

The Global Networked Value Circle: A New Model for

Best-in-Class

MANUFACTURING



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Introduction





Reaction to the broadening global economic crisis has hit much of the manufacturing world hard. Reduced consumer demand has led to swift production cuts at factories in many markets, while the credit crunch has prompted some companies to hoard cash.

Factories in the world's largest economy are producing fewer goods than they have in nearly three decades, hit hard by the spreading global recession. A report by the Institute for Supply Management, a private research group, finds that manufacturing activity in the United States has fallen to levels not seen since 1980, while prices have sunk to their lowest levels since 1949. This comes after a series of reports showing similar cutbacks in emerging markets, like China and India. A recent Purchasing Managers' Index says that China is on the verge of 'a technical recession', after its manufacturing activity fell for a fifth straight month in December 2008. At the same time, factories in India, Asia's third largest economy, are also shedding jobs, prompting India's central bank to slash key interest rates.

As companies face shrinking consumption (also called deflation), slowing production and declining prices, they will need to assess their entire value chain as they look for ways to keep costs low and improve efficiencies while continuing to innovate.

To help address this challenge, this report reflects fresh research undertaken by Capgemini in collaboration with the University of Edinburgh into the 'Best-in-Class Global Manufacturing Value Chain'. The specific objectives were to:

- Identify the key components of the global manufacturing value chain in the world now, and see if the shape, nature and content of the value chain need to be changed or adapted if it is going to be used as a management tool for assessing or benchmarking capabilities.
- Identify the lessons of experience of some top-performing companies in different manufacturing industries concerning how they effectively manage different elements of their 'best-in-class' global value chains.
- Derive benchmarks for good practice within different elements of the manufacturing value chains from top-performing companies within different segments of the manufacturing industry.

The work undertaken in this study has built on the findings of the 2008 report entitled 'Manufacturing in 2020' by Capgemini in conjunction with IDG Global Solutions.

Executive Summary

New perspectives on value chains are needed. It is a concept developed in a different era, an era before the disaggregation through outsourcing and the globalization of supply and manufacturing that we witness today. To gain these new perspectives, we examined the global value chains of some leading manufacturers that are deeply immersed in these changes. We examined how these firms are dealing with or leading these changes, and we have identified the lessons of their experience.

The study found that the value chain idea, with raw materials being processed through to consumed products, is no longer relevant. Instead, we find that best-in-class manufacturers actively manage globally networked value circles, with:

- Customer relationships leading innovations to generate a value circle rather than a linear chain
- Close collaborative relationships for design, supply and customer satisfaction
- Highly complex network relationships with customers, suppliers and competitors worldwide
- Value creation reflecting intricate combinations with the value circles of other manufacturing networks worldwide
- Active management involving advanced use of IT approaches.

This has led us to develop the global networked value circle model, shown opposite. The best-in-class firms operating in this environment display three essential abilities:

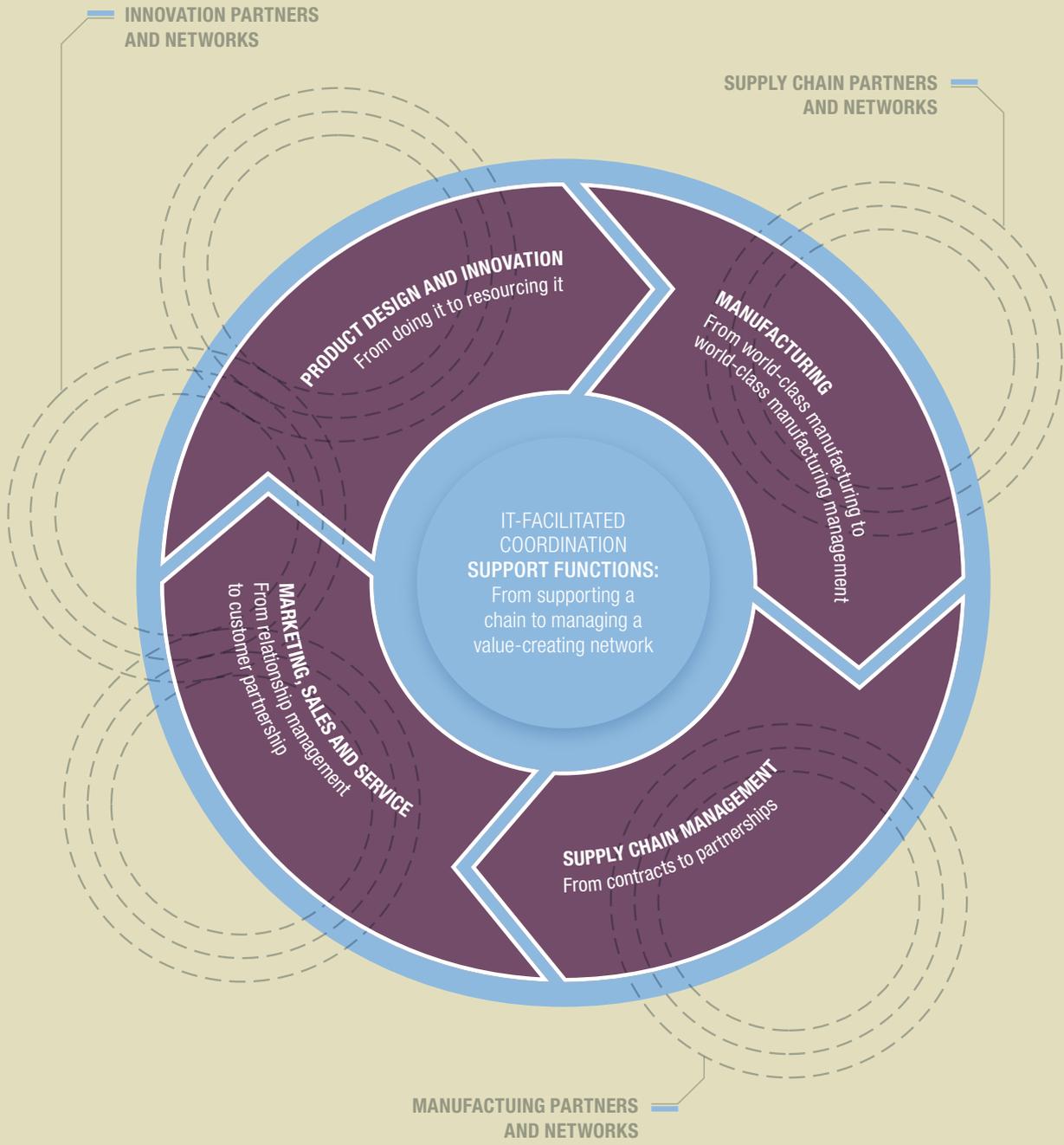
- The ability to identify realistically global competencies (and retain only these competencies in-house)
- The managerial and IT ability to form, manage and exploit relationships (despite these becoming more profuse, more global and more complex)
- The foresight to identify relationships that will become strategic assets (since many are available, but only a few will deliver competitive and strategic advantage).

