. Copy editors suggest ways to make proposals and reports more intelligible. These activities undoubtedly improve final reports' acceptability and the odds of proposals' winning funds. Rand's research proposals have a far-above-average success rate.

Larger KIFs are better able and more inclined to bureaucratize, and larger KIFs can better tolerate and balance the opposing forces in their work. For instance, Brooks (1975) argued that 'conceptual integrity' is the key to high quality in systems design. Attaining conceptual integrity, he said, probably requires centralized control by a few key experts, whereas programming and testing a designed system may require many experts. Such work can be troublesome for KIFs with experts who see themselves as equals and substitutes. Large KIFs mitigate these problems by dividing work into projects and allowing experts to specialize in either design or implementation (Bhargava, 1990). Creating routines requires persistence, and both persistence and learning may benefit from specializing with respect to technologies, markets, functions or locations.

On the other hand, large KIFs may lack knowledge intensity. KIFs are prone to grow by adding support staff instead of experts. Adding support staff promises to increase profitability per expert by using experts more efficiently, whereas growth by adding experts may use experts less efficiently. KIFs also grow by adding activities, products or services that promise to extract more value from the expertise already in-house. Thus, KIFs tend to lose knowledge intensity as they grow.

Some experts see this loss of knowledge intensity as desirable – a sensible way to get the maximum value from current staff. Other experts see growth as a necessity demanded by large clients or numerous customers. Still other experts see this loss of knowledge intensity as a danger to be combated – by avoiding growth, diversification and geographic dispersion.

Routinization helps to make knowledge intensity unstable. As with physical capital, converting expertise to routines is risky. Routines may become targets of imitation, spread, and gradually lose the character of being esoteric and advantageous. A routine used by many firms confers small comparative advantages on its users.

Organizational Culture

Cultures have to be built gradually because they are delicate and poorly understood. Building a special organizational culture takes much effort as well as imagination. Imitating another firm's culture is quite difficult, if even possible, because every culture involves distinctive traditions.

Maister (1985, p. 4) wrote admiringly of 'one-firm firms', which stress 'institutional loyalty and group effort'. 'In contrast to many of their (often successful) competitors who emphasize individual entrepreneurship, autonomous profit centers, internal competition and/or highly decentralized independent activities, one-firm firms place great emphasis on firmwide co-ordination of decisionmaking, group identity, cooperative teamwork and institutional commitment.' According to Maister, one-firm firms:

- take very seriously their missions (usually service to clients),
- grow slowly while choosing clients and tasks carefully,
- devote much effort to selecting and training personnel,
- do R&D beyond the requirements of revenue-producing projects,
- encourage free communication among personnel, and
- give information freely to their personnel, including financial information.

Maister also warned that one-firm firms may become complacent, lacking in entrepreneurship, entrenched in their ways of doing things, and inbred.

Orlikowski (1988, pp. 152–60) said Maister's idealization accurately describes the consulting firm she studied, except that her firm discourages R&D beyond the needs of current clients. The firm devotes seven per cent of its revenue to a training programme and each consultant spends over 1500 hours in training during the first six years with the firm. Overtly technical in content, this training involves both self-study and classes at the firm's school. The consultants measure their career progress by their progress through this programme. Nevertheless, most consultants seem to agree with the one who said: 'The biggest advantage of the school is the networking and socializing it allows. It really is not that important as an educational experience.'

Alvesson (1991; 1992) too described a consulting firm that spent much effort on formal socialization. The top managers ran a 'project philosophy course'. They also sought 'to sell the metaphor *the company as a home* to the employees'. Designed to foster informal interaction, the building has a kitchen, sauna, pool, piano bar and large lounge area. The firm supports a chorus, art club and navigation course. All personnel in each department meet together every second week. Every third month, each department undertakes a major social activity such as a hike or a sailing trip. The firm celebrated its tenth anniversary by flying all 500 employees to Rhodes for three days of group activities.

Interviews with software developers convinced Bhargava (1990) that larger firms work harder to build cultures. They use their cultures to promote free communication, to make them less dependent on key experts and to ease personnel transfers. He found fewer communication problems and fewer personnel transfers in smaller firms.

