Chapter 3

Identifying and Monitoring Information

3.1 INTRODUCTION

In Chapter 2, the most popular commercial and technological information sources of managers were described. In this chapter, we will be looking at information collection as a distinct strategy. This strategy will ensure:

- A well-organized approach for monitoring technological and scientific intelligence;
- Good research and development organization to encourage information flow (both of internal and external information);
- Accurate knowledge of the company's own technological position and capabilities (through technological reviews or audits);
- Efficiently organized information on markets and competitors.

As with many other aspects of technology transfer, there tend to be differences between countries on overall approaches to the organization of technological/scientific information. Differing ideas on the role of central government is a paramount reason.

For example, there has been little formal development of technological/scientific intelligence by the U.S. government for use in the private sector. In addition, as Herring [1] points out, by 1993 probably only about 3% of U.S. corporations had fully developed intelligence systems. This compares unfavorably with, say, Germany or Japan. Although American companies have continued to lead on product development and stay at the cutting edge of knowledge, this lack has caused them to look only at other American companies or labs for new technology information.

In Japan, intelligence units are much more common, with well-staffed *listening posts* in overseas offices. The units are usually administered from within the

planning department. R&D centers have also been established overseas, often drawing on the experience of local researchers (who, of course, carry knowledge and ideas as ex-employees of local competitors). The U.S. firm Motorola has now established a major research center in Japan with similar advantages. Herring points to a 1991 survey in Germany revealing that half of the companies surveyed had intelligence programs. A third of these were centralized in specific departments. The respondents indicated that the average warning time about a new technological development in the nonchemical/pharmaceutical sector could increase from 17 to 33 months if an intelligence program existed.

An admirably comprehensive American example is Baxter International's corporate technology sourcing (CTS) department. This was set up in the early 1980s with six staff members and a half-million dollar budget to scan and monitor worldwide technology developments. They scan 5,000 new technologies a year (using relationships with research labs/universities, databases of published scientific/ technological papers, professional meetings, and coverage of trade conferences). Eventually perhaps between 7 and 10 ideas may be turned into products.

Regional technology advice centers or other similar government support agencies can advise on or carry out literature searching for technological information.

There has been debate about whether intercompany partnerships help or hinder technological intelligence in a company. While there are advantages when one partner brings in new technological expertise (in exchange, perhaps, for market access or production facilities), in other cases it might be that the ready access to this particular partner technology may cause the technology intelligence program to atrophy.

3.2 RESEARCH AND DEVELOPMENT

Both research and development are terms intimately linked to innovation and technology transfer. At its purest, *basic research* may not be tied to any immediate product development but will still be considered vital to: (1) ensure that knowledge on a subject is readily available, and (2) stimulate new product opportunities.

There may also be a need for *common elementary technology research* for a variety of products and for many production systems. Kurawaha et al. [2] describe how Hitachi organized its research in Japan. The structure was:

- Independent research:
  - Basic research plus common elementary technology research;
  - At the advanced research lab, the central research lab, and at the nine corporate labs;
  - Funded by head office within agreed long-range corporate-research strategy.
- Commissioned research:
  - Mostly new product development;

  - At the central research lab and the corporate labs;
  - Sponsored by the factory, subsidiary companies, etc.—but within context of research strategy.
- Product improvement:
  - In the development departments at the factory;
  - Funded from factory budgets but must refer to the context in the research strategy.

Basic research and common elementary technology research can require a tremendous financial commitment in many sectors. For example, Canon will spend about 11% of sales on R&D. The norm in Western engineering companies would be nearer to 3%. But before committing funds for any sort of research (internal or external), even a small company needs a research policy.

At the broadest level, the company may choose to be a technical leader, a product innovator, a nicher, a follower, or a combination of these.

Larger, distributed companies will need to choose whether to have:

- Centralized research labs, which allow coordination and concentration of resources on broad strategies but require the linking mechanisms (i.e., good information flow) with production centers, customers, and suppliers;
- Labs distributed to teams, which permits closer contacts but also raises the risk of duplication or poor coordination.