The key findings within the five elements of the value circle that we examined are:

- **In product design and innovation, we witness a shift from doing it, to resourcing it.** Best-in-class manufacturers have developed new systems involving dispersed activities to capture and absorb new ideas and innovations from anyone (customers, suppliers,

collaborators and competitors as well as in-house resources), from anywhere across the globe, while concentrating their own research on big projects where they have world-class capability.

- **In manufacturing, we witness a shift from manufacturing to manufacturing management.** Where world-class manufacturing resides at the heart of the business, perhaps with global competitive location advantage, this is kept in-house. A focus on manufacturing management, however, means that manufacturing is done by others, anywhere in the world, principally in collaborative partnership arrangements where both parties gain through mutual learning and innovation.
- **In supply chain management, we witness a shift from contracts to partnerships.** Best-in-class manufacturers leverage their purchasing power in how they outsource activity where they do not have competitive advantage, and in how they control these suppliers. But they exercise that control by developing closer relationships with fewer suppliers, who are closely monitored. In a way, this gives both parties competitive advantage.
- **In marketing, sales and service, we witness a shift from relationship management to a perspective of partnership with customers.** Best-in-class manufacturers address customers' needs and problems by developing closer relationships that enable them to understand and then deliver what they require. This is achieved through location, through deeper collaboration with local distributors, and through direct close contact with customers, all of which are facilitated by information technology. This not only improves the customer lifetime experience with the manufacturer, but also helps drive the product development and innovation process. We find this links the two ends of the value chain together.
- **In support functions, we witness a shift from support of an internal value chain to the active management of a value-creating network.** Best-in-class manufacturers are outsourcing, globally dispersing, dissolving management in greater and closer collaborations with suppliers, customers and even competitors. Value creation now requires the creation and productive management of highly complex global networks. Achieving this without loss of control, value or margin requires the use of the latest IT approaches. Indeed, these approaches are not just supporting the new network management approach; by making it feasible, they are driving it.



THE GLOBAL NETWORKED VALUE CIRCLE MODEL

The Value Chain

Originally developed by Michael Porter in the 1980s, the concept of the value chain has been employed as a valuable management tool for almost a quarter of a century. The global business environment in which firms operate has changed massively since then; the whole nature of the global manufacturing landscape is different. The way firms manage themselves has also changed; the large, centrally planned industrial monoliths, for which the original value chain was geared, have largely disappeared.

The value chain used in this report is an adaptation of the one used in the 'Manufacturing in 2020' report. It is shown below, and the following pages outline what we found out from leading companies concerning the best-in-class global value chain. We were aware that the way we need to look at the value chain could have changed; the concept itself may no longer be 'fit for purpose' as it is currently constructed.



Research Design



The best-in-class value chain research initiative draws on a wide range of expertise from both Capgemini and the University of Edinburgh Business School. The collaboration between our two organizations includes two consultants from Capgemini and two investigators and four researchers from the University of Edinburgh Business School. There were four phases in the research process, including two issues workshops, documentary analysis and semi-structured, in-depth single interviews.

The details of the research process are outlined in Appendix A. In sum, eight companies were studied in depth, two from each of the automotive, consumer electronics, aerospace and general manufacturing sectors. Extensive documentary analysis of data collected from press releases, media coverage, industry reports, trade journals and academic research, was undertaken. Eight in-depth interviews with industry experts and a further 135 interviews conducted for the recent 'Manufacturing in 2020' report were used to triangulate the findings underpinning this report.

Product Design and Innovation



FROM DOING IT TO RESOURCING IT

All manufacturing value chains start with a system for capturing ideas and developing them into new products, processes, services or innovations that add value. Our value chain, therefore, starts with product design and innovation. This study uncovered several emerging leading practices for innovation and product design, several of which challenge old orthodoxies.

For instance, companies are finding that a go-it-alone, secretive approach to research and development is not as likely to yield the same results as collaborating openly with other institutions. Sources for ideas are as global as the value chains they feed into. Leading companies are organizing research and development (R&D) activities around collaborations, centers of excellence and big ideas. At the same time, companies are seeking to build partnerships with external institutions, and a parallel trend is placing more emphasis on competition internally.

Best-in-class manufacturers tap the world for ideas, with R&D in local companies and dispersed labs.

Globalization of industries, businesses and markets is often discussed, but globalization of ideas is just as important. For many firms, the era of the global R&D center or 'University' is over. Instead, for industry leaders such as ABB, EADS and Philips, R&D is dispersed across the world in R&D units that can reside within local subsidiary companies, partners or joint venture businesses, or within dispersed research or development units. Close coordination is then maintained so that the developments and ideas in these centers can quickly be shared and exploited across the groups' worldwide operations. For example, ABB strikes a balance between staying close to customers and the technical influences driving innovation by dispersing its R&D in locations around the world, including China, India and Singapore, giving it a competitive advantage over rivals with large, centralized R&D centers.

Best-in-class manufacturers use open innovation, taking ideas from anywhere. Open innovation is a term coined by Dr. Henry Chesbrough, a business professor at the University of California, Berkeley. It is an approach where companies strive to speed up innovation by collaborating with a range of partners. In contrast to the old approach to R&D, where companies sought to protect their core competencies and intellectual property, this new strategy acknowledges that partnering with leading researchers in other businesses, government and universities can make for faster progress.

The potential partners on the collaboration horizon need not be restricted to traditional patterns either. Academics, artists, fashion designers, entrepreneurs and even competitors, customers and suppliers are all examples of potential sources of new ideas, technologies and product innovations. While collaborations can focus on both product development and basic research, a hallmark of a successful collaboration is the speed by which research is translated into marketable products.

Best-in-class manufacturers take innovative influences from all sorts of people.

The market for ideas is becoming increasingly open and unconventional for best-in-class manufacturers. Examples include: Philips' drive to gain continual feedback on how well it meets end-user needs through a people-centric approach in its experiences research and innovations pipeline; HP's Idea Lab, which allows outsiders to view early-stage innovations through the web and its partnering with fashion designer Vivienne Tam to create accessories and packaging for its notebooks; and student competitions.

CASE POINT: PHILIPS

At Philips, with cutting-edge products, open innovation has become a method of working because 'going it alone makes absolutely no sense', according to Dr. Rick Herwig, CEO of Philips Research. 'We team up with academic and industrial partners who have competencies and interests complementary to our own, join forces with industry peers on standardization, and create momentum in the future directions of technology. We jointly aspire to and are active in establishing strong local networks of leading industries and research institutes.' Philips is also increasingly involving strategic suppliers at an earlier stage in product development. In its 'Partners for Growth' program, suppliers are taking an increasing share of the value added in its business.

Here, customers are increasingly the most important source of innovative ideas. In the 'Manufacturing in 2020' study, 58% of companies expected to collaborate with customers in product concept development by 2020, compared with 50% now. In product design and refinement, suppliers are also increasingly important: 40% of leading manufacturers will increase their involvement with suppliers here.

As an innovative leader, EADS is always on the lookout for ideas of innovation and for people who think differently. A student competition organized by EADS calls for students to give their ideas on areas like aircraft parts, materials and systems. Airbus will select a shortlist of 100 teams that will eventually be whittled down to five finalists who will be helped by an Airbus coach to upgrade their projects. The winning project could be incorporated in one of Airbus's programs.