Van Maanen and Kunda (1989) vividly described people's ambivalence toward culture-building efforts in a computer firm. Most people readily adopt corporate language and enjoy belonging to a supportive collectivity. Some embrace corporate values and rituals enthusiastically; more do so cynically. Most people also hold themselves aloof from group membership and protect their individual identities.

All the KIFs I have studied select experts carefully, they use teams extensively, they take their missions seriously, they manage growth cautiously and their people talk openly. Only Wachtell, Lipton, however, comes close to the one-firm model in discouraging internal competition, emphasizing group work, disclosing information, and eliciting loyalty to the firm. The other KIFs depart from the one-firm model in having multiple profit centres, assessing the productivities of individual experts, and revealing only the financial information that laws require. All the KIFs, including Wachtell, Lipton, depart from the one-firm model in decentralizing activities, encouraging entrepreneurship, and not involving everyone in decision-making.

KIFs do downplay formal structures, and they achieve co-ordination through social norms and reward systems instead of hierarchical controls (Nelson, 1988; Van Maanen and Kunda, 1989, pp. 70–93). One reason is experts' sense of their importance as individuals and their desires for autonomy: close control would induce exits. Another reason is common values and norms that result from many years of formal education. KIFs appear to derive some of their properties from universities, and some KIFs employ many who could be university faculty. Third, experts have to work independently because projects involve just a few people (Alvesson, 1992). The instability of projects and services provides a fourth reason: to absorb variations in demands for their services, KIFs need fluidity and ambiguity. Matrix structures are prevalent, and organization charts sketchy. Supervisors counsel non-directively. Experts form liaisons across formal boundaries. Indeed, the Rand Corporation designed its building to foster unplanned encounters.

Still, social norms and reward systems are not equivalent to cultures. KIFs confront serious obstacles to creating and maintaining unusual cultures, especially cultures that embody organizational learning. The attributes that make hierarchical controls troublesome – autonomy, mobility, professionalization, uncertain funding – also make it hard for KIFs to integrate people and to socialize them into unusual organizational cultures. When experts join new firms, they bring with them well-developed values, standards, habits, mental frameworks and languages. Although they have much in common with their colleagues, the culture they share is supra-organizational.

Social Capital

The Garden Company's customers can easily see whether Garden's products do what the maker claims. The customers do not buy Garden's expertise

directly. One result is that Garden's relations with customers are impersonal. Another result is that these relations may be fleeting. The customers readily switch to other suppliers, and Garden itself cuts off relations with customers when it stops making products that are less profitable.

Buyers of expertise itself, by contrast, often have difficulty assessing their purchases. Clients often consult experts because they believe their own knowledge inadequate, so they cannot judge the experts' advice or reports mainly on substance. Clients may be unable to assess experts' advice by acting on it and watching the outcomes: the clients do not know what would have happened if they had acted otherwise and it is frequently obvious that outcomes reflect uncontrollable or unpredictable influences. Clients may not even understand what their expert advisers are saying. Many experts – with awareness – use jargon that obscures their meaning. As a result, clients have to base their judgements on familiar, generic symbols of expertise. Do the experts speak as persons with much education? Have the experts used impressive statistical computations? Are the experts well dressed? Did the experts use data of good quality? Do the experts' analyses seem logical and credible? Do the experts appear confident?

Successful service KIFs, therefore, pay attention to their symbolic outputs. For example, as mentioned above, the Aerospace Corporation uses seven managerial levels that match the Air Force's hierarchy. Aerospace also asks technical experts to practise briefings in-house before presenting them to Air Force officers, and it provides strong support for writing, graphics, and artwork.

Clients also hire experts to obtain legitimacy instead of expertise. In such circumstances, the client–expert relationship is a charade: the clients choose advisers who will give wanted advice. Such selection can be unconscious. For instance, when the Facit Company was in serious trouble, the board listened to presentations by several would-be advisers (Starbuck, 1989). They then hired McKinsey & Company because that proposal had sounded most sensible: McKinsey's proposal had endorsed the general strategy the board had been pursuing. One result was that the board found it easy to take McKinsey's advice. Another result was that following McKinsey's advice only made the situation worse.

