PART TWO Designing

Contents

JOBS

WANTED

Strategic Supply Chain Manager

A strategic supply chain manager is needed to head our growing European network. As part of a global organization delivering products and services to businesses you will need to be dynamic and resourceful.

You'll have the ability to draw on experiences from most business functions but particularly project management, new product/service development, purchasing, logistics and operations. You should have a strong first degree, relevant professional qualifications and at least a proven 10 years' record of delivering successful strategic change.

What does it take to become a Supply Chain Manager?

We speak to Steve Sutton at Intel to find out.

Name: Steve Sutton

Age: 48

Current position: Supply Chains Programs Manager

Years in role: 3

How did you get into Operations Management?

I joined Intel after graduating as an Engineer with a degree in Electrical & Electronic Engineering. After a restructure in 2000 an opportunity came up for me to run the Supply and Pricing side of Intel's Business Operations. I took the role to extend my experience within the company and move closer to the heart of Intel's business in EMEA (Europe, Middle East and Africa).

What about the career attracted you?

I moved into supply chain management part way through my career and was attracted by the central nature of the role – working with customers, Finance, Sales, Logistics, Marketing and factories to satisfy product demand without building excessive inventories.

What other jobs have you done?

I started at Intel in 1984 as a quality engineer, and moved up through the ranks to engineering management. I later moved into marketing before joining the Business Operations team in 2000 where I ran the factory facing supply group. In 2003 I took responsibility for the customer facing team working with customers on their supply needs, before moving into my current role as Supply Chain Programs manager – improving the tools and processes we use to run the business. It's not a typical pathway, but it demonstrates that over a long career, the path can twist and turn many times.

What was the most useful experience that prepared you for your current role?

Working in the other Business Operations groups was the best experience I could have had before moving into Programs as I had a clear idea of the challenges faced by users and customers. This enabled me to help steer the efforts of IT to produce tools and systems that aligned with user needs.

What's a typical day in the life of a Supply Chain Programs Manager?

Much of my day is spent in meetings where my role is to oversee and steer different groups towards a common set of goals. I also attend various review meetings for updates on different projects. As a manager I will often have one to one meetings with those who work for me and also key stakeholders within the company. Towards the end of the day I speak on the phone with colleagues in the US as they are starting their day. Sometimes I need to attend early morning (6 a.m.!) or late night meetings where Intel counterparts from around the world get together to make decisions on specific projects.

What aspects do you like most about your job and why?

I love solving problems and helping others achieve their aims. I have found that these interests are very portable across the different roles I have had and this has enabled me to maintain my personal motivation working for the same company for the last 26 years.

What do you consider the ideal skills for your role?

In my current role the key skills are probably experience in people management, project management and a thorough understanding of the core business. On top of that, it is vital to have a strong network especially in a large company like Intel, in order to be able to effectively influence world wide projects.

What are the biggest challenges in your role?

One area where I spend significant time is aligning stakeholders from across the company to maintain momentum on key projects. Customers, Business Operations, Sales, Factories, Logistics and IT all have a stake in the supply chain and it's important that we maintain alignment without delaying projects.

If you weren't in Operations Management, what would you be?

If I were not working at Intel, I probably would have been a teacher. Within Intel I satisfy this need by being a trainer on a number of internal courses we run and I enjoy helping people in the class to develop new skills.

PART TWO

CHAPTER 4

Designing Supplier Relationships

Learning Outcomes

By the end of this chapter, you should be able to:

- Define what a supply chain, a supplier network and an enterprise are
- Appreciate how suppliers and their customers often work together in an increasingly integrated way
- Describe why and how outsourcing takes place
- Apply simple models to help locate an operation and its suppliers
- Design an agile enterprise based on the theories of the resource-based view of an organization, and transaction cost economics.

More Power for More Passengers

Source: © 2007 Getty Images

The Airbus A380 is the largest commercial passenger jet ever built. It was designed to meet new market requirements for an increasing number of longer-haul flights between major airports while meeting more stringent security and environmental regulations. From an industrial perspective, the plane needed to save the ailing European large-passenger-aircraft industry by competing head to head with some of the most successful commercial aircraft ever built, such as the Boeing 747 Jumbo Jet.

Arguably, Airbus and its parent company EADS gambled the future of the company on this double-decker, monster-sized, 'super-jumbo' plane – which can carry up to 853 people. In contrast, their main competitor, Boeing in the USA, continued to invest in mid-sized passenger jets that are faster, cheaper and easier to own.

It was nearly seven years from the start of the project until operators got their first planes. Pre-orders for the planes were essential for this huge project (estimated at €11 billion) in order to start generating revenue. Singapore Airlines formed a joint venture with Airbus to ensure that their planes were designed and built exactly to their requirements.

Key suppliers were also included in the design and manufacturing process. For instance, Rolls-Royce Aerospace Group was one of only two engine suppliers. Rolls-Royce built the new Trent 900 engines – one of the most powerful jet engines ever built. The other engine (the GP2700) was built by the American

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Engine Alliance (EA), whose parent companies are General Electric and Pratt & Whitney. Rolls-Royce and AEA are the main partners in the joint venture, investing time, money and knowledge right from the beginning.

In turn, Rolls-Royce joined up with its key suppliers in risk- and revenue-sharing arrangements, where suppliers invested in the development of the new engine in exchange for a percentage of their sales revenue. Seven companies participated as risk- and revenue-sharing partners (from Spain, the USA, Italy, Sweden and Japan). Three other companies were included as programme associates (from South Korea and Japan). These companies had an input into some design decisions, but did not share in the overall risk-and-revenue partnership. In addition, hundreds more suppliers were engaged in conventional, openly competitive arrangements.

GLOBALIZATION

Much responsibility rested with the supplier management team at Rolls-Royce. They managed the huge network of global suppliers, to try to ensure that parts and services were delivered on time, every time, at acceptable costs. This involved recruiting new suppliers, developing new processes, planning and scheduling, materials management, manufacturing, assembly, and final delivery to the customer. In short, the supplier team provided the links that kept the supply chain together. As a result, the Trent 900 was officially certificated as airworthy on time, in October 2004, and the first A380 flew in April 2005. Rolls-Royce is now a major player in Singapore's aerospace industry, accounting for over 10% of the country's aerospace output via joint ventures with local industry. Eight out of the first 11 airlines to order the A380 chose the Trent 900 engine.

Source: Ben Clegg, Aston Business School

Introduction

This chapter focuses on how internal organizational and external competitive forces interact and influence the design and management of operations, and particularly on how organizations come together to form different types of supplier relationship. Supplier relationships can most simply be thought of as a *chain* of organizations working together. Or, if the relationships are more complicated, they can be thought of as a *network* of organizations working together. Sometimes, if relationships are even more highly integrated, they may be considered as a joint *enterprise*.

A chain of suppliers is normally thought of as one organization supplying another in a simple, openly competitive set-up, such as a farmer supplying a grocery store, or a manufacturer of paper supplying a newspaper company. A network of suppliers is a collection of organizations that collectively deliver parts and services to an end customer. This arrangement can arise simply because an element of collaboration between organizations can often be better than purely open competition. An enterprise arises when organizations work so closely together that it becomes hard to differentiate them.

The opening case describes a sophisticated form of supplier relationship, best thought of as an enterprise. Even Airbus itself is a collaboration of aircraft manufacturers, spanning a number of European countries. In this case supplier relationships have to work at all levels throughout the enterprise (i.e. strategic, tactical and operational). Relationships have been successfully forged with customers (e.g. Singapore Airlines) and with suppliers (e.g. Rolls-Royce), who work very closely with Airbus using their processes, working to their objectives, and sometimes sharing in their risks and rewards. In this case the types of relationship have arisen because the design and manufacture of the product (the Airbus 380) are too complex to be controlled by a single organization; they require the expertise and buy-in of many different partners at all levels.

Supplier relationships between organizations cover not only elements that are bought and sold, such as materials or services; they also include intangibles such as competencies, processes, decisions and strategies. Supplier relationships will usually focus on the delivery of a family of products, such as aircraft, or a group of services, such as package holidays. Sometimes relationships are set up to encourage innovation, as a new product or service can be created more easily than by a single company working alone.

Supplier relationships are an important part of the operational strategy (Chapter 2) of the organization. This chapter begins by looking at the basics of supplier relationships, including the terminology that is used. It will

also look at why different types of supplier relationship arise, and at the decisions that are taken in designing effective networks.

Different Perspectives on Supplier Relationships

Three different views or perspectives on supplier relationships are introduced in this section. They range from a simple *supply chain*, through the more complicated but increasingly common *supplier network*, to the sophisticated *enterprise management* perspective.

Supply Chain Relationships

A 'supply chain' is a metaphor used to describe a simple, linear relationship between a series of different organizations such as a raw materials supplier, a product manufacturer, a distributor, and an end customer. Supply chains are concerned with the flow of three things between participating organizations: information, money, and materials. This is illustrated in Figure 4.1. Within each organization there are activities and processes related to each of these flaws.

The flow of activities might be triggered by a customer order – for example a bicycle from Halfords, a large UK retailer of bicycles and car accessories. The information about the order is transmitted to the distributor, in this case the Halfords warehouse; then to the manufacturer, which might be DBS, a Norwegian bicycle producer; and then, in turn, to the manufacturer's suppliers. As goods are moved along the supply chain, the firms involved incur transaction costs. These are the extra costs involved in buying goods or services (e.g. employing people to negotiate contracts, and the costs involved in moving items from one place to another). The management of these activities are referred to as *supply chain management*.

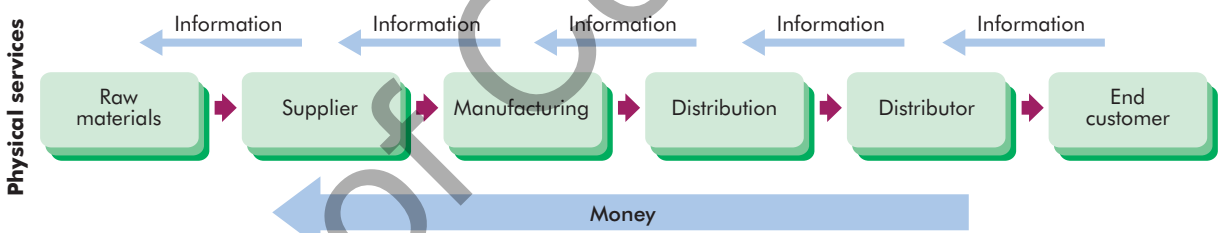

Figure 4.1 Stakeholders in a simple supply chain

Historically, business processes within individual firms in a traditional supply chain have operated relatively independently of each another. There was little sharing of information between the customers and the suppliers. Firms tended to rely on their immediate stakeholders for demand information, and therefore the information flow was slow. In order to make sure the supply chain operated smoothly, the stakeholders focused on maintaining buffers (excess stock) of materials, and capacity and lead times were based on forecast rather than actual demand.