Best-in-class manufacturers innovate by collaborating externally while fostering competition internally.

Competition is an important part of the product design and innovation process. For many companies, this is being internalized. Daimler, for example, nurtures the entrepreneurial spirit by encouraging its designers to compete against one another to have their designs selected for production. As part of the streamlining efforts of R&D processes, competition is used as a way of selecting the best ideas for further research and development.

CASE POINT: HP

R&D management at HP has recognized that, historically, there was too much reliance on personal relationships among its 600 scientists when giving projects the go-ahead. Having been given a green light, they gained a momentum that was difficult to stop. Now, projects have to be pitched, complete with business plans, to a central review board. A formal request for proposal programs offers universities worldwide the opportunity to participate in joint research with HP lab scientists on a competitive basis. Accountability after approval means that plugs get pulled if insufficient progress is made.

Researchers inside leading companies are increasingly required to compete for project funding, which helps to cultivate an entrepreneurial culture within R&D. This involves competitive processes similar to university grant applications to research funding bodies. Proposals and business plans are developed and submitted for critical review, from which the most competitive are selected. 3M, for example, has developed a process whereby inventors can compete for seed capital from units within the company.

Best-in-class manufacturers focus on big ideas, emphasizing the 'R' in R&D and actively selecting the winners.

A common R&D orthodoxy in the 1990s can best be summed up by the expression 'let a thousand flowers bloom.' Spreading resources across a number of small, often blue-sky thinking R&D projects, the theory suggests, will allow creativity and innovation to flourish. Some leading firms, such as HP, however, are finding that a downside to this approach is that resources become spread too thinly over numerous projects. So, many leading companies have begun streamlining their R&D processes.

Experience suggests that small R&D projects, even if successful, do not necessarily result in commercial offerings. Promising research on large projects can generate high added value. For this reason, industry leaders such as ABB, HP and Philips have been streamlining their research processes into larger, high-impact projects. This approach is considered to be an essential factor for achieving fundamental breakthroughs.

Best-in-class manufacturers 'repurpose' product design and innovation.

Innovative business does not necessarily mean new products. Companies that have built up a large portfolio of patents, such as HP, can increase their ROI by applying old innovations to different products and services, or by licensing them to other companies in different industries that may have a commercial use for them. Also, research programs in companies can result in patents, but the patents do not always translate into products or services of commercial value. The process of applying old patents and intellectual property to new products and services is known as 'repurposing'. In part, this is driven by product lifecycle shrinkage: most leading manufacturers in the 'Manufacturing in 2020' study expected these would shrink by 25% to 50% by 2020.

CASE POINT: IBM

IBM has pioneered a process for reclaiming scrap semiconductor wafers used in the production of semiconductor chips for use in such consumer products as mobile phones, computers and video games. The process involves removing intellectual property from the wafers so that they can be sold on to the solar power industry, where there is a shortage of silicon.

Manufacturing



FROM MANUFACTURING TO MANUFACTURING MANAGEMENT

Firms are no longer just talking about globalization as something that is and will be happening; this world is already here. Manufacturing can take place anywhere that there is a cost advantage. At the moment, it's in Asia; tomorrow it could be elsewhere. 60% of the firms in the 'Manufacturing in 2020' study expected to be sourcing from more companies within the next ten years. We are seeing a transition in best-in-class manufacturing from being manufacturing firms, to being manufacturing management firms.

The 'Manufacturing in 2020' survey also found cost advantages gained from manufacturing in the right location to be one of the main drivers of manufacturing. The need to localize products for local needs is another, with this invariably undertaken by local companies. The choice between in-sourcing and outsourcing seems to be a function of size and complexity. Firms with a focused product range may choose to in-source, while firms producing a wide range of technical products choose to outsource. In a world where the advancement of technology continues apace, collaborative manufacturing arrangements are seen as a valuable source of learning.

Best-in-class manufacturers regard themselves less as manufacturers, but more as manufacturing managers.

Outsourcing is now well-established. Philips decided in 2001 that it would outsource basic manufacturing and become a technology developer and global marketer, and by 2006, about 70% of manufacturing was outsourced. Leading manufacturers are evolving from being manufacturing companies to being manufacturing management companies. Philips now has a major outsourcing contracts management business activity, with a governance council to manage it.

While many hold on to core activities such as R&D, marketing and finance, increasingly even intellectual property, such as design and engineering, is outsourced. TomTom knew from the outset that its strengths would be in innovating, in its expertise in a particular area of technology and in its understanding of and its ability to meet customer needs in this area. It established manufacturing outsourcing capability rather than manufacturing capability.

CASE POINT: ABB

ABB has shifted a lot of activities to outsourcing, particularly to China. In robotics for the automotive industry, for example, ABB outsources nearly all manufacturing, and in IT, everything is outsourced. But strategic outsourcing decisions are made in each case. In power distribution, the heart of the business is in manufacturing, where the real innovation takes place and where the true skill of the company resides in the teams of engineers who are working on each project. Things that represent ABB's real art are never outsourced.

In-sourcing is where business processes are acquired by a firm, which can allow companies to control quality up the value chain while reducing costs. For firms with a narrow product range, such as TomTom, the streamlining and integrating of the supply chain can add competitive advantage. Even though it has outsourced all manufacturing, TomTom improved the accuracy of the navigational instruction by vertically integrating with Tele Atlas, an e-map developer. This reduced costs and yielded a significant competitive advantage in e-maps.

Best-in-class manufacturers actively seek location advantages by offshoring. For most manufacturers, keeping costs low has meant relocating production and manufacturing to overseas locations such as India and China. Captive offshoring is where the manufacturer moves business processes to a low-cost location but maintains ownership. Outsourcing, the second option, is when business processes are outsourced to a third-party vendor.

CASE POINT: EADS

Aerospace companies have offshored manufacturing to low-cost regions for many years, but not R&D and final assembly. For EADS, sub-sections of its Airbus aircraft are manufactured in low-cost countries while final assembly takes place in Hamburg, Germany, and Toulouse, France. But it recently opened an assembly line in Tianjin, China. This has two advantages. First, China is an important market for Airbus: Sichuan Airlines is taking the first Tianjin aircraft in 2009. Second, China is potentially an important strategic partner. Under a joint venture consortium arrangement, Dragon Aviation Leasing is buying the Tianjin Airbus aircraft for Sichuan Airlines.

All the manufacturers surveyed in the 'Manufacturing in 2020' study expect to rely more on overseas suppliers in coming years. But in many industries, proximity to markets is important for manufacturing location, especially those where distribution costs are substantial. Distribution can account for 30% of automobile costs, so Eastern Europe has become an attractive manufacturing location for Western European markets, while the Southern United States holds a comparative advantage over the Northern United States.

Best-in-class manufacturers collaborate to win by learning and innovating. Significant gains can include increasing innovation, improving quality and reducing costs through inter-firm learning. Even though the potential benefits of collaborating are significant, much collaboration continues to fail. When done properly, collaborations, increasingly even with competitors, can result in the unleashing of synergies and a generation of new products and processes for the participants. Other collaborations are to achieve innovation in new areas of focus, such as in the shift to 'green'. Companies embracing the green movement are turning what many once saw as a business threat into a source of competitive advantage. This is leading to process and product innovation and upgrading, while simultaneously creating cost efficiencies.