Rhenman (1973, pp. 160–71) has commented perceptively from his experience:

... there is in the consultant–client relationship an element of conflict. A game is played with all the usual trappings: negotiations, opposing strategies, etc. The client likes to 'sound out' the consultant. The client wavers between consultant A and consultant B. He also considers the cost of a particular consultant: will the organization really benefit? Has the consultant perhaps other purposes in mind, beyond his duty to the client? Perhaps he is seeking an opportunity for research or financial reward? The consultant may be particularly anxious to get this assignment. How can he persuade the client to engage him? Or he may be temporarily hard pressed for time. Can he persuade the client to postpone the assignment, or some particularly time-consuming part of it? And during the assignment the

consultant is often sure to feel that the client is blind to his own best interests, or that he, as consultant, is becoming involved in internal conflicts. . . .

We have already intimated that political groups may well try to use the engagement of the consultant for their own ends. Other groups may suspect and oppose the engagement on similar grounds; a long and heated struggle can easily develop. The consultant may be aware of what has been going on, or he may realize it only when he discovers that his engagement is tied to certain definite conditions. . . .

But the political system is not simply a part of the background. Soon, whether he realizes it or not, the consultant will become a pawn in the political game: his presence will always have some effect on the balance of power, sometimes perhaps a good deal. If he is not politically aware, various interest groups will almost certainly try to use him for their own purposes.

Over the long term, service KIFs try to convert clients' satisfaction with specific projects into long-term relations. Even in contexts that are initially impersonal, repeated interactions between specific people create bonds. Firm-to-firm ties gradually evolve into person-to-person ties. An expert who repeatedly serves the same client begins to perceive 'my' client, and the client comes to think of 'my' expert.

Such personalizing can happen with any expert, but the experts having the strongest social skills are not normally those with the greatest technical expertise. Those with superb abilities in both dimensions are rare: one interviewee estimated that only ten people in the US are 'great technical lawyers who work well with colleagues, are effective with clients and show good judgement'.

Thus, KIFs use internal specialization, in which socially skilful experts work on building ties with a few specific clients, and technically superior experts provide specialized expertise to many clients. The KIFs offer clients familiar contact persons, who then draw upon *ad hoc* teams with expertise fitting specific projects. To a client, a KIF looks like a single source of diverse expertise that gives high priority to that client's problems.

Formally, American lawyers call the persons whom clients choose to contact 'originating attorneys'. Informally, they call them 'rainmakers'. Rain-making is mysterious and magical, and rainmakers wield power. Their personal and lasting ties with clients give the contact persons divided loyalties as well as power. The divided loyalties serve a quality-control function that nurtures continuing ties between KIFs and clients. The power is a central fact-of-life that KIFs have to appreciate or risk losing long-term clients.

Keith Uncapher once worked at the Rand Corporation, designing information systems for the Defense Advanced Research Projects Agency (DARPA). Rand's top managers declared that the firm should no longer build hardware, but Uncapher believed that DARPA's goals demanded special-purpose hardware. He made a fifteen-minute oral proposal to DARPA, received an initial grant of \$10 million, and started a new organization, the Information Science Institute.

As the foregoing implies they should, service KIFs favour client relations over technical expertise. If KIFs allow client relations to dominate too strongly, however, they may lose key technical experts. Instead of thinking that they work for firms, technical experts may think firms exist for their benefit and should be working for them. To remain stable, KIFs have to reconcile their client-relations specialists and technical specialists. Each of these needs the other over the long term, but their mutual dependencies may seem obscure at any one moment.