Globalization, deregulation (the removal of government control), increasing customer demand and advances in both information and transportation technology have all contributed to make the design and management of supply chains increasingly complex. Shorter product life cycles and competitive pressures have forced firms to find new ways to work together, improve their operational efficiency, and make supply chains increasingly integrated. Figure 4.2 shows the contrast between traditional supply chains and integrated supply chains.

Supplier Network Relationships

A **supplier network** has a supply side and a demand side, as illustrated in Figure 4.3. On its *supply side* an operation has its suppliers of parts, information and services. These

Supplier network: loose group of organizations that collectively delivery parts and services to an end customer.

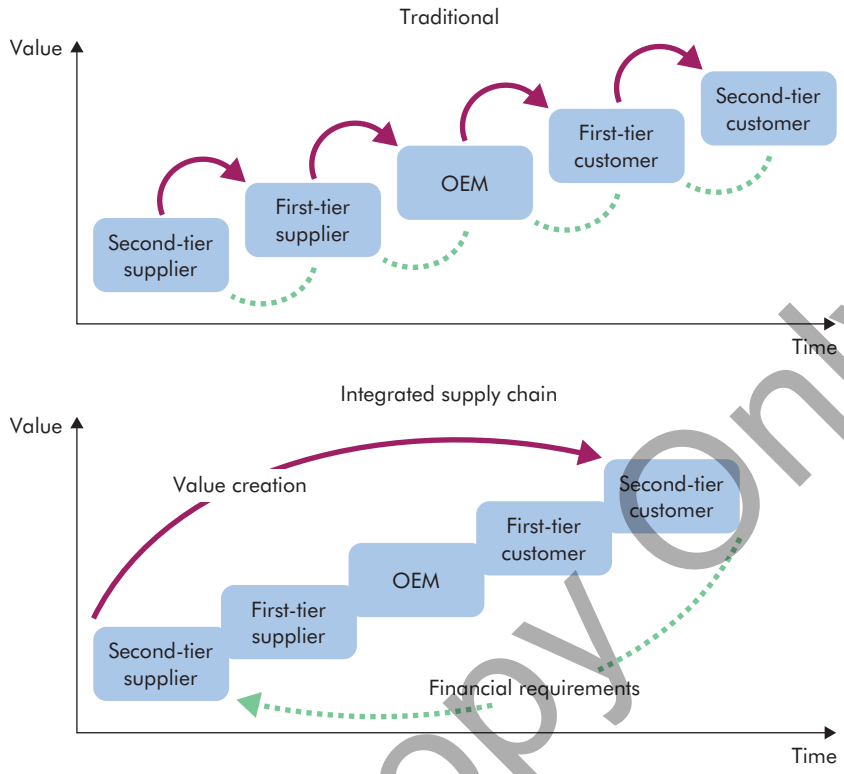

Figure 4.2 Traditional versus integrated supply chain

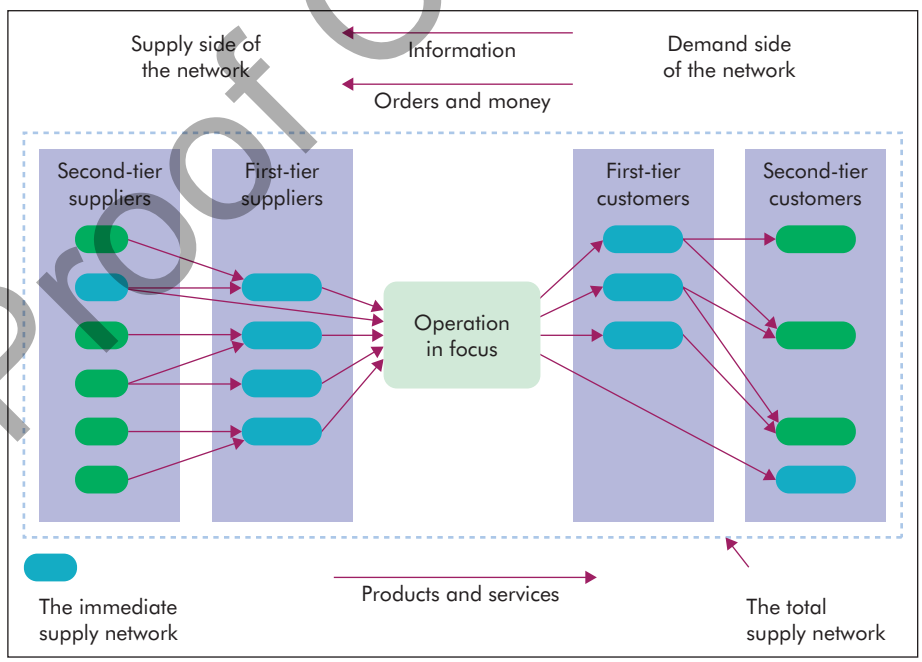

Figure 4.3 A simple supplier network

suppliers themselves have their own suppliers, who in turn may also have their own suppliers, and so on. On the *demand side* the operation has its customers. These customers might not be the final customers for the operation's product or services; they might have their own set of customers, and so on until the end user or consumer is reached.

On the supply side are a group of companies that supply the operation directly. These are called *first-tier suppliers*, and they are supplied by the *second-tier suppliers*. Some second-tier suppliers may also supply directly to the company that sells to the end customer, thus missing out some tiers in the network. For example, a second-tier supplier of nuts and bolts might supply its product both to the first-tier supplier, which might be an engine manufacturer, and to the operation in focus, which might be a car maker.

Similarly, on the demand side of the network, *first-tier customers* are those that receive inputs directly from an operation. In turn, first-tier customers may also supply *second-tier customers*, and so on. Customers who receive inputs directly from an operation are referred to as the *immediate supply network*, and customers that receive inputs indirectly from an operation, are referred to as the *total supply network*.

Occasionally a second-tier customer may receive inputs from an operation directly, as well as from its first-tier supplier. If this practice is unplanned, it can cause confusion in the network (most often over pricing), but if it is carefully planned it can be advantageous. For example, if the central operation were a golf club maker, its first-tier customers would include wholesalers, who in turn supply would supply retail outlets, the second-tier customers. However, it might also supply some retailers directly with made-to-order products, such as expensive custom-made clubs for professionals. On the supply side, most of the second-tier suppliers will provide only raw materials such as metal and rubber to manufacturers in the first tier, who may carry out other work such as machining and assembly. However, occasionally they might provide the golf club maker directly with simple products such as rubber hand-grips.

Along with the flow of goods and services in the network, each link in the network will feed back orders and information to its suppliers. When stocks run low, the retailers will place orders with the wholesaler or directly with the brand owner or manufacturers, who will in turn pass on these orders to their suppliers, and so on. It is a two-way process, with goods and services flowing one way – *downstream* – towards the end customer, and information, such as order quantities, and financial payments flowing the other way – *upstream* – towards the suppliers.

Enterprise Relationships

The European Commission (2003) defines an *enterprise* as

> *any entity engaged in an economic activity, irrespective of its legal form. This includes, in particular, self-employed persons and family businesses engaged in craft or other activities, and partnerships or associations regularly engaged in an economic activity.*

Enterprise management is the management of these enterprises.

In its simplest form, an enterprise could be a single integrated organization, but enterprises are normally thought of as being made up of parts of different organizations. The structure of an enterprise will depend upon many different, business-related factors, and its success will depend on its ability to acquire *core competencies* and integrate them into its products and services. In other words, the peripheral activities of one organization should be a core competence of another organization within an overall enterprise structure focused on delivering a particular family of products or services. However, even when an enterprise has been set up, it may need to be reconfigured and adapted to meet changing needs. For example, the construction of the Channel Tunnel was carried out by an enterprise that, throughout its lifetime, had many different structures and member companies, depending on the phase of work that was under way. When the tunnelling phase was complete, the tunnelling company would leave the enterprise relationship.

CRITICAL PERSPECTIVE

Different Supplier Relationships

The term *supply chain management* (SCM) was introduced by consultants during the 1980s, buts its roots can be traced back to the 1920s, when mass production philosophies began to dominate industry. In the 1970s supply chain management was known primarily as

distribution, which focused on the integration of warehousing and transportation within the firm. The focus was on ways in which firms could make internal changes that would reduce inventories and distribution costs.

In the 1980s the focus of SCM shifted towards re-engineering firms' supply chain processes in order to lower supply chain operating costs. This included a change in thinking, from *pushing* goods to customers towards being more market focused, and letting customers *pull* what they wanted, as and when they needed it, from their suppliers. This was achieved mainly through real-time interaction with customers, and having wider product ranges, with more emphasis on modular products and customization. SCM also made extensive use of computers and information technology in planning, delivery and control. By the end of the 1980s the goal of many firms had become reduction of SCM cost to improve customer service; this was often achieved by giving activities and responsibilities to other organizations.

In the 1990s new management concepts emerged, most notably that supplier relationships are best thought of as networks rather than as chains. This is because SCM also aimed to achieve better linkages and coordination between the processes of other organizations throughout the supply chain. From the 1990s the view was that SCM could become a strong competitive advantage for many firms. This would require a firm to align its SCM strategy (sourcing, demand flow, and customer service) with its business strategy.

With an increasing focus on services and satisfying customer needs, supply chain management had also become known as *demand chain management*. Demand chain management emphasizes market needs and customers, while the supply chain focuses on suppliers. Together, demand and supply chain management are thought of as parts of the supply network. Since the turn of the 21st century the term *enterprise management* has arisen: this is concerned with the management of companies that have become so closely integrated that it is difficult to think of them as networks of separate companies, or simple supply chains.

Enterprise: group of different companies, or group of parts of different companies, working together to deliver a product or service in a highly integrated way.

Contemporary thinking in operations management usually considers the supply chain or network metaphors to be an oversimplification. Supplier management theory is focusing increasingly on the **enterprise** as an operational entity, rather than on the traditional concept of supplier networks. For those of us who like a straightforward view of the world, though, an enterprise can be thought of as a group of different companies, or a group of parts of different companies, working together in a highly integrated manner to deliver a family of products and services to an end customer.

The key point is that different terms are used to describe the relationships between companies. You must decide which one is most appropriate in any given situation.

Stop and Think

1 Managers often use metaphors to help explain complicated ideas. Do you think these are helpful, or do they add to the complexity? How else could complicated ideas be conveyed more easily?

Transferring Activities to Suppliers

Outsourcing: process of giving part of your operations to another organization.

Outsourcing is the process of giving another organization the responsibility to deliver part of your products or services rather than doing it from within your own organization (known as *in-house* delivery). The term 'outsourcing' also means setting up a *procuring* and *purchasing* process for products and services. By outsourcing, a company enters into a contractual agreement, typically with a supplier for the supply of a certain capacity that has previously been carried out in house. The ownership, responsibility and decision-making power are shifted – partly or wholly – to the supplier.