Best-in-class manufacturers actively manage the tension between customization and standardization. Customization provides for consumer choice, but it also increases costs. Standardization, while important for driving costs down, reduces consumer choice. Best-in-class global value chain management strikes a balance between the two. There was an even split in the 'Manufacturing in 2020' study firms between those believing that they will produce more standardized products in the future and those expecting to localize them more.

But standardizing products around functional areas, such as common production platforms, allows greater flexibility when demand fluctuates and reduces the dichotomy between standardization and customization. Automotive and computer manufacturers, for example, are standardizing production platforms globally.



Supply Chain Management



FROM CONTRACTS TO PARTNERSHIPS

As supply chains have become increasingly globalized, leading manufacturers are searching for ways of leveraging their considerable purchasing power for greater cost savings earlier in the production stages. By taking control of procurement, for instance, companies are able to generate cost savings through purchasing such inputs as raw materials on behalf of their suppliers, which their suppliers' economies of scale may not have otherwise allowed them to do at the same price. This has also facilitated greater control over pricing of components bought from their suppliers.

The biggest change in supply chain management identified in the 'Manufacturing in 2020' study was increased transparency in 'open networks'. By 2020, 30% of the leading manufacturers questioned expected to improve their IT systems for managing their supply chain. Creating on-line business-to-business marketplaces is one way of reducing costs and managing disaggregated suppliers, and reverse auctions and e-sourcing are transforming the way in which contracts can be tendered and potential suppliers can compete for them.

Also evident is a trend towards developing closer relationships with suppliers. Competition is no longer the sole driver behind efficiency and cost reductions. Manufacturers are seeing collaborations, information sharing and explicit and transparent expectation setting within a family of suppliers, populating each link in the value chain as a greater driving force behind efficiency, quality and reliability. While managing complexity is a hallmark of this brave new world, best-in-class supply chain management practices also seek to simplify this complicated process through IT or outsourcing to a number of trusted specialist logistics firms.

Best-in-class manufacturers leverage their purchasing power. The relentless quest to drive costs down continues. For some leading companies, this means leveraging purchasing power for global sourcing and procurement. For example, HP has assumed control of purchasing on behalf of its contract manufacturers. It hides the price of strategic components from both competitors and contract manufacturers by buying them directly from contract manufacturer suppliers and reselling them to their contract manufacturers. This also leverages HP's significant purchasing power on behalf of its contract manufacturers, cutting costs without the risk of contract manufacturer suppliers feeling pressured into reducing prices for the contract manufacturers. HP can then distribute strategic components based on contract manufacturer need.

But a number of weaknesses are inherent in traditional supply chains. The cost of inputs into key components produced by suppliers, and consequently, the price of purchasing them, can be difficult to determine for the manufacturers. Quality can be hard to monitor. Supply and demand patterns can be challenging to determine. And buying power can be weak. TomTom, for example, outsources all of its manufacturing, and that would present a business risk if there were a disruption with a supplier relationship. So the number of single-source components is minimized, and the highest-volume products are dual-sourced from two manufacturing partners.

To overcome these supply chain risks, some manufacturers have turned to buy and sell programs designed to increase control of supply chains. But outsourcing manufacturing can decrease transparency over demand and supply patterns of key components. Costs can be hidden by suppliers, increasing the risk of price inflation for the manufacturer and decreasing their buying power. It also makes it difficult to monitor quality.

Best-in-class manufacturers develop reliability chains through closer relationships with suppliers.

Manufacturer-supplier relationships have traditionally been characterized as adversarial. Cost-oriented competitive approaches to managing suppliers dominated business orthodoxy. Several exemplars of best-in-class supply chain management practices have rejected these old dogmas. Many leading manufacturers actively seek long-term relationships with suppliers that perform well on such metrics as quality and reliability.

Driven partly by ‘lean production’ philosophy, manufacturers wager that greater cost efficiencies can be derived from bilateral goal setting, information sharing and working with suppliers. TomTom, for example, continues to depend on a limited number of suppliers, and sometimes sole suppliers, for component supply and manufacturing. This improves purchasing power. But the relationships with key manufacturing partners and component suppliers such as Quanta and IAC are close and long-term, although moderated by regular audits and reviews by local engineering and quality-assurance departments.

Seeking the lowest-cost producers is no longer the most important factor in selecting a supplier. The disruption caused by switching suppliers can be fatal, so preventing supply chain disruption has become a major driver of supplier selection processes and has increased collaboration between manufacturers and suppliers. ABB, for example, leverages its operations in low-cost countries by ‘back-sourcing’ well-qualified suppliers with good relationships with ABB by helping them to establish themselves in Western Europe and North America. This helps to reduce costs and the length of supply chains for ABB, yet also gives great benefits to the supplier companies.

CASE POINT: EADS

EADS has a sourcing strategy that emphasizes leveraging purchasing power across the business through joint sourcing initiatives, identifying and evaluating potential suppliers globally based on their capabilities and certification, and regularly evaluating supplier performance. For suppliers to be considered for partnership with EADS, they must demonstrate constant excellence across a range of metrics.

CASE POINT: BOMBARDIER

For Bombardier, time-to-market can be as important as guarding design ideas and intellectual property from their partners. Bombardier has moved away from adversarial approaches with their suppliers, towards more open collaborative approaches, including sharing expertise and knowledge. Rather than seeking cost reductions from its suppliers’ margins, Bombardier’s approach tries to achieve cost reductions from a larger cost base, while simultaneously sharing supply chain risk with its partners.



Marketing, Sales and Service



FROM RELATIONSHIP MANAGEMENT TO CUSTOMER PARTNERSHIP

Where customers are located across the globe, businesses face not only the physical challenges of maintaining relationships across such wide distances, but the cultural challenges as well. Manufacturers have long faced a tension between localization to customers' needs and global standardization for productive efficiency. There is a fine balance to be determined by every business, and competitive disadvantage is the result of getting it wrong. Firms must consider how much their production needs to be globalized to achieve the necessary level of productive efficiency. This depends on the amount of actual working together with customers that they desire, the level of communication and the language involved, as well as the effect of cultural differences on the relationship.

This study reveals some profound changes in how leading manufacturers manage their relationships with customers. They have found new ways of reconciling the long-standing tensions that imply deeper changes in the very notion of the manufacturer-customer relationship.

Best-in-class manufacturers focus on customer experience, not product characteristics. Increasingly sophisticated products from suppliers worldwide compete for market share among more knowledgeable customers. The approach of 'selling to' customers on the basis of product attributes (technical specification, reliability, etc.) is dying out. Products are usually purchased in order to yield a series of benefits over a period of time, so the best manufacturers design and offer their customers a package that delivers an experience of living with the product over the lifetime of its use. Service, product maintenance and possibly even adaptation affect the perceived value of a product, and this is profoundly affected by the quality of the relationship between supplier and customer (including, for example, the level of trust between the parties that problems can be resolved). A problem that is sorted out well can even build a better relationship.