3.3 ROLES OF STAFF IN INFORMATION FLOW

In Chapter 2 one of the three major stereotype roles in information flow—the technical gatekeeper—was introduced. The two other major roles are the *godfather* and the *champion*.

The godfather is a senior manager who watches over and protects the technology-transfer project and informs or convinces other senior staff of the value of the new technology. The role of the godfather may continue throughout the whole transfer process or may be limited to its development phase.

The champion, who is usually at the middle-management level, is skilled and committed, and may have to take over from the godfather for the implementation phase. The volunteer champion is likely to bring the benefit of a knowledge of internal politics, in comparison with an appointed external champion. Good communication and interpersonal skills are required (not always a feature of a technology-/information-oriented staff). The gatekeeper would certainly have the required technological knowledge but may be reluctant to assume the management implications, even in a flatter team hierarchy.

3.4 TECHNOLOGY REVIEWS (OR AUDITS)

An important technique for assessing the current state of a company's technological health and for assessing future technological innovations is the technology review (or audit).

It typically has three parts:

(R1) Review of competitors' technology (what have they got?);
(R2) Review of company's own technology (what have we got?);
(R3) Review of state-of-the-art technology (what could we have?).

Later discussion in this chapter will link R1 with *benchmarking*, and the links of R3 will be discussed in Chapter 4.

After a review has been set up and clearly supported by senior company staff, the following eventual uses for the review should be emphasized:

1. Briefings for key need-to-know managers and professionals (this is what we've got, what they've got, and what we could have);
2. Briefings for suppliers that provide needed technology (can you get us what we could have?);
3. Briefings for R&D teams, including product-design staff (can we find what we could have?);
4. Briefings for external stakeholders, such as customers, financial institutions, and government agencies (can we afford to get/not get what we could have?);
5. Any inhouse technology-transfer activities, such as seminars and training programs (hey, look everybody, this is what we could have!);
6. Integration into evolving technology and business strategies (we're going to get what we could have and use it!).

The most effective transfer of technology comes about through people links; therefore, technology reviews keep people informed, empower technology awareness, and produce better decisions.

A basic tool of technology management, the technology portfolio, can be easily used to categorize each of the company's technologies according to its competitive position and business attractiveness. Usually, the technology is presented in a four-cell, two-by-two matrix, with business attractiveness or technological importance along one axis and the competitive position along the other (see Figure 3.1). An assessment can then be made as to which technology projects should be emphasized in company business strategies.

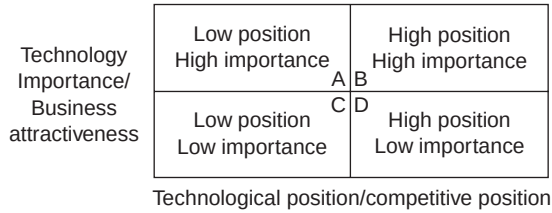

Figure 3.1 The technology portfolio.

Technologies that fall into cell A are considered important and attractive as current projects and programs, yet the company is not currently in a strong competitive position with respect to them. Thus, R&D resources and emphasis should probably be increased to gain a more competitive edge.

Technologies in cell B are considered important and the company currently sustains a strong competitive position with respect to them. Current levels of resources are probably sufficient to sustain these technology projects, but the company must be prepared for possible competitive attacks.

Technologies in cell C are not considered important and the company does not maintain a strong competitive position with respect to them. They should be considered for elimination from the technology portfolio of the company.

Finally, those technologies in cell D are not considered important, yet the company maintains a strong competitive position with respect to them. Senior staff responsible for R&D and those responsible for strategic planning should consider the reasons for continuing these projects before either moving them to cell B or eliminating them.

You might consider briefly allocating the technologies of a company you know into these four cells as an exercise.

When applying the technology-review approach to a particular project within the company, the following typical procedure might be considered. It is based around a design created for use within a larger organization.

1. Obtain an objective view by selecting an audit team comprising of closely involved personnel and people who are not directly affected by it.
2. Have the project manager present technology and R&D strategies to the team.
3 Have the project manager identify key strategic areas and technologies, stressing issues that may affect these strategical areas and technologies and the skills needed to manage them.
4. Interview staff, managers, customers, and suppliers to obtain the internal and external perception of the company's technological stance. Summarize the findings in a clear statistical manner (e.g., a bar chart).