STRATEGIC DEVELOPMENT

This article's second section asserts: 'Knowledge is a stock of expertise, not a flow of information.' Ironically, firms' stocks of expertise come from the flows in complex input-output systems. Knowledge flows in through hiring, training and purchases of capital goods. Some knowledge gets manufactured internally, through research, invention and culture building. Knowledge flows out through personnel departures, imitated routines and sales of capital goods. Some knowledge becomes obsolete. Fluid knowledge solidifies when converted into capital goods or routines. The sequences of events resemble random walks, and the net outcomes are difficult to foresee. Thus, strategies do not evolve coherently (Greenwood *et al.*, 1990).

Diversification

For product KIFs, strategic development calls for regulating numbers of customers and numbers of product lines. Similarly, service KIFs need to regulate numbers of clients and numbers of topical foci. As with other specialization-diversification problems, high risks come from having very few clients or customers and very few topics or product lines. A KIF with very few topical foci must perform superbly in those areas, and a KIF with very few customers cannot afford customer dissatisfaction. The issues, however, do not all lie in the realms of expertise or social skills.

For a year and a half after Wachtell, Lipton began, one client accounted for 75 per cent of its revenue. Then, this client asked Wachtell, Lipton to do something unethical. They replied that they could not take the wanted action. The client countered that Wachtell, Lipton must either do its bidding or lose its business. The partners refused . . . and gave up 75 per cent of their revenue. At that point, unsure their firm could survive, the partners adopted a policy that has had profound consequences: Wachtell, Lipton would work only one-case-at-a-time. It would never again make a long-term commitment to a client.

If Wachtell, Lipton had been more ordinary, this policy might have been deadly. But the firm became one of the rare ones to which corporations turn when their normal legal resources seem inadequate – at least, when corporations don't want to find out whether their normal legal resources would be adequate. In this status, having no long-term clients becomes an asset, for Wachtell, Lipton can be hired by whoever calls first.

Some KIFs serve a few clients contentedly. Keith Uncapher said, 'I

wouldn't know how to look good to two clients.' He designed the Information Science Institute to serve only DARPA, and no other client. The Aerospace Corporation derives 99 per cent of its revenues from a single long-term contract and makes no effort to change this situation.

Most KIFs that begin with narrow foci try to diversify. Like Aerospace, the Rand Corporation initially served a single client, the US Air Force. At the Air Force's urging and with its help, Rand began making strenuous efforts to gain broader support and greater autonomy. These efforts have had partial success. Rand has raised an endowment exceeding \$40 million, and it does research for over 80 sponsors annually. Nevertheless, three military sponsors still account for 70 per cent of Rand's revenues, and 80 per cent of its research deals with national security.

A. D. Little has attained broad diversification after developing incrementally for over a century. A. D. Little's precursor, Griffin & Little, began in 1886 as specialists in the chemistry of paper-making. In 1909, when the current firm incorporated, its expertise encompassed paper-making, forest products, textiles, plastics and sugar. These industries were central to the economy of New England, the firm's home.

Over the years, as the firm expanded its geographic reach, it added a wide range of physical and biological sciences and expertise on a wide spectrum of manufacturing technologies. A. D. Little first studied regional economics in 1916, began financial studies in the 1930s, and moved into management consulting broadly in the 1950s.

These expansions sprang partly from the firm's standards about conflict of interest. After advising a client about a topic, A. D. Little will not advise a different client from the same industry about the same topic. Future projects must change either the industry or the topic.

Just as diversification regarding clients may erode a KIF's ties with its long-standing clients, topical diversification may undermine a KIF's credibility. A few years ago, A. D. Little's senior managers concluded that their firm had become too amorphous. Hiring had become hard because the firm had so few experts in any single specialty. Covering too many specialties for too many dissimilar clients was yielding neither enough profit nor enough client satisfaction. A survey revealed that clients were turning to other consultants to get 'focused depth of resources'.

Thus, the firm went through a major planning effort, and began to focus on half-a-dozen functions in a handful of industries – mainly chemicals, financial services, health care and telecommunications. Alfred Wechsler explained, 'We try to define our expertise with verb-noun-adverb combinations. For example: we know how *to manufacture a paper cup inexpensively*.'