For example, customers typically contacted ABB when the equipment wasn't working properly, or when they needed spare parts. These events might have been treated well, but they were still seen as on-off transactions. Now they are viewed as relationship-building opportunities in which ABB is able to differentiate itself markedly from its competitors. A competitive supplier that does not offer the same confidence, value and relationship qualities, even if it has a better product, will not have the same competitive advantages. But this also costs money: HP invested massively in training to offer its 'Total Customer Experience' program, which involves sales executives taking responsibility for customers' product experiences.

CASE POINT: BOMBARDIER

In the aerospace sector, customer support is an essential ingredient in the management of a best-in-class manufacturing value chain. Learjets are priced from \$US 5m, with annual operating and maintenance costs of up to \$US 200,000. Bombardier's 100-149 seat C Series aircraft are priced from \$US 46.7m. To meet high customer care expectations, Bombardier has built an industry-leading logistics, technical, maintenance and field support network. Through Authorized Service and Line Maintenance Facilities with 40 accredited service centers, it has customer support on six continents, and stocks of the top 25 high-demand business jet parts are stocked in strategic locations.

For best-in-class manufacturers' customer relationships, location matters. Competitive advantage in customer relationships requires the appropriate level of physical closeness, sometimes with regular discussions and working sessions with customers. So strategic decisions need to be made regarding the extent to which sales structures are centralized or decentralized, and the extent to which local operations are given autonomy of decision-making. So even in globalized value chains, successful manufacturers are decentralizing their marketing relationships and allowing strong local autonomy.

Like many companies, HP has struggled to achieve the right balance between localization and centralization in its customer relationship management. A good recent sales performance reflects a massive shift towards decentralization, despite some loss of clarity of structure and some duplication of effort. The US sales force of 17,000 has been decentralized into individual business units, administrative layers have been stripped out and division heads have been given control over their own sales forces.

But there is no general rule: the extent of use of the distribution channel, or direct sales, varies according to business area and region. In this decision, local responsiveness needs to be allowed, but mediated by coordination with the center so that coordinated responses to global trends can be developed.

CASE POINT: ABB

ABB has been through a number of transformations in recent years and recent performance indicates that it now has the balance between localization of its decision making and globalization of its capabilities about right. ABB now gives autonomy to the operating companies that are in direct contact with the customers, to innovate responsively to customer needs. But ABB also needs to present one coherent face to customers (or potential customers). A customer relationship management system allows this, which, though being centrally controlled, is viewed, monitored and operated locally, by the local operations in their daily contact with customers.

Best-in-class manufacturers achieve closeness by collaborating down the value chain. Retailers' and distributors' connections with customers can be critical. The best manufacturers increasingly adopt collaborative approaches rather than simply competitive supplier relationships, in order to give greater value to customers. There are benefits for both sides. As the complexity of manufactured products increases, greater training of retail or distributor staff is required, and this demands longer-term collaborative arrangements with distributors. Deeper collaborative relationships give them the incentive to feed customer and market information back to their collaborating manufacturers. This is changing the distribution landscape. The majority of Chinese and US manufacturers in the 'Manufacturing in 2020' study expect to rely on overseas distributors for addressing local market needs; this is presently the minority.

Best-in-class manufacturers achieve closeness by increasing psychic as well as physical closeness.

Achieving more direct relationships with customers may require physical connection between manufacturer and customer, but other activities can increase closeness in a 'psychic' sense, helped by the use of IT. A 'virtual customer environment' involving more sophisticated web interaction can help more than the selling process; it can also help consumers conceptualize products that may be of interest, as well as allowing them to leave feedback, so deepening the manufacturer-customer relationship.

Best-in-class manufacturers tap their customers and their end users for innovation. Customers can be a valuable source of innovative ideas across the value chain. Toyota asked consumers for design ideas on some models and then asked them to vote on them, giving consumers direct input into the design process and reducing design risk for Toyota. Courting customer feedback on products is common. Leading manufacturers now provide an opportunity for customer input in the decision-making process, enabling them to become partners in new product creation.

It will be recalled that we found customer relationship to be an essential aspect of the best-in-class product design and innovation process. We now also see this to be an essential aspect of marketing, sales and service management, as the two ends of the value chain are linked. Best-in-class manufacturing companies have a value circle.

CASE POINT: TOMTOM

TomTom has invested massively in its call center in Amsterdam. It is a call center with a difference. It recruits and retains new enthusiastic graduates of any discipline from across the world to discuss and interact in a personal way with callers. The way they do this not only enhances a customer's experience with the company, it builds loyalty even among customers who had cause to complain. But this investment has had an even greater payback. Information is collected from customers and is fed back directly into the innovation process. It is feedback from end customers that drives the product development process, and it is the main source of innovative ideas. This has helped the firm to be entrepreneurial in selecting the (few) ideas that will have commercial follow-through, and being entrepreneurial in how the ideas are delivered in a product and marketing sense.

Support Functions



FROM SUPPORTING A CHAIN TO MANAGING A VALUE-CREATING NETWORK

Best-in-class manufacturers support product design and innovation by using central hubs to coordinate projects in dispersed labs. While the era of the central laboratories is over and the era of dispersed research has begun, innovations need to be captured, managed and exploited. Much of Philips' research is localized in its research labs around the world. The company is investing 40 million Euros in R&D in China, in eleven R&D centers. The challenge, however, is to ensure that this dispersed research excellence contributes to Philips' global competitiveness. This means that innovations locally in China (for example, the value-segmented X-ray scanners developed in a Philips-Neusoft joint venture) need to be developed into a global opportunity for the group as a whole.

This transformation requires strong network linkages within the group. Firms need well-organized central 'hubs', not geographically central, not central in a discipline or functional sense, but central strategically and commercially. HP set up a Technology Transfer office to speed the transfer of research undertaken in the company's 23 district laboratories in seven countries into products and services in as many routes as possible. The office facilitates product development within HP's different business groups, organizes intellectual property licensing agreements with third parties, and manages relationships with venture capital firms. The job of the hubs is to:

- Scour for ideas, trends and developments and to facilitate exchange with others inside or outside the organization.
- Facilitate the development of group-wide plans for the speedy development of profitable new products.
- Enable potential new strategic developments to be spotted and considered by the most senior management levels in an informed and appropriate way.

Best-in-class manufacturers harness IT for faster innovation and operational cost efficiencies. The support is no longer just human and organizational. To cut the time and cost of developing IT systems, technology now enables them to be simulated before they are produced. This allows for new systems to be experienced virtually before being prototyped, cutting the time-to-market, project costs and increasing their adoption.

A partnership between Capgemini and iRise, a world leader in visualization software provision, for instance, has developed visual modeling technology that is being deployed across General Motors. This technology is helping to make traditional mock-ups a thing of the past. Software applications can be modeled and experienced through simulation before being developed. It cuts project time by an estimated 10%, allows for systems to be implemented very quickly, increasing innovative applications in the process, and has received high customer satisfaction ratings.

Best-in-class manufacturers support supply chain management by using advanced IT solutions. For many manufacturers, the exponential increase in outsourcing poses considerable challenges for managing diffuse, globally sourced networks of inputs. Advances in IT make it possible to manage supply chains from tens, hundreds and sometimes thousands of suppliers. It is in the interest of many leading manufacturers to standardize collaborative IT systems.