5. Where applicable, quantitatively measure the company's technological developments (e.g., patents, new products, scientific papers). Obtain a summary of the company's technological stance by identifying successes and failures, listing the factors responsible for each.
6. Identify organizational mechanisms that are used or are expected to be used to transfer technology (e.g., the R&D team, product development staff). The processes may be summarized by using a flow chart.
7. Review all of the team's information by using rating sheets for each project and program. Rate the requirements of the new technology against past developments, technological requirements, and fit within the organizational mechanisms to obtain a prioritized list of projects.
8. Analyze the results and draw conclusions for the technology strategy and the probability of success of each project.
9. Present findings, make recommendations, and follow up.

Thus, a project review (what we want out of the "what we could have" options), a competitors' review (what they've got), and a state-of-the-art technology review (the "what we could have" options) are obtained.

Here is a final overall checklist that a review should ask of any organization:

- What is the current situation?
  - What are the key technologies and know-how on which the business depends?
  - What is the company's status in these technologies? Does it lead or follow its competitors? What technology may be developing outside which may adversely affect the current situation in the market?
  - How did the company acquire these technologies? Were they made in-house or brought in?
  - Have we looked at everything to do with our current technology? Are there no new things we could do with it?
  - How do the company and its existing products compare with its customers' expectations?
  - How much longer is the current technology going to last?
  - What processes and policies are in place to identify product life?
  - What relative technological strengths and weaknesses are there in comparison to the competitors? Are there some products or technologies held onto merely for historical reasons?
  - What presently drives technological management? Quick fixes? Operational profit? Strategic considerations?
- What does the company intend to do?
  - What is the proposal for the new technology?
  - Can the company sell the existing technology and gain from being "ahead of the game"?

  - Has the company optimized its exploitation of the technologies beyond integration into products? Has it maximized the technologies through strategic alliances, licensing, joint ventures, or cooperative R&D?
  - Have strategic alliances been developed to obtain basic or distinctive technologies?
- What can we make the situation become?
  - How will continuing with the new technology affect the company's status in the market? Will it enhance differentiation? Technological lead? Product or service uniqueness? First-mover advantages?
  - Has this sort of thing ever been done before? If so, what is the track record, or what can be learned from the previous experience(s)?
  - How effective is internal transfer of technology? What communication networks are in place? Are they formal or informal?
  - Have the barriers to effective transfer of information been identified and removed?
  - Are the technical personnel available to fully exploit the technological opportunities?
  - Is there a process in place to integrate the technology and strategic business planning? If so, how effective is it?
- Moving on to the next stage…
  - Is the full support of all of the management of the company in place? This is a key milestone in achieving the goal of the new technology.
  - Does the company fully believe in the technology and its success?
  - Have the technology audits been effective in highlighting areas not previously covered?

3.5 ESTABLISHING MARKET POTENTIAL

Information required for the business plan and feasibility study includes the establishment of the market potential. In Chapter 2, it was shown that market research was necessary to make informed decisions on the options for the company. This process should be updated at this stage of the technology transfer process, particularly because new developments can cause the market to change dramatically, and often quite quickly. There are two main techniques involved: scenario planning and market research.

With scenario planning, a description of the possible future (a scenario) is produced, based on certain assumptions. It allows a chance for decisionmakers to assess their reactions to possible future changes. Scenario planning will be covered in detail in Chapter 11 on minimizing the risk of failure for the technology-transfer process.

Market research involves collecting customers, recording data on competitors, classifying other influences, and analyzing the results. The data on customers

will arise from discovering both the overall market size and the needs of the customers. Techniques involve:

- Desk research (e.g., the Mintel database on growth in market sectors);
- Field research, such as face-to-face interviews, telephone interviews, mail surveys, panel discussions of interested people, and questionnaires based on defined key objectives and statistically valid samples.

In addition, market research determines what segments of the market exist and seeks to define the product in customer terms (features, benefits, proofs, who will buy the product first?).