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SHORT CASE 4.1

Banking on Outsourcing

Source: © Bloomberg via Getty Images

Barclays is one of the world's biggest banks. In the early 2000s Barclays Global Retail Bank was attracted to outsourcing and offshoring (i.e. moving work out of the home country in favour of another) to India, because of the low labour rates. According to David Skillen, Chief Operating Officer of Barclays Global Retail Bank, the original driver for outsourcing was labour arbitrage (i.e. taking advantage of different labour rates around the world), delivering as much as 40% savings compared with the UK. Barclays initially outsourced its non-voice back-office services (i.e. its Internet services) for both its commercial and retail banks to Intelenet in 2003. Skillen explains that 'There was no reason for us to own our servicing call centres, since they were really a commodity.' In addition to reducing labour costs, the ability to serve customers 24/7, 365 days a year, was another attraction. Also, outsourcing helped the UK call centre to balance its workload by providing more flexibility.

As the relationship evolved, Barclays learned how to manage it for best value. In the early days of offshoring, Barclays just sliced off the mechanical aspects of a particular process, such as data entry, and only outsourced that. However, it eventually came to understand that service providers can deliver more value at a strategic level if they control the whole process from start to finish. As trust and understanding grew, Barclays began to outsource the end-to-end delivery of its core processes, such as new information technology development, finance and accounting, and human resources management.

Questions

1 How have Barclays and Intelenet built a good relationship?
2 How can service providers add more value to a buying organization?
3 Do you think the buyer or the seller of the service should have most influence?

Source: http://www.outsourcing-center.com, 13 September 2010

Outsourcing is typically used to improve an organization's financial position, operational productivity or structure. Financially driven reasons include improving return on assets, gaining access to new markets and customers, reducing overall costs, and turning long-term fixed costs into costs that are more variable in the short term. Productivity-driven reasons include improving quality, shortening cycle time, obtaining new expertise and technologies, and reducing risks. Organizationally and structurally driven reasons include being able to focus on what the firm does best (i.e. its core competencies), increasing flexibility to meet changing demand patterns, helping to improve customer responsiveness, and joining up with other successful companies. These reasons are summarized in Table 4.1.

Offshoring is a specific form of outsourcing in which companies transfer some of their activities to other countries outside their country of origin. The main drivers behind offshoring have been access to new markets worldwide, and lower labour costs in developing countries. It has been estimated that labour rates in developing countries can be 90% lower than those in developed countries. For example, the average salary of a radiologist in 2006 was US$35,000 in India, US$95,000 in Singapore, US$140,000 in the UK with the National Health Service, and US$340,000 in the USA (Yu and Levy, 2010).

The reverse of offshoring is known as *onshoring*. This is when organizations bring their suppliers back to their home country, to reduce risk or increase supply certainty.

Single Sourcing

In *single sourcing* the buyer relies on one source for the supply of an item or service. The arrangement between the firms is like a partnership, and often results in a strong, durable and trusting relationship. Price will

Table 4.1 Reasons for outsourcing

Financially driven reasons	• Improve return on assets by reducing inventory and selling unnecessary assets • Generate cash by selling low-return entities • Gain access to new markets, particularly in developing countries • Reduce costs through a lower cost structure • Turn fixed costs into variable costs (or vice versa) depending on the situation
Productivity driven reasons	• Improve quality and productivity • Shorten cycle time • Obtain expertise, skills, and technologies that are not otherwise available • Improve risk management • Improve credibility and image by associating with superior providers
Organizational/structurally driven reasons	• Improve effectiveness by focusing on what the firm does best • Increase flexibility to meet changing demand for products and services • Increase product and service value by improving response to customer needs

Source: adapted from Jacobs and Chase (2008, p. 189).

not necessarily be the most important criterion. Single sourcing often requires that the partners trust each other, especially regarding the sharing of confidential knowledge about the outsourced products and services, which can be complex and specialized. The strong dependence, in turn, encourages more commitment and effort from both parties.

Single sourcing also has its disadvantages. The buyer might be more vulnerable to disruption if a failure to supply occurs. For instance, this can happen when a supplier files for bankruptcy, and has no means of fulfilling the contract. Too much dependence on a particular supplier also makes the firm vulnerable to price demands. The extreme version of this occurs when the supplier is the sole source of the product or service: there are no other suppliers with the capability to deliver it – a monopoly situation (e.g. the supply of piped water to homes in a particular area of the UK).

Multiple Sourcing

In order to avoid the supply risks associated with single sourcing, companies can use *multiple sourcing*, establishing a wide supply base, where the suppliers are encouraged to compete with each other – often on price. The buyer can then drive down the price by *competitive tendering*. Multiple sourcing strategies also allow the buyer to switch sources in case of supply failure, as well as tap into wider sources of knowledge and expertise. If such a practice becomes too adversarial, though, it can be difficult to encourage commitment from suppliers. They will also be less willing to invest in new technologies and processes if they know their customer may be sharing confidential details with their competitors.

Sourcing from two parties (or *dual sourcing*) combines the advantages of single sourcing and multiple sourcing by building strong relationships without the danger of a monopoly occurring. Some guidelines for sourcing decisions, adapted from Burt *et al.* (2003), are as follows:

Single sourcing is appropriate when:

- Lower total cost results from a much higher volume (economies of scale)
- Quality considerations dictate
- The buying firm obtains more influence or 'clout' with the supplier
- Lower costs are incurred to source, process, expedite, and inspect
- The quality, control, and coordination required with just-in-time manufacturing require a single source
- Significantly lower freight costs may result
- Special tooling is required, and the use of more than one supplier is impractical or excessively costly
- Total system inventory will be reduced
- An improved commitment on the supplier's part results
- More reliable, shorter lead times are required
- Time to market is critical

Multiple sourcing is appropriate:

- To protect the firm during times of shortage, strikes and other emergencies
- To maintain competition and provide a backup source
- To meet local content requirements for international manufacturing locations
- To meet customers' volume requirements
- To avoid lethargy or complacency on the part of a single-source supplier
- When the customer is a small player in the market for a specific item
- When the technology path is uncertain
- In areas where suppliers tend to leapfrog each other technologically

If organizations decide to outsource their products and services, and there is a choice between different possible suppliers, they need to decide which one to go for. The next section looks at choosing suppliers, based on their location.

Location Decisions and Supplier Relationships

It is often said that, when buying a house, there is nothing as important as location: the same might be said for locating a business. Unfortunately, not all businesses have good reasons for their location choice. Often they are there for historical reasons, and find it difficult to justify the cost and disruption of moving unless compelled by very strong reasons. Strong reasons might include changes in demand for their goods and services, or in changes in their supply of inputs.

The Impact of Demand Changes

Demand changes can be driven by a change in the location of a customer, in frequency of purchases, or in the total number of customers in a particular area. For instance, if there is a boost in the construction activity in a particular area of a country – Beijing's new airport, for example – then a cement manufacturer may choose to locate there. Similarly, if there is growth in the student population in a certain area of a city, then more fast-food outlets may locate there.

Demand-based location is heavily influenced by the suitability of the site itself. For instance, luxury holiday hotels are often located next to a sandy beach in a beautiful bay. If a hotel were located in a back street industrial area, it would have little appeal, and demand for its service would inevitably be low. The same is also true for retailers, who compete for high-profile sites in the high street, where demand from passing traffic is high; such sites can fetch a premium price in comparison with back streets that have little passing traffic. Quite often a particular address is sought after, such as Wall Street in New York for trading companies, Harley Street in London for medical practices, or Sunset Boulevard in Los Angeles for swanky restaurants. At other times the site is determined by convenience: for example, public services such as fire stations, hospitals and schools have to be located near the population that will use them.

The Impact of Supply Changes

Supply changes can be driven by the cost or availability of inputs supplied to an operation. For example, a mining company or a forestry company may need to relocate as resources become depleted, or an energy company may need to relocate to where there is a plentiful and reliable supply of water to drive its hydroelectric turbines.

A manufacturing or software engineering company may choose to relocate to parts of the world where the labour force is relatively cheap, in terms of cost per hour of employment, or beneficial exchange rates, or lower overheads. (Overheads in this case refer to the extra costs of employing someone, e.g. pension, fringe benefits and sick pay.) Other labour-related issues include the availability of the right sort of labour. For example, science parks are often located close to universities because they hope to recruit the people that the university has educated.

A company may also choose to relocate to areas where land and business rates are cheaper, and so can be influenced by wider governmental, political, societal and economic forces.

Making the Location Decision

The aim of making a good location decision is to achieve an appropriate trade-off between the costs associated with the geographical location, the level of service an operation is able to deliver to its customers, and the potential the location has to generate revenue. In different scenarios some factors are more important than others. For instance:

- Commercial manufacturers are concerned mainly with minimizing the variable costs due to geographic locations associated with the transportation of supplies and finished goods, while maximizing their revenue and customer service levels
- Commercial service providers are concerned mostly with the direct costs of renting or leasing premises (such as offices, conference centres or retail units) and their potential to attract clients, as clients usually place a lot of weight in *where* they go for services such as a meal or a haircut
- Non-profit organizations are concerned mainly with a location's ability to provide an acceptable level of service to its customers, sometimes despite its costs of leasing, renting or any associated transportation costs to and from it. For instance, the location of a school is often chosen for easy access by its pupils and their parents.

The location decision for any operation is therefore determined by the relative strengths of its supply-side and demand-side factors.

Centre of gravity method: approach that uses the physical analogy of a 'balancing point' to determine the geographical location of an operation relative to others that it has a direct relationship with.

Weighted score technique: technique for comparing the attractiveness of alternative operational locations that allocates a weighted score to each relevant factor in the decision.

Operations managers need to draw on their skills and experience when making location decisions, although there are some basic quantitative steps that can help rationalize the process. We describe two here: the **centre of gravity method**, which is most useful for transportation-based decisions, and the **weighted score technique**, which can be used to assess wider managerial factors in an outsourcing decision.

Centre of Gravity Method

Minimizing transportation costs for an operation is usually an important contributing factor in locating an operation. The **centre of gravity method** can be used to help minimize these costs. It is based on the idea that all possible locations can be scored and assigned a numeric value, based on the sum of all transportation costs to and from that location. The best location is the one that minimizes the overall transportation cost.

All locations are represented on a scale map that has square gridlines on it, rather like a standard road map. The centre of gravity of the map is found, and this represents the coordinates of the lowest-cost location for a site. The x and y coordinates of this location are calculated using the following formulae:

$$x = \frac{\Sigma x_i V_i}{\Sigma V_i}$$

$$y = \frac{\Sigma y_i V_i}{\Sigma V_i}$$

where x_i is the x coordinate of the source or destination i, y_i is the y coordinate of the source or destination i, and V_i is the volume to be transferred from source or destination i.

WORKED EXAMPLE 4.1

Putting the Centre of Gravity Method into Practice

A local authority operates four schools, which currently each have a small storeroom for their foodstuffs (e.g. tins, vegetables, milk). The local authority has decided to get rid of these small storerooms and build a large new central distribution centre to try to cut costs and create more space in the schools for the pupils. Each school is a different size, and needs a different volume of supply, and hence a different number of deliveries (i.e. trucks) travelling to and from them per week. Table 4.2 shows the volumes transported each week.