CASE POINT: HP

For HP, supply constraints and/or price fluctuations in specific components present risks to revenue and gross margin. Managing suppliers can involve straightforward inventory management, but also contractual agreements for critical suppliers and manufacturers. Under Procurement Risk Management, software tools developed by HP help quantify the inherent uncertainties involved. Suppliers can get a lower volume commitment, but HP benefits from guaranteed minimum volumes.

Best-in-class manufacturers devolve management of the complexity of manufacture. Given the sheer complexity in managing logistics globally, many leading manufacturers have also moved towards devolving increasing responsibility for running supply chain management and logistics to specialized third parties. For example, under its Power 8 program, EADS is consolidating local depots into district centers managed by Kuehne + Nagel in France, Germany, the UK and Spain, from where DHL will deliver components, equipment and raw materials to its production lines. EADS expects this to become a source of competitive advantage and will meet program efficiency improvement objectives.

Best-in-class manufacturers use customer information, communication and technology in IT solutions to manage complexity. Customers have the information that manufacturers need, more than any other group: information about their needs, information about the manufacturer's products (and competitors' products), and ideas for product, process or service developments. We have noted how customer feedback is an integral part of TomTom's product development process, for example, and informs the company how it expands its products and services. Essential in this approach is the use of IT systems for customer relationship management.

Marketing operations around the world have information about local needs and about their responses to them; information that will lie at the heart of a coordinated response. Successful manufacturers receive this information and manage and use it effectively to generate appropriate responses. At ABB, for example, a more customer-focused and service-oriented approach to engineering products, and the development of full-service maintenance agreements highlighted the need for a new, technology-led inventory management system. The outcome is reduced inventories, an improved service offer with greater service revenue, and a proactive approach to customer service that is seen to offer a competitive advantage.



Conclusions, Implications and Lessons





From a Value Chain to an Interlinked Global Value Circle

The value chain as a notion has its roots within the centrally-planned firms of the 20th century. It was a useful way for firms to consider the value of their operations, as well as their competitiveness in what were often quite stable competitive environments.

Manufacturers still need well-crafted value chains. Leading firms are still driving down their costs in the face of competitive pressure. They are still improving the speed of production and the quality and reliability of their products for customers who easily find competitive products worldwide. The quest for competitive advantage has not changed. The context within which firms seek these outcomes, however, has changed radically.

The old orthodoxy of a simple value chain in which manufacturing firms take new materials, transform them into products and feed them into a distribution system has gone. Firms engage with their customers and distributors in the very process of innovating and developing new products, and are closely concerned not so much with 'pushing out' good products, but with delivering value outcomes to customers who embrace not only product features, but the whole experience of use throughout a product's lifetime. This leads us to the transformation of a value chain, with inputs at one end and outputs at another, to a value circle involving a continuous and developmental process of value creation.

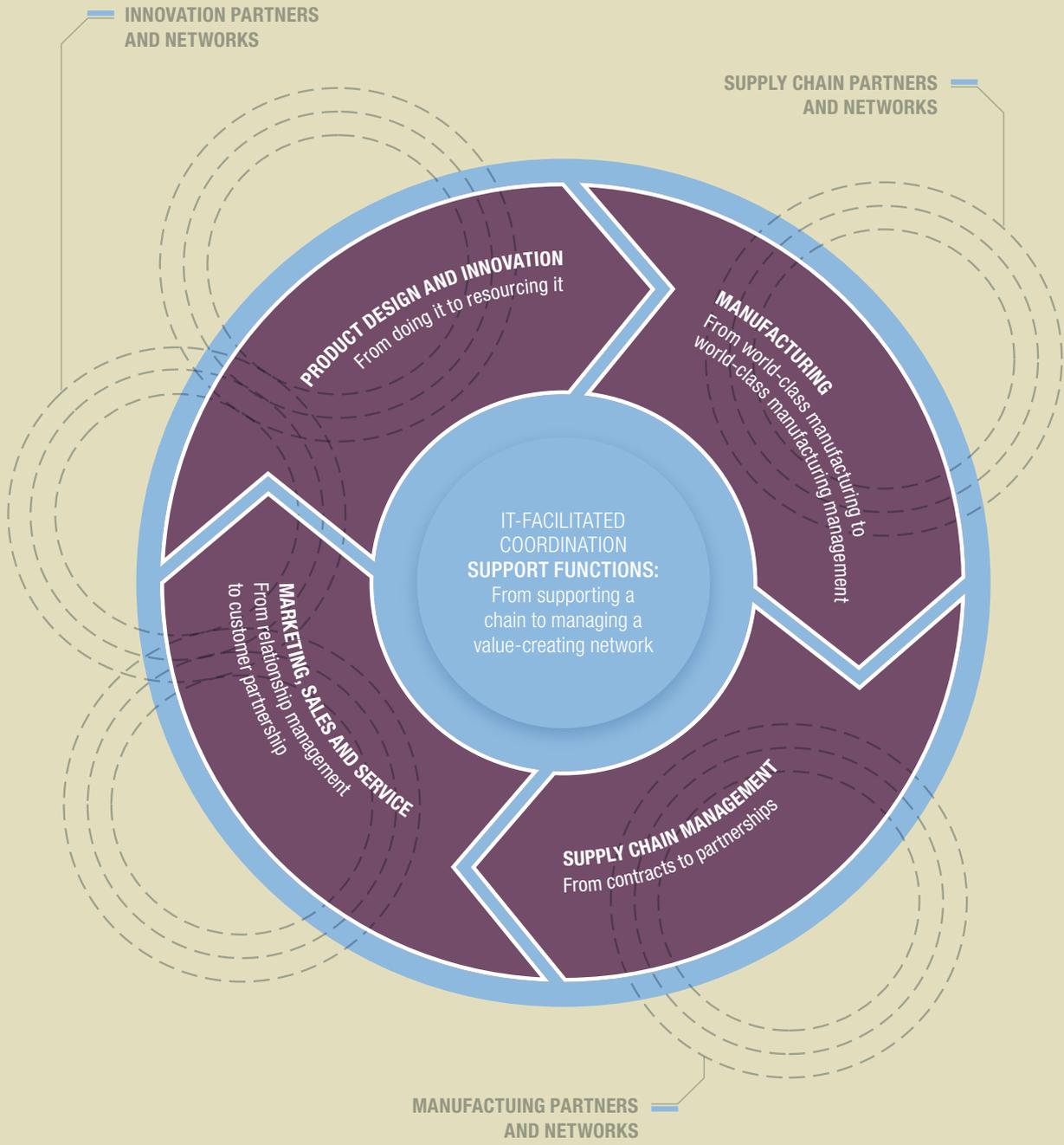
Within the circle, we can see many changes and developments, some of which have been catalogued here. The 1990s prescription of 'letting a thousand flowers bloom' within dissipated innovation centers has gone. But there has not been a reversion to the vast R&D centers. Rather, we see increasingly tight control of and communication between diverse innovation units, in an attempt to capture the innovativeness of the small specialist units with the scale economies of global firms, and their capabilities to push big ideas through selective, focused investments.

