M

aintenance departments are facing difficult times. High automation creates high complexity and just-in-time production drastically reduces buffers and inventory levels. At the same time, the importance of efficiency is being stressed and maintenance budgets are being cut.

Some companies respond to these challenges by outsourcing maintenance services. When asked for reasons most name costs, while others cite ‘tradition’ and ‘gut feeling’. Are there better ways to define the goals that guide companies to decide whether a service is made or bought? And, on a broader notion, are ‘make’ and ‘buy’ the only possible sourcing alternatives?

Sourcing maintenance services is different from sourcing products. Services are immaterial in nature, which leads to high complexity and incomplete contracts. These, in turn, cause high uncertainty for all parties during the provision of a service. Not only lacking information about type, scope and duration of the service, but also about the timing of demand, this is especially apparent in the case of breakdown maintenance. In addition, services rely heavily on the coordination of knowledge between the client and service provider.

The maintenance process needs to access both firm-specific and object-specific knowledge, underlining the importance of knowledge management. Lastly, the relationship between transaction partners demands consideration. Due to high requirements for equipment availability, the creation of a trusting relationship between client and service provider is desirable.

FOUR MAINTENANCE SOURCING ALTERNATIVES

What are the options a company can choose from when deciding how maintenance demands can be satisfied? If a company owns and completes all activities necessary for the provision of a service, it chooses ‘make’. The second well-known option is ‘buy’, meaning that the company does not use any of its resources to provide the service.

But, what if a company provides the same service in-house that it also sources from outside? For example, fast food restaurants of the same brand are sometimes run by a franchisee (buy) and others by the company itself (make) (Bradach, 1997), and a company may use independent sales agents (buy) and employees (make) to service the same territory (Dutta, 1995). These cases can be labelled ‘concurrent sourcing’ and constitute a third sourcing alternative.

When one company buys services from the other they usually do not share common goals for the transaction at hand. One is trying to optimise its effectiveness and efficiency, the other its earnings. What happens, however, if two or more companies jointly source from a third party or jointly provide maintenance services, as found in the airline industry? They could do so to gain power in contract negotiations or to increase the productivity of their maintenance departments by sharing resources and knowledge. This ‘cooperation’ emerges between businesses sharing common values and goals. The partners engage in long-term, trusting relationships.

ECONOMIES OF SCALE AND SCOPE

As with any other management decision, suitable criteria need to be derived at the beginning of the decision-making process. Taking a step back, the problem becomes one of setting the boundaries of a firm. These boundaries define which activities are completed inside the company and which ones are bought from outside. Strategic management literature offers valuable insight into how boundaries can be delineated.
There are a number of options to choose from when deciding how maintenance demands can be satisfied, with each leading to a different outcome.
In markets, prices fulfill this task. In companies, management uses commands to coordinate the production process. This coordination is costly. In markets, using prices comes with search, information and contractual costs. In firms, management costs arise from solving motivational problems through administration, organisation and performance measurement.

In other words, transaction costs occur in order to avoid opportunistic behaviour that could arise from the division of labour and a lack of transparency. TCE is in favour of in-house provision, if only a small number of suppliers exist, transaction specific investment is required and uncertainty about behaviour and environmental factors is immanent.

In contrast, if the same transaction is conducted frequently and credible safeguards against opportunism are in place, companies will choose narrow boundaries, even if uncertainty and the need for transaction specific investment exist. To mitigate the risk stemming from opportunistic behaviour, knowing the capabilities of a third-party provider exactly before a job is assigned is advisable. Another criterion will be to keep transaction partners at arm’s length by ensuring that no investments are made that tie the company too closely to another company, for example an outsourcing provider.

A RESOURCE-BASED VIEW

The resource-based view (RBV) of a firm points out the importance of strategic resources. A resource is strategic if it enables a company to create value, is rare, is not imitable and is non-substitutionable (Barney, 1991). It, thus, can create a sustainable competitive advantage, especially if the firm controls more than one strategic resource.