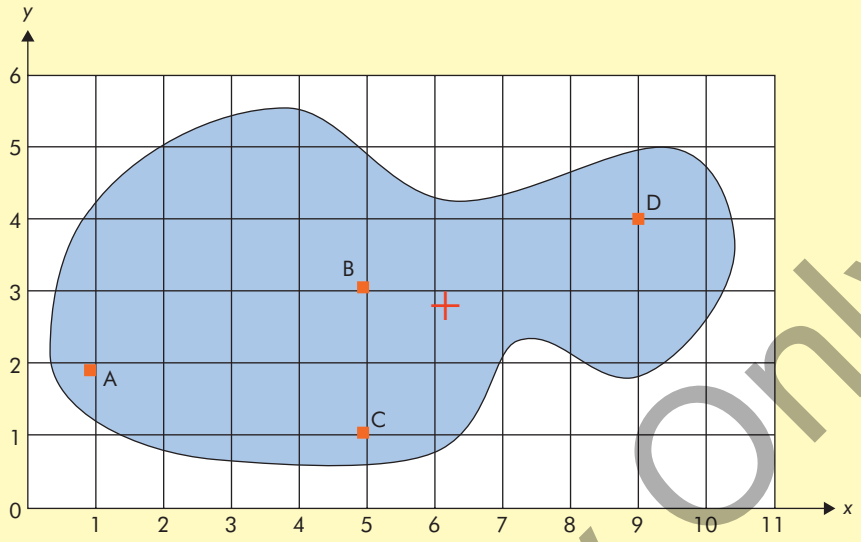

Figure 4.4 Centre of gravity model for the local authority

Table 4.2 Weekly deliveries to the schools

	Deliveries per week
School A	5
School B	10
School C	15
School D	20
Total	50

Problem: *Where should the new distribution centre be located?*

Approach: The local authority region is sketched out on a grid – which is represented by the blue area in Figure 4.4. In the figure the schools' locations are also plotted, and the above formulae are applied.

The calculation is therefore:

$$x = \frac{(1 \times 5) + (5 \times 10) + (5 \times 15) + (9 \times 20)}{50} = 6.2$$

$$y = \frac{(2 \times 5) + (3 \times 10) + (1 \times 15) + (4 \times 20)}{50} = 2.7$$

This means that the minimum-cost location, or the 'centre of gravity', for the new distribution centre is at point (6.2, 2.7) – which is shown by the red cross on the map.

In practice the optimum location will also be influenced by other factors, such as the transportation network, or the geography of the land. So if the optimum location was at a point with poor access to a suitable road, or at some other unsuitable location, such as in a river or in a graveyard, then the chosen location would need to be adjusted. Therefore this technique is used only as a guide, suggesting general locations.

Weighted Score Technique

This technique involves:

1 identifying criteria (in addition to distance and frequency of supply) that can be used to evaluate different locations

2 assigning a weighting of relative importance to each criterion

3 scoring each location's suitability against each criterion.

This technique can also be extended beyond physical factors to wider management considerations, such as cultural fit, or the language capability of the population.

WORKED EXAMPLE 4.2

Putting the Weighted Score Technique into Practice

A UK Internet service provider (ISP) has decided to set up a new call centre in Poland, or South Africa, or India. In order to choose the correct location, it has decided to evaluate them on the following criteria:

- The cost of acquiring the location (crucial)
- Cultural and language compatibility (very important)
- The site's access to the international airport (very important)
- Local taxation rates or subsidies (important)
- The availability of suitable skills in the local labour force (important)
- Time zone difference from Greenwich Mean Time (minor importance).

There are three sites to consider that may work. These are known as sites P (Poland), SA (South Africa) and I (India). After investigating each in detail, the operations managers allocate a score between 0 and 100 that they believe represents the usefulness of each site in relation to each criterion; this is shown in Table 4.3.

Problem: *Where do you think the ISP should locate its new call centre, and why?*

Approach: Allocate a weighting between 1 and 5 to each of the criteria to indicate how important they are. Then multiply each usefulness score by the importance weighting. Finally add up the adjusted scores (Table 4.4).

Solution: The preferred outsourcing option is the South African site (see Table 4.4), as the weighted total score is the highest: $(90 \times 5) + (50 \times 3) + (50 \times 3) + (80 \times 4) + (70 \times 4) + (50 \times 1) = 1{,}400$.

Using the same method, the Polish site has scored lowest, and the Indian site has achieved the middle rank.

Note: The ISP company can use this technique to reassess the scenario should any factors become more or less important; or if other factors need to be considered later on.

Table 4.3 Usefulness scores for new call centre outsourcing decision

Criterion	Usefulness scores for sites		
	P	SA	I
Cost of the site	80	90	95
Rate of local property taxation	40	50	80
Availability of suitable skills in the labour force	50	50	50
The site's access to the international airport	50	80	25
Cultural and language compatibility	30	70	25
Time zone difference from Greenwich Mean Time	30	50	40

Table 4.4 Weighted usefulness scores for new call centre outsourcing decision

Criterion	Importance weighting	Weighted usefulness scores for sites		
		P	SA	I
Cost of the site	5	400	450	475
Rate of local property taxation	3	120	150	240
Availability of suitable skills in the labour force	3	150	150	150
The site's access to the international airport	4	200	320	100
Cultural and language compatibility	4	120	280	100
Time zone difference from Greenwich Mean Time	1	30	50	40
Total weighted scores		1,020	1,400	1,105

Supply Base Rationalization

From the late 1990s onwards, supplier management practices have shown a strong trend towards increasing supplier integration, which in turn reduces the overall number of suppliers. This practice is often called **supply base rationalization**, and can be seen as a backlash to the tendency of organizations to outsource during the preceding decades.

Supply base rationalization: reduction of suppliers in order to become more efficient.

The underlying purpose of supply base rationalization is simple: it involves working more closely with fewer suppliers. The practice builds on the idea that an individual organization has only a limited amount of resources, and by reducing the number of suppliers an organization has to manage *directly*, it becomes easier for it to focus its management efforts. But although supply base rationalization may achieve short-term cost savings, and complement other practices such as *lean management* (as described in Chapter 10), it can bring its own problems. These are described below.

The financial effect of supply base rationalization can be demonstrated by looking at cost structures. Broadly speaking, there are three levels of cost:

- *Strategic costs* – which are best thought of in terms of commercial risks incurred and lost business opportunities. They are typically intangible, indirect, and very hard to measure
- *Tactical costs* – which are management costs associated with things such as visiting suppliers, holding quality audits and supplier conferences. These are usually overheads that can be attributed to particular products or services
- *Operational costs* – which are the costs of making the products or delivering the service, such as materials, and salaries of employees. Relatively speaking, these are direct costs and are the easiest to measure.

Often when organizations move from a large supply base to a smaller one, the cost structure seems to turn upside down, as demonstrated in Figure 4.5. Strategic costs increase relatively as the buying organization becomes increasingly dependent on fewer firms, and has more strategic activities to participate in, such as the co-development of new products and services. In contrast, operational costs *should* decrease relatively, because the overall number of transactions should decrease (e.g. moving from ten suppliers to one can mean raising 10 times fewer purchase orders). The overall intention of supplier rationalization, by the dominant organization, is to reduce overall cost (as implied in Figure 4.5 by the smaller triangle post-reduction) and management complexity. This is achieved by reducing the number of suppliers managed, by either encouraging first-tier suppliers to

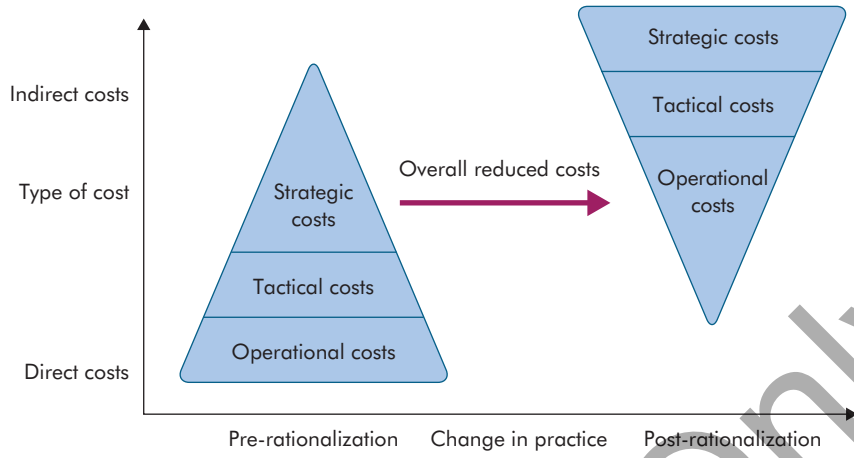

Figure 4.5 The effect of cost on supply base reduction (adapted from Cousins, 2005)

merge, or encouraging some first-tier suppliers to manage other first-tier suppliers, who, as a result, effectively become second-tier suppliers.

We should treat the practice of supplier rationalization with caution, though, because it is difficult to demonstrate clearly *overall* cost savings, owing to the problems of measuring the indirect cost element accurately.

WORKED EXAMPLE 4.3

Costing Supply Base Rationalization at EuroCook

A large European industrial catering company known as EuroCook is looking to outsource some of its food production in an effort to reduce its overall supply costs and their variable cost component. EuroCook has five different non-meat food production lines that it wants to outsource (bread, cakes, pastries, biscuits and cereals), as it wants to concentrate on meat-based products, which will continue to be made in house. It has invited FoodFactory to bid for the work. The costs should be based on 1,000 units of output per month over a 12-month period, and need to be broken down and attributed to strategic, tactical and operational activities.

EuroCook's management accountants have calculated what it costs the company currently to produce its non-meat product lines; these are shown in the 'Pre-rationalized suppliers' column in Table 4.5. FoodFactory's accountants have costed the bid; their costs are given in the 'Post-rationalized suppliers' column in Table 4.5.

Problem: *Will it be cheaper for EuroCook to keep managing its non-meat product lines in-house, or let another company (FoodFactory) manage them?*

Approach:

Pre-rationalized suppliers total annual costs (€s):

$= 100{,}000 + (5 \times 10{,}000 \times 12 \text{ months}) + (1000 \times 1.2 \times 12 \text{ months})$
$= 100{,}000 + 600{,}000 + 14{,}400$
$= €714{,}400$

Post-rationalized suppliers total annual costs:

$= 300{,}000 + (5 \times 5{,}000 \times 12 \text{ months}) + (1000 \times 0.8 \times 12 \text{ months})$
$= 300{,}000 + 300{,}000 + 9{,}600$
$= €609{,}600$

Solution: It can be seen that at 1,000 units of production per month it is far cheaper (€714,400 – €609,600 = €104,800 savings per year overall) to let FoodFactory manage its suppliers.

Table 4.5 Supply base rationalization for EuroCook's non-meat product lines

Level at which cost is incurred	Example	Supplier management costs	
		Pre-rationalized suppliers managed by EuroCook	Post-rationalized suppliers managed by FoodFactory
Strategic	Whole company (e.g. EuroCook or FoodFactory) on an annual basis	€100,000 per year Variable costs	€300,000 per year Fixed costs
Tactical	Particular production line (e.g. bread) on a monthly basis	5 lines × 12 months × €10,000 per month Variable costs	5 lines × 12 months × €5,000 per month Fixed costs
Operational	Unit of output (e.g. one tray of bread)	1,000 units per month × €1.2 cost per unit Variable	1,000 units per month × €0.8 cost per unit Variable

Note: Rationalization means that EuroCook is effectively dealing with only one supplier (FoodFactory) for all its non-meat products, rather than with many individual suppliers. This should make management of suppliers simpler. This decision will also reduce its risk, as some of its variable costs have been turned to fixed costs, which makes budgeting and financial planning easier.