Data on competitors is obtained in an altogether different manner. A current vogue expression is *benchmarking*, whereby company characteristics—its strengths and weaknesses—are compared with those of a competitor and the differences are then studied.

The primary use of benchmarking in this chapter is to identify areas of strength to further develop and areas of weakness to remedy or withdraw from. Benchmarking, however, is also an extremely important technique for determining planning objectives and improving quality by incorporating best industry practice into the company.

3.6 BENCHMARKING

Benchmarking was pioneered by Xerox. The company best known for its photocopying machines was losing both market share and profitability during the late 1970s, so its managers authorized a study of the quality, features, and unit costs of the competition's machines in comparison with Xerox machines. They were shocked by the initial results. Xerox's unit manufacturing cost equaled its Japanese rivals' selling price in the U.S.; Xerox had nine times the number of production suppliers than did the best companies; assembly-line rejects were ten times higher; product lead times were two times longer; and defects per 100 machines were seven times higher. Although Xerox executives could not believe the results, new benchmarking studies confirmed the data. The benchmarking process led to a meeting in 1983 involving the top 25 managers in the company to plan a quality strategy. The benchmarking results helped them to understand the amount of change that was required and to set realistic targets to guide their planning efforts. As an example of adopting best industrial practice through benchmarking, Xerox used an adaptation of the warehousing and distribution practices of the L.L. Bean retail group (benchmarking should not be limited solely to direct competitors if research resources allow) [3].

Other benefits of benchmarking include:

- The process is motivating. It provides targets that have been achieved by others.
- Resistance to change may be lessened if ideas for improvement come from other industries.
- Technical breakthroughs from other industries that may be useful can be identified early.
- The process broadens people's experience base and increases knowledge.

A company that makes the same product is not necessarily a competitor. Companies with similar products may be selling to entirely different markets. Conversely, competitors are not always immediately obvious. One product can in fact be a substitute for another. Finding financial details (e.g., size or profitability) of competitors may be difficult. In Britain, for example, reports submitted by law to the Companies House Library may be incomplete, inadequate, or of no value.

Directories available from local libraries, however, can yield useful indicators. For example, if staff numbers are known, the payroll can be estimated from industry norms (allowing for knowledge of competitor attitude). From this, turnover can be estimated using standard operating ratios.

Important competitor characteristics required by a business plan are:

- Description;
- Size;
- Profitability;
- Operating methods.

Analyzing these characteristics can yield:

1. Knowledge of competitor weaknesses and their likely reactions to your innovations;
2. A definition of your product's points of difference (based on key factors of success in your sector).

Further information on competitors can be found from:

- Buying/analyzing their products;
- Studying their advertisements;
- Visiting trade exhibitions.

Product, service, and process improvements can only take place in relation to established standards, with the improvements then being incorporated into the new standards. Benchmarking measures an organization's operations, products, and services against those of its competitors in a ruthless fashion. It is a means by

which targets, priorities, and operations that will lead to competitive advantage can be established.

Put another way, benchmarking is the continuous process of measuring products, services, and processes against those of industry leaders or the toughest competitors. This results in a search for best practices—those that will lead to superior performance—through measuring, continuously implementing change, and emulating the best.

There may be many reasons for carrying out benchmarking. Some of them are set against various objectives in Table 3.1.

Table 3.1
Reasons for Benchmarking

Objectives	*Without Benchmarking*	*With Benchmarking*
Becoming competitive	• Internally focused • Evolutionary change	• Understanding of competitors • Ideas from proven practices
Industry-best practices	• Few solutions • Frantic catch-up activity	• Many options • Superior performance
Defining customer requirements	• Based on perception • Based on history or gut feeling	• Market reality • Objective evaluation
Establishing effective goals and objectives	• Lacking external focus • Reactive	• Credible; unarguable • Proactive
Developing true measures of productivity	• Pursuing pet projects • Route of least resistance • Strengths and weaknesses not understood	• Solving real problems • Understanding outputs • Based on industry-best practices

There are four basic types of benchmarking:

- *Internal:* a comparison of internal operations;
- *Competitive:* specific competitor-to-competitor comparisons for a product or function of interest;
- *Functional:* comparisons to similar functions within the same broad industry or to industry leaders;

- *Generic:* comparisons of business processes or functions that are very similar, regardless of the industry.