In manufacturing, we see a retreat from blind outsourcing, but not to in-house manufacture. There is a new switch: from manufacturing to manufacturing management, that is, reliable, tight and close management, whether the manufacturing is undertaken in-house or outsourced. In supply chain management, we also witness a retreat from 'outsourcing of everything, anyhow', but not a reversion to doing things in-house. Rather, we see increasingly

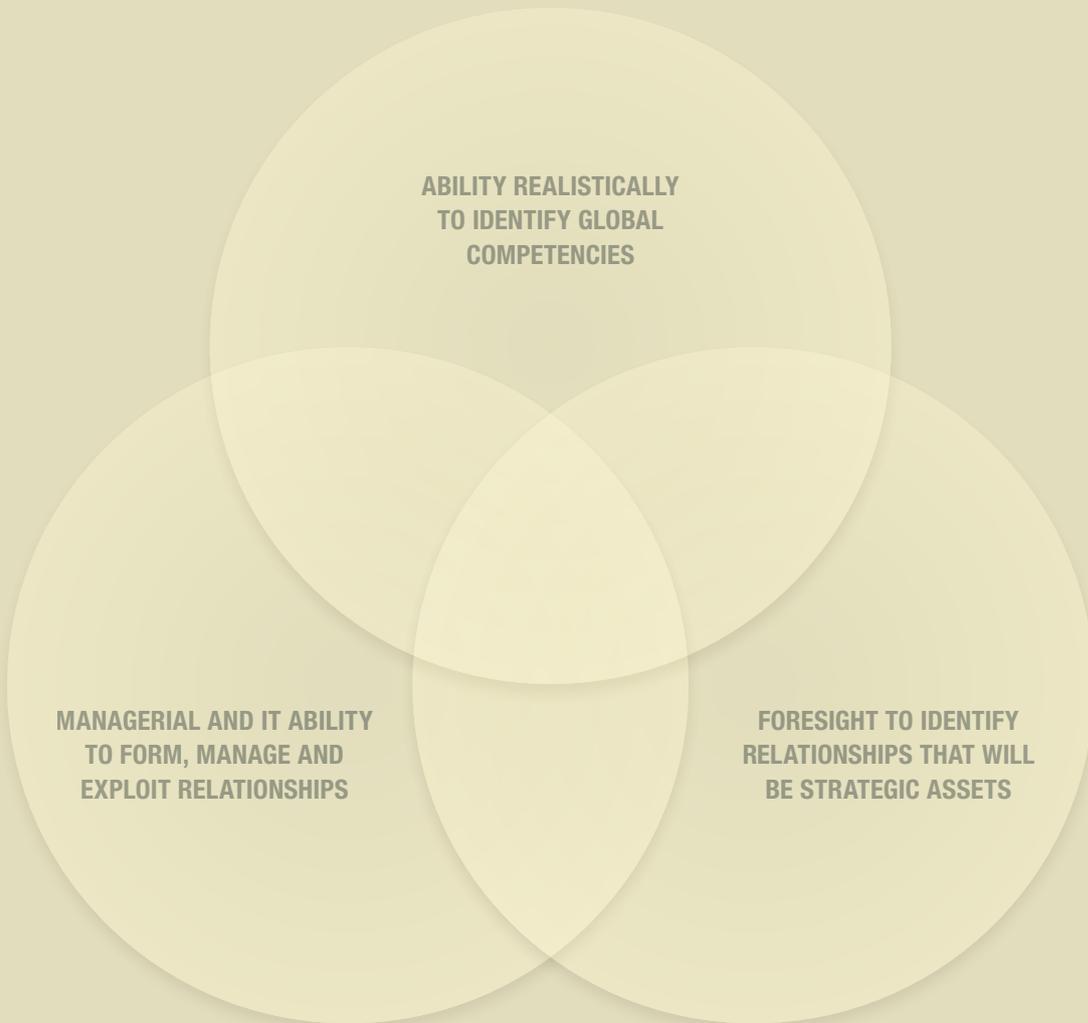
close interaction with, monitoring of and coordination alongside supply chain partners. In marketing, sales and service, we have abandoned the ideas of central sales operations for entire multinational operations, but have not reverted to small, unconnected, locally responsive units doing their own things out of contact with anyone else. Rather, we have locally responsive units acting in globally coordinated ways.

These changes within each element of our value chain show one thing very clearly: there is a central coordinating hub to our new value circle. But this hub is not the vast headquarters overhead of the 1960s and 1970s multinational corporation. We still have lean operations; the competitive pressures allow nothing else. What then, has allowed 'lean coordination' of innovation, of manufacturing, of supply chain, of customer relations, and all the partners and collaborators involved with each?

It is the evolution (that has barely just begun) of ever-more sophisticated IT systems. These have had the most profound effects on the value-generation process of our leading manufacturers, and on how this value generation is organized. The 'Manufacturing in 2020' study noted how IT solutions are supported by hard technology improvements. For example, more than two-thirds of the manufacturers in that study expected Radio Frequency Identification (RFID) to be used more in the management of complex supply chains over the next ten years.



VALUE CIRCLES WITHIN NETWORKS OF VALUE CIRCLES



THE KEY ABILITIES FOR THE 21ST CENTURY NETWORKED VALUE CIRCLE

Therefore, the inner processes of value generation have changed beyond recognition, from the earlier notion of firms competing with their value chains against the value chains of other firms. Since then, the very competitive battle in which they are fighting for survival and success has changed. One-off joint ventures evolved into sophisticated collaborations and these then became intricate network relationships that interweave and interlock in almost unfathomable complexity. Customers are collaborators in innovation, and sometimes also in manufacture. Competitors collaborate in research, and sometimes in customer relationships. Supply chain partners compete for customers and even with their customers as well. Firms put their own units in competition with each other even while they collaborate with other competing units in rival firms.

So we do not have firms' value circles autonomously trying to gain competitive advantage on the value circles of other firms. We now see complex networks of value chains that are both competing and collaborating with one another in intricate ways. This is the inevitable and logical consequence of a search for competitive advantage, achievable only on the basis of core competencies that need to be world-class in a rapidly changing and deeply competitive global manufacturing environment.

Manufacturing firms without world-class core competencies die. And in the current world recession, they are dying fast. So firms with deficiencies in critical elements of their value circle need to collaborate with other firms that have excellence, or with other firms with whom they can jointly build up excellence, even if these other firms are customers, suppliers or rivals. So how is competitive advantage achieved in this context and what do firms need to do if they are to win in a global competitive landscape? Three key strategic capabilities of this value-creation process emerge from this study.

The first is the ability to make tough and very difficult strategic decisions about a firm's core competencies, its deficient competencies and its incompetencies, and what can be done about them. Many manufacturing firms have determined that manufacturing, and possibly even supply chain management, are beyond their core competencies, so by outsourcing, they effectively interlink to the value circles of others. Most of the firms in this study, however, have determined essential core competencies that they can guard with vigor, nourish and invest in. By linking with other value chains, however, these firms can instead:

- Avoid the vulnerability of carrying business costs in areas of incompetence
- Partner to overcome weaknesses in areas with deficient competence
- Leverage the areas in which they have world-class core competence.