The key point is that, by practising supply base rationalization, an organization has costs that are arguably more certain, and easier to measure and manage.

Stop and Think

2 If you were a senior manager in a small organization supplying a large organization, which was conducting a supplier rationalization programme, what steps would you take to ensure that your company was not adversely affected?

SHORT CASE 4.2

Supply Base Rationalization at Sony

Sony makes innovative products, such as the Walkman music player and the PlayStation game console. It has built a valuable global brand. However, in the financial year ending 2009, the Japanese company made its first annual loss in 14 years (nearly £0.5 billion) as it was hit by declining global demand, a strong Chinese yuan, and reducing product prices. In response, under a turnaround plan led by Chief Executive Officer (CEO) Howard Stringer, Sony halved the number of parts suppliers, to reduce its costs by 20%. This was achieved because it was less costly to manage fewer suppliers.

Sony reduced the number of parts makers from about 2,500 to about 1,200 in a single year.

Source: © 2009 Getty Images

GLOBALIZATION

After supplier rationalization, Sony became more focused, improved its efficiency, boosted its earnings and profits, expanded its demand-side distribution network, and increasingly shared its parts makers' processes with its suppliers.

Another closely related issue was that the various internal divisions of Sony needed to work together better. Stringer said that their business units often didn't communicate well with each other, and even hinted that they were territorial. Stringer said that 'we must transform Sony into a more innovative, integrated and agile global company,' which is an essential step to take before rationalizing the external supply base.

BUSINESS INTEGRATION

Questions

1 What further steps could the CEO of Sony take to save supply costs?
2 What would you do if you were a supplier to Sony?
3 What are the downsides to the supplier reduction that Sony is implementing?

Source: The Associated Press, 2009. Adapted.

CRITICAL PERSPECTIVE

Why Do Organizations Outsource and Rationalize?

Outsourcing is concerned with finding alternative external supply sources for an organization, and supply base rationalization is about ensuring that the organization does not have too many external supply sources. If an organization has too many suppliers, this can generate a burdensome overhead and unnecessary complexity.

Often businesses go through cycles of outsourcing followed by periods of supplier rationalization, which is then repeated as organizations drop certain suppliers and subsequently look for new ones. Although this may be seen as wasteful and iterative, it often stops an organization from stagnating, by bringing in fresh ideas and approaches.

The key point is that an organization must make sure that it has enough external suppliers to keep costs and internal bureaucracy down and innovation up, but not so many that they begin to become burdensome and counterproductive.

Virtual enterprise: temporary group of organizations exploiting a short-term, high-risk opportunity.

Extended enterprise: semi-permanent group of organizations working towards joint strategic objectives.

Vertically integrated enterprise: almost permanent and extremely well-integrated group of organizations; very similar to a single legal entity.

The Design of Enterprises for Closer Supplier Relationships

Enterprise management is an emerging idea about how organizations are designed, structured and managed. Contemporary thinking sees an enterprise as an inter-organizational structure that links the operations of separate companies very closely.

There are three basic types of enterprise:

- **Virtual enterprise (VE)**: a short-term temporary group of (parts of) organizations exploiting a specific short-term, often high-risk opportunity
- **Extended enterprise (EE)**: a semi-permanent group of organizations working towards joint strategic objectives
- **Vertically integrated enterprise (VIE)**: an almost permanent and extremely well-integrated group of organizations; similar to a single legal entity.

These three types exhibit different characteristics and are suited to different operational contexts, as described in Table 4.6.

Table 4.6 Enterprise types: virtual, extended, and vertically integrated

	Virtual enterprise	Extended enterprise	Vertically integrated enterprise
Philosophy	Agile	Lean and agile	Lean
Foundation of relationship	Based mainly on technical competence features; emphasis on high innovation; allocation of resources depends on competitive and comparative advantage	Based mainly on social competence features; past relationship experience important; emphasis on strategic sourcing of critical products	Based mainly on efficiency factors; emphasis on transaction costs (e.g. prices)
Core competencies	Newly emerging, speculative, untested, high risk, requires many members to spread risk; high asset specificity; high transaction costs	Tested to some extent, medium risk, understood by innovators; medium asset specificity; medium transaction costs	Mature, well-accepted, tested and widely usable; low asset-specific investments; low transaction costs
Scope of relationship	Project-based activities that exploit specific opportunities across organizational boundaries; present a unified face to externals; partners involved in many other collaborative activities simultaneously to lessen their risks	Mid-term strategic thinking; often spans whole product life cycle across organizational boundaries	Standardization, high production volumes and corporatization of structures; focus on scales of economies rather than on scope of economies
Longevity of relationship	Short-term temporary alignment of operations	Medium to long term	Foreseeable as permanent (as long as competitive)
Proximity and depth of relationship	No stability; dynamic and unpredictable environment; collaboration improves agility and flexibility; low degree of interdependence and integration	Strategic collaboration; relationships, technology and knowledge management become critical; medium degree of interdependence and integration	Tend towards industrial dominance; emphasis on removal of IT legacy systems; high interdependence and integration
Governance of relationship	Loose and flexible; temporary and reactive to emerging trends; right balance of control and emergence (i.e. co-opetition)	Strategic sourcing and partner development; design and implementation of co-owned processes; proactive governance aiming for efficiency	Single command and control; focused on monitoring and control through standardization and corporatization
Strategic role of enterprise integrator	Incubator; scouting for potential value members; initiates collaborative activities	Integrator; coordination of collaborative activities; supports value members in competence development	Incumbent; in-house development of proprietary systems; relying on power and authority
Strategic role of value members	Innovative suppliers; deploying specific competencies for innovating new technologies and solving complex R&D problems	Integrator; integrating parts to more complex systems and managing and coordinating sub-supplier base	Volume production; value creation through cost-efficient making and delivery of parts to high quality
Main collaboration points	Mainly new product and service planning and concept design	Mainly concept, early delivery design and mass delivery planning	Mainly high-volume design and delivery

Enterprise integrator/ orchestrator: organization that takes the lead role in transforming a loose supply network into a tightly integrated enterprise.

In an enterprise there is always one dominant – most strategically influential – organization, known as the **enterprise integrator** or **orchestrator** (Brown *et al.*, 2002). This organization is predominant in the design of the enterprise, and it is critical that operations managers within this organization understand suppliers' motives capabilities and structures, in order to be able to design an appropriate *enterprise structure*. The enterprise should contain the most useful parts of the most suitable organizations. This requires managers in the integrator organization to combine an 'outside, looking in' view, known as an *exogenous view*, of each partner with an 'inside, looking out' view, known as an *endogenous view* of their organization. This is based on the resource-based view of an organization described in Chapter 1 and the theories of transaction cost economics described in the section below.

Endogenous theories: theories about an organization that focus on the organization and its links to the business environment.

Exogenous theories: theories about an organization that focus on its internal workings, resources and skills.

Endogenous theories or views and **exogenous theories** or views should be used to complement one another; excessive focus on either one can result in a poor operations strategy. For instance, too much internal focus can mean that an organization does not develop strong enough links with its suppliers and customers, implying that it might be hard for it to buy or sell products and services easily. Conversely, too much external focus can mean that the organization may not develop internal skills and resources adequately, implying that it risks losing its unique competitiveness or innovative features. We shall now build on these ideas to show how enterprises should develop over time.

Transaction costs: the price associated with buying or selling goods or services.

Transaction Cost Economics

If you bought a new coat, you might spend time and money choosing it, and have to pay delivery costs if you bought it through the Internet, or pay petrol and parking costs if you drove to a shopping centre. These costs are all **transaction costs**. Another example would be buying a house. As well as the cost of the house, there is the time spent with estate agents, fees to estate agents and legal fees, and the costs of moving.

Transaction cost economics (TCE) has emerged as a *de facto* economic explanation for the existence and scope of a commercial organization. Nobel Prize Laureate Ronald Coase (1937) stated that commercial organizations exist because of these 'transaction costs' – in other words, the price of using the open market mechanism. An organization has to use this thinking all the time when buying new products or services. For example, buying new computer services for students' residences or a university library will incur transaction costs. These may include the time taken to do research (e.g. spending time researching what type of server is needed, and who provides them), bargaining (e.g. spending time negotiating with potential suppliers) and enforcement (e.g. maintenance of the servers, and extra costs for fixing problems). There will be similar costs involved for the computer service provider (e.g. time putting together a proposal, delivering a sales pitch, etc.).

TCE is based upon the interplay of four behavioural assumptions: bounded rationality, opportunism, asset specificity and uncertainty.

Bounded rationality is the assumption that, although most human behaviour is intended to be rational, it is often limited by knowledge, behaviour and language (Simon, 1957). For instance, we may try to choose the cheapest or most waterproof coat we can, but we have no sure way of knowing this, as we cannot check *every* coat that is for sale.

Opportunism is the assumption that 'actors' (organizations or individuals) will try to improve their own standing in comparison with others. For instance, if we saw a coat that was fashionable and good value, and we really wanted it, we would buy it regardless of any other actors' needs or desires. Opportunism could be described as 'self-interest seeking with guile' (Williamson, 1975). This is self-centred behaviour, and is often how free markets operate. However, it is difficult to distinguish between those who act like this deliberately, those who act like this from bounded rationality, and those who may actually want to collaborate. Higher competitive pressures and levels of mistrust between organizations will cause more opportunism.

Asset specificity considers how specialized assets (e.g. core competencies for design, manufacture or branding) are dedicated to delivering certain products or services. In successful times these are often the source of competitive advantage. These specialized assets are risky to own, though, as they cannot be fully utilized if the particular application for which they were acquired is no longer required. This is because they cannot be easily transferred

to another application. For example, a general-purpose sewing machine that is used to make coats will have low specificity, because it can easily be used for making a variety of other clothing, whereas a machine that can be used for only one task (e.g. a fabrication plant for PC processors) will have high specificity, as it will have expensive retooling and changeover costs. The four main types of asset specificity are *location* (e.g. restriction to a particular place), *physical properties* (e.g. speed of a machine), *human limitations* (e.g. limited skills) and *degree of dedication* (e.g. the amount of different things that can be done at any one time). In adverse conditions, assets with highly specific properties are believed to increase the opportunism, or, if conditions allow, may result in organizations collaborating.

Uncertainty relates to the business environment, and the behavioural limitations of organizations and individuals. Organizations facing high levels of uncertainty in their markets and the external environment will tend to seek to develop their own internal resources, and look for low-risk projects and organizations to work with (e.g. hospitals often have their own back-up power plants to ensure that they always have a reliable source of electricity). However, such risk aversion usually means more expense, and slower rates of innovation.