To gain this advantage, a company must learn how to deploy and how to manage its stock of unique resources. Only if a given activity and the company’s strategic resources are interdependent does the RBV advocate wide boundaries and internal provision to guarantee high utilisation of its unique resources. In turn, this also means that activities will no longer be performed in-house if they are not linked to those resources.

The production system can be seen as a strategic resource in this context. Hence, ensuring high equipment availability can lead to a competitive advantage for the company. The management of strategic resources is complex, however. Thus, it is critical to have complete transparency about cost and actual performance at all times, so that the management of different activities remains feasible.

A KNOWLEDGE-BASED VIEW

In the knowledge-based view (KBV) of the firm, knowledge is the main strategic resource (Grant, 1996). The knowledge of a company, inherent in its processes and routines, generates a sustainable competitive advantage because competitors cannot imitate it. Management is responsible for making the most of the firm’s knowledge resources and for constantly growing them through innovation. The KBV supports wide boundaries since

The first concepts are economies of scale and scope. The former arises from bulk purchasing rebates and an efficiency increase through higher output (Viner, 1932). The efficiency may increase because of a greater division of labour or specialised equipment. Economies of scope are due to synergies gained from simultaneous production of several goods using the same inputs and equipment. The resulting productivity increase leads to lower average costs.

Economies of scale and scope suggest in-house provision in order to profit from productivity gains. To make sure that productivity remains high, no additional capacity can be held for peak demands in maintenance services. The first criterion ensures that any temporary peak demands for maintenance resources, such as personnel, tools or spares, are dealt with economically.

TRANSACTION COST ECONOMICS

The second input stems from transaction cost economics (TCE): a company engages in an activity because it can minimise the sum of production and transaction costs (Coase, 1937; Williamson, 1975). When two companies use division of labour to productively create products or services, coordination is needed. It ensures that the divided tasks are performed in a way that the required result will follow (Voigt, 2010).
transfer and conservation of knowledge is easier within a company than across markets. If a leap in technology is likely or the required knowledge is completely codifiable, however, then narrow boundaries will result.

**ACCESS TO KNOWLEDGE AND NEW TECHNOLOGY**

The last two sourcing criteria follow. The first is access to firm-specific knowledge about the flaws of a company’s machines – underlining that general knowledge about the machine type may be insufficient and that the maintenance crew needs to know, for example, the history of failures as well. The second is having access to up-to-date knowledge and maintenance technology in order to keep the equipment running at desired performance levels.

These are certainly not all the criteria that can be derived from these four theoretical lenses. In the empirical study underlying this research, however, they proved to be the most important ones.

**SOURCING ALTERNATIVES’ PROS AND CONS**

How do the four sourcing alternatives perform in light of these criteria? The benefits of ‘make’ are high equipment availability through quick response time, high availability of firm-specific knowledge and no investment being needed that would tie the company to a service provider.

<table>
<thead>
<tr>
<th>CRITERION</th>
<th>MECHANICAL ENGINEERING</th>
<th>CHEMICAL INDUSTRY</th>
<th>MAKE</th>
<th>BUY</th>
<th>CONCURRENT SOURCING</th>
<th>COOPERATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak demands</td>
<td>12.8%</td>
<td>12.4%</td>
<td>-</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Equipment availability</td>
<td>15.7%</td>
<td>15.7%</td>
<td>+</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up-to-date knowledge</td>
<td>10.9%</td>
<td>11.6%</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost transparency</td>
<td>15.3%</td>
<td>15.6%</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provider qualifications</td>
<td>15.4%</td>
<td>14.9%</td>
<td>-</td>
<td>-</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Firm-specific knowledge</td>
<td>16.1%</td>
<td>16.4%</td>
<td>+</td>
<td>-</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>No specific investments</td>
<td>13.9%</td>
<td>13.4%</td>
<td>+</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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  - Timber & Fire Doors
  - Handyman Services
  - Workstations
  - Partitioning
  - Partitioning
  - Refurbishments
  - Plaster Repairs
  - Renovations
  - Concreting/Paving
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  - Rubbish Removal
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  - Amenities Products
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  - General Maintenance
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It is, however, less able to cope with demand fluctuation, cannot easily provide access to up-to-date knowledge and transparency about costs is difficult to obtain.