A. D. Little's strategic development has generally paralleled the developments in its client population – large industrial enterprises. Chandler (1962) described how single-product firms grew into multiple-product, divisionalized firms during the first half of the century: in the same period, A. D. Little was adding many product lines and decentralizing. In the 1970s and 1980s, conglomerates such as ITT decided to retrench into a few core businesses: A. D. Little was making analogous changes at the same time. After 1950,

many American firms expanded overseas, and A. D. Little too became multinational.

Its initial foreign venture was an office in Zurich that opened in 1957 to serve American firms that were expanding into Europe. To their surprise, the consultants discovered that European firms also wanted their services. They now have offices in six European cities and in Mexico, Brazil, Venezuela, Saudi Arabia, Japan, Singapore, Hong Kong and Taiwan. In 1972, they added laboratories in England; these later expanded to Germany.

Multinational KIFs

For KIFs, multinationality poses challenging issues that differ from those facing industrial firms. Many industrial firms use authority and steep hierarchies, and they can often use formal controls or hardware technology to reach performance standards. Consulting firms and other KIFs dare not resort to authority or formal controls and they lack technological wonder pills. They have to depend on autonomous small teams to act ethically and to meet performance standards. This, in turn, means that they need cultural homogeneity.

Nonetheless, A. D. Little has found national differences to be minor problems. One reason may be careful selection of experts. Another reason may be the homogeneity arising from education. Haire *et al.* (1966) found that managers with similar education espouse similar values no matter what their nationalities. Wuthnow and Shrum (1983) discovered that education erases the ideological differences between managers and professional-technical workers. After much education, managers and professionals espouse similar values.

Perhaps because they use authority, formal controls and technology to produce homogeneity, many industrial firms have shown insensitivity toward local values or treated host-country personnel less well than home-country personnel. Yet, insensitivity and inequity have not prevented industrial firms from operating successfully in foreign lands. Consulting firms, on the other hand, would fail if they did allow for local values, and they are apt to treat host-country consultants more than equally.

For instance, A. D. Little is trying to deliver reliable quality across diverse sites, but its clients want services tailored to their individual needs and contexts. Tailoring calls for consultants to act differently, whereas reliable quality and teamwork call for them to act similarly. A. D. Little began its multinational expansion by exporting American experts. Experience promptly convinced the firm that a foreign office must hire primarily experts native to that country. First, devising effective solutions for problems usually requires thorough understanding of the contexts in which those solutions will be tried. Second, clients do not want to waste time explaining basic economic, sociological or political facts to expensive foreign consultants. Thus, the consultants who staff a foreign office tend to have strong social skills and close ties with their clients. These assets, in turn, tend to give the host-country consultants high status within the firm.

LOOKING BACK AND FORWARD

Summary

Because everyone defines knowledge differently, discussions of KIFs evoke debates about proper definition. Such debates have led me (a) to emphasize esoteric expertise instead of widely shared knowledge; (b) to distinguish an expert from a professional and a knowledge-intensive firm from a professional firm; (c) to differentiate a knowledge-intensive firm from an information-intensive firm, and (d) to see knowledge as a property of physical capital, social capital, routines, and organizational cultures, as well as individual people.

Highly successful KIFs exhibit uniqueness, and they reflect and exploit the peculiarities of their environments. Since they and their environments change symbiotically, their environments reflect and exploit these KIFs.

Whereas experts distinguish between preserving, creating, and applying knowledge, their daily work obscures these distinctions. Not only do preservers, creators, and appliers behave similarly, but preserving, creating and applying are interdependent. Furthermore, experts resist new ideas – even the experts who describe themselves as creators of knowledge. Such resistance arises from self-interest and narrow perspectives. Yet, it may improve learning – by both individual experts and their firms – by making people ask whether knowledge has lasting value.

KIFs learn by hiring, training and dismissing personnel. They also convert ideas into physical capital, routines, organizational culture and social capital. Personnel changes and purchases of capital goods generally offer fast ways to pick up new ideas. Training, physical capital, routines and organizational cultures can turn individuals' knowledge into collective property. Knowledge in people or in physical capital is easy to lose, and KIFs have difficulty using routines and building special cultures. Social capital transforms a series of successful relations with a client into a long-term relation, but it also converts collective successes into individual property. One consequence is that hierarchies within KIFs reflect social skills as well as technical expertise.