However, this requires the second and increasingly important capability of the modern manufacturing age: the ability to form, develop, deepen, manage and exploit complex and interlinking business relationships. These relationships are very varied, but they are evident in every firm examined here and in every element of the value circle. They can be pursued locally with physical contacts or remotely through call centers or web systems. They can be bilateral, involving close and closed relationships between two firms in sensitive areas, or be wide, open, network relationships. This all depends on the firms, the industrial needs and what is to be achieved. But they are very important, operationally and strategically, and while there are many approaches to developing and using business relationships, and new approaches are being developed all the time, it is evident that some firms seem to be better at it than others.

The third new strategic capability is the foresight to see the relationships that will represent a long-term asset within a firm's value circle and to find a way of linking this in to creative competitive advantage. Gaining competitive advantage in a value chain used to be seen as achieving marginal developments to fix weak links in the chain. Creating sustainable, competitive advantage in a networked value circle is about engineering and negotiating a mutually advantageous value circle with others.

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Appendix A: Research Design

The best-in-class value chain thought leadership initiative draws on a wide range of expertise from both Capgemini and the University of Edinburgh Business School.

The collaboration between Capgemini and Edinburgh University includes two consultants from Capgemini and two principle investigators and four researchers from the University of Edinburgh Business School. There were four distinct phases in the research process including two issues workshops, documentary analysis and semi-structured, in-depth single interviews.

A1 Issues Workshop 1

The first phase of the process began with an intensive two-day issues workshop held at the University of Edinburgh Business School. The objective of the workshop was to define what was meant by best-in-class value chains and to identify two industry leaders in each of four industries. The four industries focused on are automotive, aerospace, consumer electronics and general manufacturing. The companies were agreed upon through a process of generating lists of potential candidates to be researched, and then narrowing that list down through structured debate. The issues workshop outputs provided the framework for the documentary analysis to follow.

A2 Documentary Analysis

Documents on the companies identified during the first issues workshop were systematically searched for by the four researchers. This phase of the research lasted for one month. The documents being analyzed for the best-in-class value chain include industry reports, trade journals, business media reports and company reports. A coding protocol was established based on academic principles of grounded theory. Grounded theory (Strauss and Corbin 1967) is a process by which categories emerge naturally from the data through systematic coding. As documents were analyzed, best practices were identified and coded by the researchers, and they were entered into a data workbook. The data workbook became an evidence base of best-in-class value chain management practices.

A3 Issues Workshop 2

Following the documentary analysis, a second issues workshop between the University of Edinburgh and Capgemini was held at the University of Edinburgh Business School. The objective of the workshop was to identify the top practices comprising best-in-class value chain management from the data workbook. The process consisted of workshop participants from both Edinburgh University and Capgemini generating separate lists of best-in-class value chain management practices for each stage of the value chain grounded in the evidence compiled in the data workbook and then systematically refining the lists through structured debate between the workshop participants. The lists were then checked for type one and type two errors. Type one errors are when information is on the list that should not be there. Type two errors are when information is not on the list that should be. Finally, gaps in the data and issues that required more information were recorded.

A4 Single Interviews

The final phase of the research process consisted of semi-structured single interviews with industry experts. The purpose of the interviews was to triangulate data. Triangulation is used to increase the reliability of the data from the documentary analysis. The interviews were also used to fill in gaps in the data. The interviews lasted between 30 and 75 minutes. Extensive notes were taken during the interviews. Each interview was transcribed within 24 hours of it taking place. The questions posed during the interviews consisted of asking about the best-in-class value chain management best practices identified during the documentary analysis phase of the research and also about any gaps existing in the data.

A5 Data Sources

The findings in this report are grounded in the data generated during the research. A complete list of documentary sources comprising this work and the contents of the report that follows is available on request. A standard practice in qualitative research is to ensure anonymity among interview participants.

Appendix B: References

- Andersson, U., Forsgren, M. and Holm, U. (2002) 'The strategic impact of external networks: Subsidiary performance and competence development in the multinational corporation', *Strategic Management Journal*, Vol. 23, No. 12, Pp. 979-996.
- Bartlett, C. and Ghoshal, S. (1987) 'Managing across borders: new strategic requirements', *Sloan Management Review*, Vol. 29, No. 1, Pp. 43-53.
- Bartlett, C.A. and Ghoshal, S. (1993) 'Beyond the M-form: Toward a Managerial Theory of the Firm', *Strategic Management Journal*, Vol. 14, Pp. 23-46
- Birkinshaw, J and Hood, N. (2001) 'Unleash Innovation in Foreign Subsidiaries', *Harvard Business Review*, Vol. 79, No. 3, Pp. 131-137
- Buckley, P.J. and Ghauri, P.N. (2004) 'Globalisation Economic Geography and the Strategy of Multinational Enterprises', *Journal of International Business Studies*, Vol. 35, No. , Pp. 81-98
- Chesbrough, H (2003) 'Open Innovation: The new imperative for creating and profiting from technology', Boston, MA: Harvard Business School Publishing.
- Foss, N. and Pedersen, T. (2002) 'Transferring knowledge in MNCs: The role of sources of subsidiary knowledge & organizational context', *Journal of International Management*, Vol.8, No.1, Pp. 49-67.
- Ghoshal, S. and Bartlett, C. (1990) 'The multinational corporation as an interorganizational network', *Academy of Management Review*, Vol. 15, No. 4, Pp. 603-625.
- Gulati, R., Nohria, N., and Zaheer, A. (2000) 'Strategic networks', *Strategic Management Journal*, Vol. 21, No. 3, Pp. 203-216.
- Inkpen, A.C. (1998) 'Learning and Knowledge Acquisition through Strategic Alliances', *The Academy of Management Executive*, November, Pp. 69-80
- Kogut, B. and Zander, U. (1993) 'Knowledge of the firm and the evolutionary theory of the multinational corporation', *Journal of International Business Studies*, Vol. 24, No. 4, Pp. 625-645.
- Moss Kantor, R. (1994) 'Collaborative Advantage', *Harvard Business Review*, July-August, Pp.96-108
- Nahapiet, J. and Goshal, S. (1998) 'Social capital, intellectual capital and the organizational advantage', *Academy of Management Review*, Vol. 23, No. 2, Pp. 242-266.
- Ohmae, K.(1989) 'Managing in a Borderless World', *Harvard Business Review*, May-June, Pp. 152-161
- Porter, M.E. (1990) 'The Competitive Advantage of Nations', *Harvard Business Review*, Vol. 90, No. 2, p. 78
- Powell, W.W., Koput, K.W. and Smith-Doerr, L. (1996) 'Interorganizational collaboration and the locus of innovation: Network of learning in biotechnology', *Administrative Science Quarterly*, Vol. 41, March issue, Pp. 116-145.
- Tsai, W. and Ghoshal, G. (1998), 'Social capital and value creation: The role of intrafirm networks', *Academy of Management Journal*, Vol. 41, No. 4, Pp. 464-476.
- Womack, J.P. and Jones, D.T. (1994) 'From lean production to the lean enterprise', *Harvard Business Review*, March-April, Vol. 94, No. 2, Pp. 93-103.
- Yip, G.S. (1997) 'Patterns and Determinants of Global Marketing', *Journal of Marketing Management*, Vol. 13, No. 2, Pp. 153-164



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