The evolution of benchmarking in an organization is likely to progress through four focuses. Initially, attention will be concentrated on competitive products or services, including, for example, design, development, and operational features. This should develop into a focus on industry-best practices and may include, for example, aspects of distribution or service. The real breakthrough is when the organization focuses on all aspects of the total business performance, across all functions and aspects, and addresses current and projected performance gaps. This should lead to the final focus on true continuous improvement.

At its simplest, competitive benchmarking, the most common form, requires every department to examine itself against its counterpart in the best competing companies. This includes a scrutiny of all aspects of their activities. Benchmarking that may be important for customer satisfaction, for example, might include:

- Product or service consistency;
- Correct and on-time delivery;
- Speed of response or new product development;
- Correct billing.

For impact, the benchmarks may be:

- Waste, rejects, or errors;
- Inventory levels/work in progress;
- Costs of operation;
- Staff turnover.

The task is to work out what has to be done to better the competition's performance in each of the chosen areas.

The process has 15 stages, all of which are focused on trying to measure comparisons of competitiveness:

- Plan:
  - Select departments or process groups for benchmarking.
  - Identify the best competitor, perhaps using customer feedback or industry observers.
  - Identify benchmarks.
  - Bring together the appropriate team.
  - Decide information and data-collection methodology (do not forget desk research!).
  - Prepare for any visits and interact with target organizations.
  - Use data-collection methodology.

- Analyze:
  - Compare the organization and its competitors, using the benchmark data.
  - Catalog the information and create a *competency center*.
  - Understand the *enabling processes* as well as the performance measures.
- Develop:
  - Set new performance level objectives/standards.
  - Develop action plans to achieve goals and integrate them into the organization.
- Improve:
  - Implement specific actions and integrate them into the business processes.
- Review:
  - Monitor the results and improvements.
  - Review the benchmarks and the ongoing relationship with the target organization.

An alternative six-step process used by Alcoa in the U.S. is:

1. Decide what to benchmark. The following questions are often asked to guide the activities of the benchmarking team: Is the topic important to the customers? Is the topic consistent with Alcoa's mission, values, and milestones? Does the topic reflect an important business need? Is the topic significant in terms of costs or key nonfinancial indicators? Is the topic an area where additional information could influence plans and actions? The answers lead to the development of a purpose statement, which describes the topic to be benchmarked and guides subsequent activities.
2. Plan the benchmarking project. A team leader is chosen, who is responsible for seeing that the project is successfully completed. The leader should have the authority to make changes in processes, products, and services based on the benchmarking information. A team is then created, based on the range of skills needed for the project. The team's first task is to refine the purpose statement by considering questions such as: Who are the customers of the study? What is the scope of the study? What characteristics will be measured? What information is readily available?
3. Understand current performance. The team examines the factors that influence performance to learn which characteristics are most important and which are least important. Team members learn which data relate to the important characteristics and how to collect and measure those data. The collected performance data create the baseline and structure for benchmarking comparisons.
4. Study others. The team identifies benchmarking candidates, narrows the list down to a few candidates, prepares general and specific questions, decides the best way to get the questions answered, and performs the study.

5. Learn from the data. The team analyzes the data collected, quantifies performance gaps, and identifies which pieces of information might be particularly useful for improving performance.
6. Use the findings. The team works with the project sponsor to determine how the benchmarking findings can be best utilized and which other organizations in the company can benefit from its work.

Benchmarking is a multidimensional, multifunctional approach toward determining planning objectives and improving quality. To be effective, it must be applied to all facets of a business. For example, Motorola encourages everyone in the organization to ask [3] "Who is the best person in my own field and how might I use some of their techniques and characteristics to improve my own performance in order to be the best (executive, machine operator, chef, purchasing agent, etc.) in my 'class'?"

3.7 CONCLUSION

This chapter has demonstrated the vital importance of a systematic approach to information and communication. A good intelligence strategy can help you to learn from the best practice of competitors, avoid unpleasant surprises, find new technologies that are available (and cost effective), and ensure that research and internal communications work well.

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