The key point is that all the above assumptions affect transaction costs. If other factors are favourable, then when an organization's overall transaction costs with external organizations are higher than its internal transaction costs, it will often grow. This is because it is cheaper and easier to do activities in house. Conversely, if internal transaction costs are higher than external transaction costs, an organization can benefit from downsizing or outsourcing its operations, because it is cheaper and easier to get another organization to perform these activities.

TCE is often criticized for:

- Failing to explain clearly situations when suppliers should collaborate as partners in jointly strategic relationships
- Focusing too much on cost minimization rather than on value maximization.

Resource-based View

As explained in Chapter 1, the *resource-based view* (RBV) traditionally focuses on the internal resources of a single organization. We also saw how the traditional RBV has, more recently, been extended to recognize that resource bases vary over time and require collaboration with different organizations, leading to the *dynamic capabilities view* (DCV) of organizations (Teece *et al*., 1997) discussed in Chapter 1. The main difference between the DCV and the RBV of organizations is that DCV considers a number of simultaneously collaborating organizations working towards joint business objectives, instead of individual organizations being purely opportunistic. This is also recognized by the managers of enterprises.

The core competencies of an organization (which are endogenous resources) are difficult to transfer, because of high transaction costs, dependence on tacit knowledge, and high asset specificity. Because of this, core competencies can usually only be deployed effectively internally within single organizations. However, under certain conditions organizations may prioritize development of their core competencies over and above the minimization of transaction costs – for instance when engaging in a new collaborative venture (such as a long-term research project with a university to develop a new technology). This challenges the notion of competitive advantage, and suggests that *cooperative advantage* or *collaborative advantage* (Dyer and Hatch, 2004) can sometimes be more appropriate. Collaboration should occur when the minimization of operational transaction costs has become less significant than gaining new external core competencies in new collaborative enterprises.

In other words, to remain competitive, new meta-core competencies (those that are a property of the whole enterprise, rather than just one company) need to be built by the enterprise integrator alongside existing traditionally valued ones to reconfigure operational competencies and organizational structures. The enterprise integrator's role is assumed by the most significantly influential member of the enterprise. For example, the Canadian company Magna Steyr attempted to acquire parts of the former European General Motors as it almost became strategically and financially more dominant than GM, the original equipment manufacturer.

SHORT CASE 4.3

Virgin: Come Together

Source: © Photogenix/Alamy

The Virgin Festival (or 'V Festival') is a groundbreaking music festival, as it was the first to be delivered over two days at two different UK venues – Hylands Park in Essex and Weston Park in Staffordshire. Originally, the festival was the brainchild of the pop group Pulp's lead-man, Jarvis Cocker, who wanted to play two live festivals on consecutive days, one in the north and one in the south of England. The festival contrasts with other big summer music festivals, such as Glastonbury, that are held over several days, at a single location.

BUSINESS INTEGRATION

In the UK, SJM Concerts promotes the festival. The planning involves many different types of organization, such as caterers, radio stations, ticket agencies, mobile phone companies, engineers, sanitation providers, security, emergency services – and, of course, the musical artists. They must come together for a short time span to deliver a service to the festival-goers and then part until, perhaps, participating again the following year.

GLOBALIZATION

The V Festival concept has been so successful that it is now also staged in Australia (over four sites in Sydney, Melbourne, Perth and the Gold Coast), where it is sponsored by Virgin Mobile, Virgin Blue (local airline) and MTV. What makes this festival so successful is that the key partners in it have a shared long-term vision for what should be delivered, and how to deliver it. Even the short-term stakeholders (e.g. the food stalls, and the artists) become part of the bigger picture.

Questions

1 Who do you think are the most powerful organizations in this enterprise, and what core competencies do you think they have?
2 Name aspects of the festival that have high and low transaction costs.
3 Are there any advantages to be gained from having multi-site festivals?

Source: Ben Clegg, Aston Business School

Stop and Think

3 Why don't organizations cooperate all the time, if there are potential gains to be made from doing so?

Collaborative enterprise governance: method of controlling parts of many different organizations simultaneously, in order to deliver products and services with agility and efficiency.

Contemporary Thinking: Collaborative Enterprise Governance

Designing and integrating collaborative enterprises is rather like putting together a jigsaw puzzle where each piece is owned by a different organization. **Collaborative enterprise governance** (CEG) is an approach to designing enterprises. It considers enterprises to be made up of parts of different companies (i.e. the pieces of the puzzle), known as *enterprise modules*, where each individual enterprise module is built around highly specific core competencies belonging to an individual organization. For instance, an enterprise module could be the engines on a ship such as the new *Queen Mary 2*, or a military vessel such as the new BAE Systems Astute Class nuclear submarine; or the provider of ticketing services for a train company such as Eurostar.

Often the enterprise module provider gives a unique and valuable proposition distinct to the rest of the enterprise, such as an in-house design and engineering specialism, or is a provider of additional capacity, such as an additional

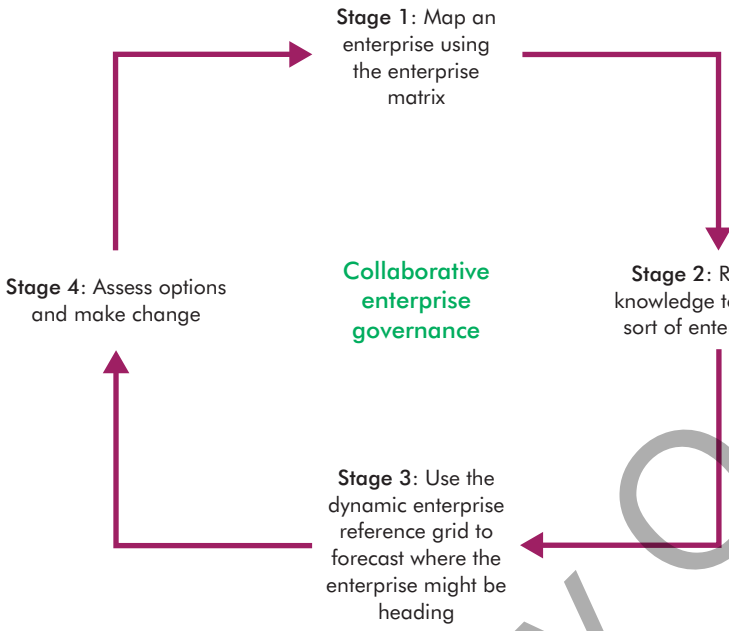

Figure 4.6 Collaborative enterprise governance

assembly plant in another country. The core competencies of any enterprise module are combined with other less specific resources, such as communication technology, cooperative contracts, and shared processes (which are relatively easy to share across a whole enterprise), to form an enterprise structure with economically acceptable transaction costs.

Enterprise integrators help overcome the traditional adversarial view, and help promote the ideas of inter-company collaboration instead. This means connecting enterprise modules (parts of one organization) with other enterprise modules (parts of another organization) to create *agile enterprises*. These agile enterprises often meet the demands of rapidly changing business environments, while operating with acceptable costs, more easily than single large traditional organizations. The role of enterprise integrator is often fulfilled by companies such as information technology consultancies, which provide the skills and technology to design shared processes and technology (e.g. companies such as SAP, Capgemini or Accenture). Sometimes, if it is necessary and if the enterprise is agile enough, the jigsaw can be remade with different pieces, to create a new picture (e.g. a new enterprise). The four main stages of CEG are shown in Figure 4.6, and are explained below.

Stage 1: Mapping the Enterprise

First we have to decide on a particular product or service family on which to focus the enterprise, and then map the enterprise using the *enterprise matrix* shown in Figure 4.7.

The members of the enterprise, who create value for it in some way or another, should be listed on the vertical axis; they are listed in order of significance, from the most important at the top to the least important at the bottom. There can be any number of these value members, which may reach into the hundreds for a complex product such as an aircraft or a complex service such as a long-distance luxury air flight. But the different types of value member can usually be classified into just a handful of different types, in order of the most significant: enterprise integrator, joint partners, design-make-and-deliver, and make-to-print suppliers:

- An *enterprise integrator* will be the most influential, as it brings all the other companies together (like Airbus in the opening case study).
- A *joint partner* will usually have made some up-front investment in the project, and will share in the revenues and losses of the whole enterprise (like the Rolls Royce Aerospace Group in the opening case study).

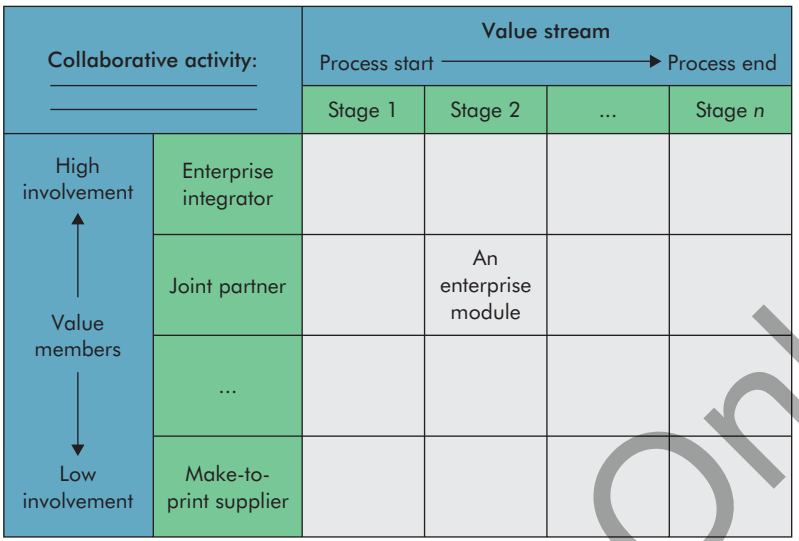

Figure 4.7 The enterprise matrix: a mapping tool

- *Design--make-and-deliver suppliers* could be employed by the enterprise integrator or joint partner to design and deliver items or services, and so are skilled members (like the programme associates in the opening case study), and will usually be hired through an invited competitive tendering process to participate.
- *Make-to-print suppliers* are relatively low-skilled organizations, delivering standard low-risk and low-value items that are easily available.

Design-make-and-deliver and make-to-print suppliers are likely to get paid whether the whole enterprise is successful or not (as long as it does not become bankrupt), as they have not invested in it up front, and do not share directly in its profit.

Each stage of the value stream in the enterprise is then mapped along the horizontal axis, with the first stage on the left-hand side and the last stage on the right-hand side. There can be any number of stages, but the whole value stream can usually be described adequately in a few key stages.

What each member of the enterprise does at each stage of the value stream is then described in the appropriate place in the enterprise matrix. This is a description of:

- What the enterprise module has as specific assets, and how they differentiate it from the others
- What processes it uses, and what they deliver
- How its performance is measured
- How it can be efficiently linked with other modules
- The transaction costs that are incurred by using it.

By describing the enterprise like this, we can begin to understand how the whole enterprise is built and governed.