Three themes afford a framework for interpreting KIFs' strategic development. First, complex input–output systems for knowledge make KIFs' strategic development look erratic. Second, KIFs have to regulate numbers of customers or clients, and numbers of product lines or topical foci. Some KIFs focus on small numbers of clients, customers, product lines or topics, but most KIFs try to diversify. Third, service KIFs often mirror prominent characteristics of their clients. These similarities are loosely qualitative, however, for KIFs differ from their clients in many ways.

Post-Industrial Currents

One cliché prediction says: future societies will have ever higher proportions of service workers, because machines will replace blue collars much more often than white collars. Perhaps KIFs are also growing more prevalent. But the future is always moot, and more interesting than the general trends are the swirling currents within them.

First, KIFs tend to grow by becoming less specialized and by adding support staff rather than experts. It nearly always *seems* that additional support staff, products or services will extract more value from the experts already in-house. Individual experts, too, think about broadening their domains as they update their knowledge and see social and technological changes opening new opportunities. But when support staff come to outnumber experts greatly, or when KIFs claim expertise in too many domains, KIFs lose their halos of expertise and their credibility.

Second, all kinds of expertise become less profitable as they grow more prevalent. Esoteric expertise has monopoly power and this power erodes as expertise becomes less esoteric. Neither experts nor KIFs nor KIFs' industry associations should seek proliferation. Yet, experts resist control and they have strong penchants to start new firms. Very small firms can compete successfully if they take advantage of their peculiarities and the peculiarities of their environments. The Garden Company could easily lose out to competitors with better ideas.

Third, some kinds of expertise attract consumers even though their benefits are obscure. Examples include crisis intervention, economic forecasts, investment advice, psychotherapy . . . and management science. Some obscure-benefit expertise seems to have high value partly because the experts are unusual. Such expertise may lose value as the experts come to make up higher proportions of the work force. On the other hand, such an outcome is not obvious. Placebos make effective treatments although they are very common. Mystery can be routinized. People need help with their problems even when the problems have no solutions – perhaps, especially then.

Obscure-benefit domains may be either more or less stable than the domains in which expertise yields clear benefits. Obscure-benefit domains are stable if they satisfy perennial human needs and no alternatives appear. There were probably economic forecasters before there were humans; even in recent times, the demand for economic forecasts has mounted as organizations have grown larger and more rigid. Obscure-benefit domains can be unstable if beliefs change, if human needs shift, or if more effective substitutes appear. Astrology is a case in point. Clear-benefit domains may themselves wither – as dentists are discovering.

Fourth, physical capital will displace some of experts' activities. Similar changes are occurring across the economy, within firms, and in the work of individual experts. Several new industries are distributing expertise in the form of physical capital. Both firms and individual experts are creating databases and expert systems, and they are buying or building tools to amplify experts' productivity by replacing some of their activities.

These substitutions will enable fewer experts to serve more clients or customers or to invent more products. They also will mean that many clients or customers no longer need experts or that they can make the products they have been buying. Millions of people are already using software to do accounting, to file income taxes, to write wills, to construct leases, or to help them write articles. Computers are revolutionizing product design, manufacturing control and computer programming. Spiralling medical costs may yet

compel the use of software that diagnoses diseases and issues medical prescriptions.

To appreciate such currents' beauty and intricacy, social scientists need to stop averaging across large, diverse categories. The average painting is flat grey, the average day is neither hot nor cold and has 12 hours of daylight, the average firm is mediocre and short-lived, and the average expert knows little about any field. In the social sciences, broad patterns over-simplify and capture only small fractions of what is happening. They leave scientists in worlds that look random. Broad patterns also tend to emphasize what is consistent with the past and to overlook subtle changes.

There is also a world of bright colours, sizzling days, exceptional firms, rare experts, and peculiar KIFs.

NOTE

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