The 'buy' option proves best in dealing with demand fluctuation and cost transparency, but is weak in ensuring availability and ease of determining the service provider’s qualifications.

While concurrent sourcing can combine firm-specific knowledge with access to up-to-date industry knowledge and technology, it falls short in the ability to screen the service provider’s qualifications as well as other alternatives can. It manages the possible risks of opportunistic behaviour quite well, however, because the switch to solely make or buy is rather easy.

Cooperation is chosen because of its advantage in coping with demand fluctuation by using the resources of two or more partners, and because the long-term relationship creates trust and allows exact judgment of the service provider’s qualifications. The weaknesses are a lack of cost and performance transparency and the necessity to invest in a partnership with a specific partner.

**WEIGHING THE CRITERIA**

Selecting a suitable sourcing option has now become a problem of weighing the criteria. To be able to do so, 1043 companies of the mechanical engineering and chemical industries in Germany were surveyed, of which 230 participated.

Industry experts reckon that the mechanical engineering industry tends to buy maintenance services, since it is generally more open and flexible due to its small size. In addition, its equipment is less interlinked and the market demands high efficiency.

The chemical industry, however, favours make. Equipment availability is most important since stoppages lead to long repair times, accidents or impacts on the environment. Moreover, maintenance teams require high knowledge of the production process and the equipment is highly interlinked and automated. The mindset of this industry also tends to be more conservative and its decisions are quite often based on tradition.

The companies also differ in size: 75 percent of the chemical companies employ up to 265 people, whereas this number is 122 in the mechanical industry. The median annual maintenance budgets are €60,000 for mechanical engineering and €300,000 for chemical companies. Eighty-seven percent of chemical companies claim that maintenance is very important, in comparison to 76 percent in mechanical engineering.

When asked about the sourcing of their maintenance services, most companies use make and buy at the same time and hardly anyone chooses cooperation (see figure 1). If a company chooses buy, it typically uses the services of three to seven providers. Three-quarters of the companies also use the services of the original equipment manufacturers.

If they were to change sourcing options, firms with a maintenance budget of less than €20,000 a year would typically take less than three months to do so. Companies with a budget exceeding €1.4 million would take considerably longer: one-third could make the switch within seven to 12 months; another third would take longer than a year. Only 10 percent of the mechanical engineering and 26 percent of the chemical companies, however, did switch between sourcing options in the past 10 years.

More than 90 percent of the respondents accepted the proposed criteria. They ranked firm-specific knowledge and equipment availability as the most important criteria, followed by transparency of costs and performance.
performance (see figure 2). The least important criteria were access to up-to-date knowledge and compensating peak demands.

The ascribed weights do not differ significantly between industries, size of workforce, value creation steps, maintenance budgets or the chosen forms of maintenance organisation. They do differ, however, between companies that attribute great importance to their maintenance services and those that do not. If maintenance plays an important role in a company, dealing with peak demands and access to up-to-date knowledge and technology are significantly more important.

They also differ in times of economic downturn: transparency and dealing with peak demands become the most important considerations, and the weight of equipment availability decreases considerably.

Using these criteria and the proposed characteristics of the four sourcing options, 51 percent of mechanical engineering companies would choose concurrent sourcing over make (40 percent), buy (5 percent) and cooperate (4 percent). Fifty-five percent of chemical companies prefer make over concurrent sourcing (43 percent) and cooperate (3 percent). No company would choose to buy.

Interestingly, in comparison to their actual sourcing strategy, a different sourcing option was proposed for more than half the companies. Companies can find out how their maintenance sourcing would differ using the outlined criteria and characteristics of the sourcing alternatives by means of an interactive decision-making tool on www.stefan-gassner.de/maintenance. FM

REFERENCES:

Dr Stefan Gassner is a senior consultant at Grosvenor Management Consulting, Sydney. He recently completed his Ph.D. at the University of Hohenheim, Germany, researching the procurement of maintenance services in production networks, and has developed a framework to show how companies can jointly make procurement decisions.

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