Stage 2: Reflecting on Knowledge

This stage compares practice with theory to decide which sort of enterprise structure a particular scenario is currently best suited to. Table 4.6 characterized the three main types of enterprise: *virtual enterprises* (VEs), often found in research and development situations; *extended enterprises* (EEs), often found in knowledge transfer and product or service derivation situations; and *vertically integrated enterprises* (VIEs), found in commercially proven situations with stable markets. These different types do not result from different strategies, but are actually part of the same overall strategy, focused on inter-organizational collaboration at different times of the enterprise's development. Virtual enterprises are preferable in rapidly changing environments, and are typically used for

experimental products and services; extended enterprises are preferable in environments that are fairly predicable, and deliver products and services with some proven track record; and vertically integrated enterprises are preferable in very stable operational environments, when organizations compete mainly on cost.

Remember that each enterprise is focused around the delivery of a particular family of products or services (e.g. mp3 players, or a mobile device payment services). Therefore an enterprise module is likely to be part of many different enterprises simultaneously. For example, an enterprise module making parts for Sony music players is also likely to be able to supply other consumer brands; and Visa will have payment-processing modules operating in many different organizations, each operating quasi-autonomously, but drawing upon the same specific competencies. It is therefore useful to perceive enterprises as a collection of quasi-autonomous modules, where each module is simultaneously able to contribute value to a number of coexisting enterprises.

Stage 3: Using the Dynamic Enterprise Reference Grid

It is important to recognize that competencies are strategic resources which need to be developed and managed. The number and type of enterprise engagements for any one organization depend on the value placed on its enterprise modules by other companies and, the capability to deploy them; this is known as an enterprise module's **engageability**. The engageability of a module may increase over time as value members become more integrated, transaction frequency increases, and costs reduce (exogenous factors). In a similar way, the low marketability of a new competence (exogenous factor), due to its untested market value, will initially result in low attractiveness and low engageability. However, this may change through further development of the competence, leading to higher maturity and less risk.

Engageability: the ability to attract partners and the means to deliver value.

Figure 4.8 shows the *dynamic enterprise reference grid* (DERG). It summarizes the four main types of enterprise and their engageability, ranked simply as 'high' or 'low'. In each of the quadrants, the most suitable enterprise structure is shown. The DERG is important because it is the basis of how dynamic changes in an enterprise can occur. Below we give a description of each of the quadrants (Q) of the DERG, with examples.

Quadrant 1 (Q1): Low Current Engageability but High Future Potential Engageability

Enterprises in this quadrant are managed and governed 'virtually', and show a prevalence of modules with competencies that have low current but high future engageability potential. This is because they usually have many

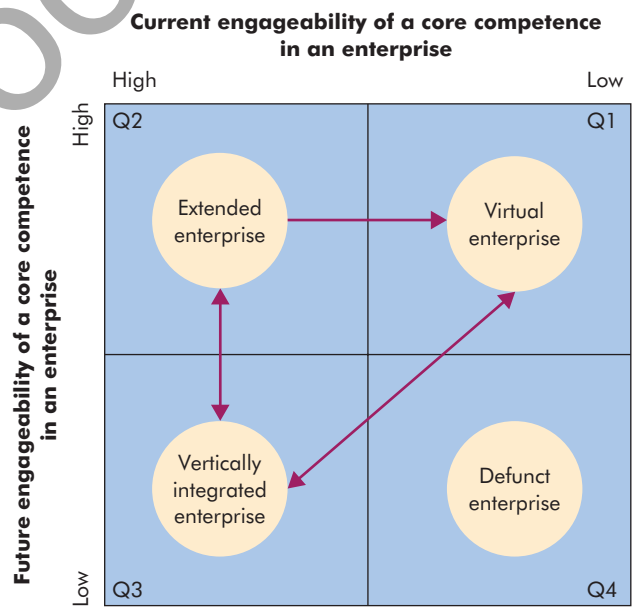

Figure 4.8 Dynamic enterprise reference grid (DERG)

newly emerging competencies – for example, the initial enterprise that developed the prototype Bluetooth short-range, hands-free communications protocol for mobile devices, which at the time was untested on consumer markets. In this situation, the enterprise governor and the value members will be reluctant to make long-term plans and investments until they start to produce revenue. So, here, collaboration arrangements will often be temporary, intended to exploit market opportunities and spread the risk over many different value members. In addition, the cost of collaborating may be very high, owing to the fragmented resource base, the high specificity of the competencies, and the high transaction costs. These are all characteristics of a *virtual enterprise*. In a virtual enterprise it is usual for value members to deliver very specific and limited value to the overall value stream. The selection of value members is based on their ability to solve complex technological problems, and their capability to bring them to market quickly.

Quadrant 2 (Q2): High Current Engageability and High Future Potential Engageability

Enterprises in this quadrant are governed as extended enterprises, and show a prevalence of competencies that are currently highly engageable, owing to their relatively mature nature and market success; this makes them highly attractive to other value members. eBay, an Internet site that has proven ability to sell products, or an ability to deliver a market-ready Bluetooth chip for mobile devices, are good examples. Such competencies involve relatively low levels of uncertainty and risk during their deployment. They are also perceived to have high potential engageability in the future, based on an ever-increasingly universal application of their value proposition. In this situation the enterprise integrator will seek a more stable, medium- to long-term co-developmental supply strategy with value members in order to minimize commercial opportunism. This decreases the costs of collaboration, and increases the ability to integrate these competencies into efficiently operating enterprises. These are characteristics of an *extended enterprise*. In an extended enterprise the value members tend to be involved in collaborative activities spanning many steps of the value stream. Their selection is based primarily on their good interface capabilities, making it relatively easy to use their competencies in an increasing number of different enterprises at relatively low transaction costs.

Quadrant 3 (Q3): High Current Engageability but Low Future Potential Engageability

Enterprises are governed in a *vertically integrated* way; they are currently highly engageable, thanks to their mature, well-established and widely usable competencies and capabilities. However, on the downside, they may become less attractive in the future, because of fears that profit margins are eroding, or that their technologies may become obsolete. This may cause the enterprise governor to seek whole-ownership of capabilities to minimize transaction cost. This leads towards a merging of organizations or permanent acquisitions of enterprise modules within a *vertically integrated enterprise*, and a control-based governance structure. An example of this is Chinese auto manufacturer NAC's purchase of MG Rover's Longbridge production plant. By taking this course of action, the once collaborative enterprise begins to closely approximate the traditional vertically integrated organization. In vertically integrated enterprises a single significant member (or small number of significant members) will cover most of the value stream in order to maximize economies of scale and standardization. In this situation, the selection of value members is based primarily on their ability to be highly efficient, and not necessarily on their ability to be innovative.

Quadrant 4 (Q4): Low Current Engageability and Low Future Potential Engageability

Enterprises found in this quadrant have a prevalence of enterprise modules that are perceived as undesirable for current and future engagement. The enterprise integrators seek to disengage them from the rest of their organization before an unrecoverable commercial situation is reached. For example, Hewlett-Packard sold the major shareholding in its PC manufacturing enterprise in 2004 to a Chinese company (Lenova Group). Recovery from this situation is possible by simultaneously developing other new virtual engagements, such as Hewlett-Packard partnering with management consultancies so that they can provide high-value IT business services. Another example is the ISP PlusNet partnering with small software development companies to become a high-value online business applications service provider (ASP). In this way, the collaborative enterprise governance cycle begins again.

Stage 4: Assess Options and Make Changes

This stage occurs when enterprise managers need to redesign and implement changes to an enterprise, based on new understanding of any given context. The dynamic enterprise reference grid shown in Figure 4.8 indicates how one enterprise structure may change into another as a result of different factors acting upon it. This is a two-way dependency, as the chosen enterprise structure will affect the development of future potential competencies, just as the development and deployment of competencies will influence the emergence of enterprise structures. Proactive strategies are shown in Figure 4.8 by the arrows, and are based largely on controllable endogenous factors.

It is important to note that all enterprises are at risk of becoming defunct, and could fall into Quadrant 4 if they do not closely monitor internal and external factors, act upon changes affecting them, and proactively seek to modify their enterprise type to best suit their situation.

The key point is that at different points of a product and service life cycle different enterprise structures and methods of governance are required.

SHORT CASE 4.4

A Smart Car Needs a Cleverly Designed Enterprise

BUSINESS INTEGRATION

The Smart car is one of the most innovatively designed and produced cars of recent years. The production of the Smart was initially a temporary collaboration, with weak ties between parts (enterprise modules) of Daimler-Benz (DC) and SMH, manufacturer of Swatch watches, to exploit market opportunities for very small cars. As the market grew the relationship strengthened, and it became longer term and more permanent.

These changes were accompanied by a change in the role of DC, which grew from a coordinator of manufacturing and logistics operations (relationship and technology management) to include the coordination of strategic information (knowledge management). DC began to act as the enterprise integrator. These changes saw the enterprise move from a virtual enterprise (Q1) into an extended enterprise (Q2).

Because of problems of achieving further market penetration for the Smart, tension between DC and Swatch grew, and led to the buyout of the two-seater Smart from Swatch by DC. This signified a transition from a extended enterprise (Q2) structure towards a vertically integrated enterprise (Q3) as major parts of the know-how and competencies of the venture became 're-insourced' into parts of DC. DC became an overwhelmingly dominant force, controlling the collaborative relationship that once had been a virtual and then an extended enterprise.

As a vertically integrated enterprise (Q3) DC also deployed its core competencies in other directions, which gave birth to the production of the new Smart Forfour car jointly designed with Mitsubishi, in another separate inter-company enterprise where parts would be supplied by Mitsubishi and the engines by Mercedes-Benz. This initially formed a new virtual enterprise (Q1) that quickly became successful and moved towards an extended enterprise structure (Q3). And so the cycle goes on.

The Smart is the result of effective enterprise management, and by being proactive the enterprise has avoided becoming defunct.

Questions

1 Using the collaborative enterprise governance concept, describe how careful enterprise management has helped Smart.
2 Why do you think these changes have helped effective innovation and efficient production?

Source: Ben Clegg, Aston Business School

WORKED EXAMPLE 4.4

Using the Enterprise Matrix

Isobel has chosen to do her dissertation on medieval history, and urgently requires a rare book that is currently out of print for her research. She finds it on the website of a popular online bookseller, who promises to print and deliver it within 24 hours by using their on-demand print supplier. The enterprise for the on-demand print company is mapped out using the enterprise matrix, as shown in Table 4.7.

Problem:

Using Table 4.7:

1 *State how many key steps there are in their value stream, and how many different types of value stream members they have. What does the 'development partner' do?*

2 *What sort of enterprise do you think it is? Who is the systems integrator? Why?*

Approach:

Read the above section (Collaborative enterprise governance) carefully, and then refer to the enterprise matrix example in Table 4.7.

Solution:

1 Table 4.7 shows five key stages in the value stream, starting with new process development and ending with delivery. It also shows five main types of supplier/value member: the most significant are the customers, and the least significant are the open-source suppliers. The development partner is responsible for making the special printing machines and making sure they are well maintained.

2 One might consider the printer to be the systems integrator in this extended enterprise. This is because using an on-demand print supplier of books (i.e. they do not begin to make the book until it has been sold) requires a highly integrated process. To deliver this requires a collaborative and competitive enterprise strategy, developing strong semi-permanent links with their immediate customers (the publishers), a good understanding of their end customers' needs (i.e. Isobel, the buyer and reader of the book), access to a large distribution of wholesalers, retailers and booksellers, and unprecedented inventory control via electronic links (Internet and electronic data interchange).

Table 4.7 The enterprise matrix for an on-demand book-printing service

Value members	Book-printing value stream				
	New process development	**Scheduling**	**Printing**	**Finishing**	**Delivery**
Publishers (customers)	Electronic data links				
On-demand printing company	Electronic data links	On-demand electronic data links scheduling	High-technology printing	Binding and finishing	
Development partner	Company that co-develops the printing machines		Contract maintenance		
Strategic/dual-source supplier		Paper suppliers			
Open-source supplier				Other materials (e.g. glue and card)	Logistics company

Stop and Think

4 From your experience, can you think of other examples that the collaborative enterprise governance concept could be applied to?

Summary

This chapter has focused on how supplier relationships are formed. It started by providing a background to different ways of thinking about supplier relationships – chains, networks and enterprises – and emphasized that these give us metaphors and models to help us understand different types of relationship. It showed how these relationships can change and evolve due to internal and external factors.

It then examined how operational activities can be transferred to and from firms by outsourcing, and outlined the advantages and disadvantages of doing this, and also the benefits and costs of using multiple-source and single-source supply chain strategies. Decisions on site location were considered with two tools – the centre of gravity method and the weighted score technique – introduced to help in making these decisions. Finally the characteristics of enterprises were studied in more detail, and a method of designing them (collaborative enterprise governance) was explained.

Outsourcing is not a panacea for all operations management problems; too much uncoordinated outsourcing can itself cause problems. Sometimes in an industry or company there is a trend to rationalize, and bring the supply base back into control, which can mean a reduction of suppliers overall, or the use of other organizations to manage suppliers for you.

Key Theories

- **Transaction cost economics (TCE)** – an economic explanation for the existence and scope of a commercial organization. TCE is based on the interplay of four behavioural assumptions; *bounded rationality*, *opportunism*, *asset specificity* and *uncertainty*.
- **Resourced-based view (RBV)** – an organization theory that focuses on the internal resources of a single organization. RBV explains how competitive advantage within organizations is achieved and sustained over time. RBV assumes that each organization (i.e. a single legal autonomous entity) is thought of as a bundle of resources in its own right.
- **Enterprise management** – the management of companies that have become so closely integrated that it is very difficult to think of them as networks of separate companies, or simple supply chains.
- **Supply base rationalization** – management practice that reduces the number of suppliers an organization has to deal with. The objective is often to reduce management costs and complexity.

Suggested Answers to Stop and Think Questions

1 **Management metaphors:** There probably is no easier way of doing this, although managers sometimes develop metaphors, models, frameworks and formulae to help develop generic principles for managing. Most metaphors need to be treated with caution, though, as they will only get you so far before they fail.

2 **Combatting supplier rationalization:** Seek to 'move up the value chain' by becoming a module supplier rather than a component supplier, develop meta-competencies of integration yourself in addition to traditional ones, seek to understand the end customer better, and cease competing only on a cost basis.

3 **Cooperation:** Cooperation and collaboration between organizations are suitable only when complementary competencies are being used. At other times, when similar competencies are being used, organizations will be in competition with one another. Sometimes there is a grey area between these juxtapositions that require organizations to work together within strict legal arrangements; these often focus on the delivery of specific product and services.

4 **Collaborative enterprise governance:** The concept could be applied to the delivery of any complex product or service that uses a variety of different organizational roles. It is especially relevant where the business environment, role and membership of the enterprise are rapidly changing. For instance, services would include air flights, Internet service provision, and mobile phone services; products would include big budget films, large buildings and construction projects.

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Review Questions

1 Can organizational relationships be accurately explained using a simple 'chain' metaphor, or is this an oversimplified view?

2 Why is it important for companies to work together more closely than before?

3 What are outsourcing, in-sourcing and offshoring?

4 Under what circumstances would you practise supply base rationalization?

5 What are TCE and RBV? What are they used to explain?

6 What is an enterprise, within the context of supplier management? What different sorts of enterprise are there, and how do they differ?

Discussion Questions

1 What effects do you think good supplier–buyer relationships have on an industry overall? How can they be encouraged?

2 Map out a supply network for a product such as a car or aircraft, or a service such as hotel accommodation. State and discuss the complexities that you come across in trying to do this. What do you think are the success factors?

3 Try to map an enterprise for a product or service that you are familiar with, using the enterprise matrix. State who you think are the relatively major and minor members of the enterprise, and what their roles are. Using the dynamic enterprise reference grid, describe what you think are the dynamic changes occurring in it.

Problems

1 A fire service serves three different cities – A, B and C – in a region. There are located at coordinates (35, 47), (12, 25) and (86, 72) respectively. The fire service needs to build a new fire station, D, to serve all three cities, taking into account how often they are called out (V). The details for each city and their frequency of callouts are given in Table 4.8.

Table 4.8 Locations of cities A, B, C and their frequency of callout

City	Location		Frequency
	x	y	V
A	35	47	50
B	12	25	70
C	86	72	80

Required: *Using the centre of gravity method, locate the new fire station, D.*

Use the following formulae:

$$x = \frac{\Sigma x_i V_i}{\Sigma V_i}$$

$$y = \frac{\Sigma y_i V_i}{\Sigma V_i}$$

where x_i is the x coordinate of the source or destination i; y_i is the y coordinate of the source or destination i, and V_i is the amount to be 'transferred' from source or destination i.

2 A European English-speaking university is thinking of setting up a new teaching facility overseas. It needs to take into account:

- Number of local students (crucial)
- Rent of the site (very important)
- Availability of suitable teaching staff in the area (important)
- Accessibility from the home nation (minor importance).

The university is considering two sites, one in Hong Kong (HK) and one in East Africa (EA). After some research, the university allocates usefulness scores (out of 100) to each potential teaching facility, shown in Table 4.9.

Table 4.9 Usefulness scores for the new teaching facility decision

Criteria	Usefulness scores for sites	
	EA	HK
Number of local students	70	90
Rent (note: high score means it is cheap)	60	20
Availability of suitable teaching staff in the area	50	70
Accessibility from the home nation	50	80

Required: *Using the weighted score technique, calculate which site you think the university should choose for its new teaching facility, and why.*

3 The Washing Machine Company wants to rationalize the number of its suppliers, as it believes there are too many, which creates unnecessary complexity and costs in the supply network. It is considering outsourcing the management of all its suppliers to one of two possible companies: Supply Chain Management Company A or Supply Chain Management Company B. Table 4.10 shows the current supplier management costs in the 'Pre-rationalized suppliers' column and bids from the potential alternative options in the other two columns.

Table 4.10 Cost comparisons for three possible outsourcing solutions for the Washing Machine Company

Level at which cost is incurred	Example	Supplier management costs		
		Pre-rationalized suppliers	Supply Chain Management Company A	Supply Chain Management Company B
Strategic	Whole-company costs on a annual basis	€1,000,000 Fixed costs	€1,500,000 Fixed costs	€500,000 Fixed costs
Tactical	Different production lines: (e.g. domestic washing machines, and industrial launderette machines) on a monthly basis	2 lines × 12 months × €200,000 per month Variable costs	2 lines × 12 months × €100,000 per month Fixed costs	2 lines × 12 months × €400,000 per month Fixed costs
Operational	Unit of output: one washing machine	500 units per month × €100 cost per unit Variable	500 units per month × €50 cost per unit Variable	500 units per month × €150 cost per unit Variable

Required: *Using the supplier rationalization approach in described in the chapter, and a planned output of 500 washing machines per month, calculate whether The Washing Machine Company should continue to manage its own suppliers, or rationalize them by giving the management of them to Company A or to Company B, if it is going to reduce their overall annual supply costs.*

Online LearningCentre

Visit the Online Learning Centre at **www.mcgraw-hill.co.uk/textbooks/paton** for a range of resources to support your learning.

Further Reading

Baldwin, C.Y. and Clark, K.B. (2000) *Harvard Business Review on Managing the Value Chain*, Harvard Business School Press, Boston, MA.

Binder, M. and Clegg, B.T. (2010) *Sustainable Supplier Management in the Automotive Industry: Leading the 3rd Revolution through Collaboration*, Nova Science Publishers, New York.

Doz, Y.L. and Hamel, G. (1998) *Alliance Advantage*, Harvard Business School Press, Boston, MA.

Dyer, J.H. (2000) *Collaborative Advantage: Winning Through Extended Enterprise Supplier Networks*, Oxford University Press, Oxford.

Fine, C.H. (1998) *Clockspeed: Winning Industry Control in the Age of Temporary Advantage*, Perseus Books, Reading, MA.

Hamel, G. and Prahalad, C.K. (1994) *Competing for the Future*, Harvard Business School Press. Boston, MA.

Fung, V.K., Fung, W.K. and Wind, Y. (2008) *Competing in a Flat World: Building Enterprises for a Borderless World*, Wharton School Publishing, Philadelphia, PA.

References

Brown, J.S., Durchslag, S. and Hagel III, J. (2002) 'Loosening up: how process networks unlock the power of specialization', *The McKinsey Quarterly*, Special edition: Risk and Resilience, 59–69.

Burt, D.N., Dobler, D.W. and Starling, S.L. (2003) *World Class Supply Management: The Key to Supply Chain Management*, 7th edn, McGraw-Hill/Irwin, Boston, MA.

Coase, R. (1937) 'The nature of the firm', *Economica*, **4**(16), pp. 386–405.

Cousins, P.D. (2005) 'The alignment of appropriate firm and supply strategies for competitive advantage', *International Journal of Operations and Production Management*, **5**(3), 143–155.

Dyer, J.H. and Hatch, N.W. (2004) 'Using supplier networks to learn faster', *MIT Sloan Management Review*, **45**(3), 57–63.

European Commission (2003) 'Commission recommendation of 6 May 2003 concerning the definition of micro, small and medium-sized enterprises', *Official Journal of the European Union*, C(2003) 1422, L124/36–41.

Gartner, C.A. (2004) 'Offshoring in the service sector: economic impact and policy issues', *Economic Review – Federal Reserve Bank of Kansas City*, **98**(3), 5–37.

Jacobs, F.R. and Chase, R.B. (2008) *Operations and Supply Management: The Core*, McGraw-Hill/Irwin, New York.

Simon, H.A. (1957) *Models of Man: Social and Rational*, Wiley, New York.

Teece, D.J., Pisano, G. and Shuen, A. (1997) 'Dynamic capabilities and strategic management', *Strategic Management Journal*, **18**(7), 509–533.

Williamson, O.E. (1975) *Market and Hierarchies: Analysis and Antitrust Implications*, Free Press, New York.

Yu, K.-H. and Levy, F. (2010) 'Offshoring professional services: institutions and professional control', *British Journal of Industrial Relations*, **48**(4), 758–783.