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RESEARCH NOTE

Market centricity and producibility

An opportunity for marketing and operations management to enhance customer satisfaction

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Abstract

Purpose – Operations management and marketing have played important roles in contributing towards an ongoing corporate objective of delivering enhanced customer satisfaction. Focusing on the concept of producibility, this paper aims to explore the potential for developing an inter-disciplinary approach to market centric value delivery.

Design/methodology/approach – For its approach, the paper uses a review of the literature and analyses a number of company examples to highlight the benefits of extending design for manufacture and assembly (DMFA) into the operational processes of physical distribution and service support management.

Findings – A solution will be an increase in design for manufacturing or producibility engineering. Changes to achieve this will not only reflect the short-term "drivers" of performance, cost and time management but also "industry performance drivers" such as knowledge management, technology management, relationship management, and process management. In the development of an interdisciplinary approach, R&D and design would be a logical candidate for such an integration.

Research limitations/implications – The paper is based on specific examples, but there are general implications as business organisations have been able to increasing levels of sophistication in the processes used to understand the customer and to effect delivery.

Practical implications – The new directions for operations management have practical implications for information communications technology (ICT) as well as the technical capabilities and capacities of production.

Originality/value – By exploring some novel approaches from practice, the paper offers an original perspective from which to deliver enhanced customer satisfaction.

Keywords Marketing, Operations management, Customer centricity, Market centricity, Producibility

Paper type Research paper

Introduction

Organisations have seen customer focus as an essential component of competitive advantage. Operations management and marketing have played important roles in contributing towards an ongoing corporate objective of delivering enhanced customer satisfaction for a number of years. Clearly methods and outcomes have changed as business organisations have been able to increasing levels of sophistication in the processes used to understand the customer and to effect delivery.

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A cost/price focus dominated the early years of the twentieth century, fuelled by the increased efficiencies of mass production epitomised by the "Ford" approach of delivering "price-led affordable value", with scant attention to customer choice by providing product variety. A hundred years on the technology of operations management guided by more detailed and current customer information enabled a move towards mass-customisation at affordable prices by the end of the twentieth century; as the twenty first century progresses so the "ideal", customisation, becomes closer to reality.

New directions or marketing

The role of marketing in a customer/market led business environment has resulted in a number of conceptual shifts in the discipline. Customer satisfaction has become more focused. In the 1960s a strong brand promise targeted towards broad socio-economic segments sufficed; the power and effectiveness of television advertising supported by trade marketing through efficient distribution (increasingly being offered by multiple retailing intermediaries in almost all product categories) was a successful formula. Vastly improved attitudes towards relationship management (as seen in supplier and customer networks) now makes marketing management's task within network structures easier to identify opportunities to create stakeholder solutions whereby both vendors' and purchasers' value expectations are met and benefits are shared by both.

Slywotzky and Morrison (1997) introduced the term "customer-centric thinking". Using a "customer-centric" approach to the value chain network suggests "things that are so important to customers" are the customers' value drivers, those adding significant value to customers and to customers' customers. Within the context of the value chain network, value drivers assume two-fold significance. One is clearly that of the role of the process of adding relevant value for customers and its ability to differentiate the value offer such that it creates competitive advantage for both the customer and the supplier organisation. The second is that like their customers, suppliers also have value drivers, and creating value creates costs for supplier organisations, thereby raising questions on the impact on the value and cost drivers of the supply/vendor organisation.

MacMillan and McGrath (1997) argued that the customer life cycle, or the consumption chain is a means by which: "[...] they can uncover opportunities to position their offerings in ways that they, and their competitors, would never have thought possible". Using a process they have labelled "mapping the consumption chain", they capture the customer's total experience with a product or service. Such a process identifies numerous ways in which value can be added to a product or service. The mapping process to identify the consumption chain comprises a series of questions aimed at establishing aspects of behaviour that occur.

The increasing importance and application of service in the value proposition (the product-service offer made to the end-user customer; Webster (1994) and Anderson *et al.* (2006) is another "new direction" for marketing. Vandermerwe and Rada (1988) coined the term servitization suggesting it as a phenomena:

> [...] happening in almost all industries on a global scale. Swept up by the forces of deregulation, technology, globalization and fierce competitive pressure, both service companies and manufacturers are moving more dramatically into services.

This suggested the potential for organisations to differentiate their value proposition by adding service characteristics. More recently Neely *et al.* (2011) suggested

(power-by-the-hour) a product-SERVICE strategy providing "solutions" based upon guarantee of "up-time" and planned equipment availability; known as "out-come" based contracts they are often long-term; product-SERVICE strategies focus on asset productivity rather the asset component of the complete product. This approach differs from the traditional solution to a customer problem in which a "PRODUCT-service" is a predominantly tangible product that provides a "hardware" solution for the customer problem, and is clearly applicable to both B2B and B2C market sectors. As competition intensifies the service content of the package can become a critical factor in vendor/customer relationships and at an appropriate time (or perhaps a situation) in the relationship the PRODUCT-service becomes a product-SERVICE. Rolls Royce Engines, Caterpillar and Hilti use this approach to offer an opportunity to customers to purchase productivity rather than "hardware" and the opportunity to use the cash flow released to expand their core businesses: this suggests the introduction of asset management into marketing services portfolio.

New directions for operations management

Operations management has probably undergone more transition than marketing in efforts to contribute towards becoming closer to the goal of a "customer-centric" supply chain with the objective of maximising customer satisfaction rather than simply as a supplement to the company's provision of service at least cost. One major development is the introduction of the notion of design for manufacturing, or producibility engineering, an approach that integrates the product-service design process with manufacturing to ensure overall operations effectiveness by coordinating both design and manufacturing processes to achieve production efficiency (i.e. quality specifications, volume and delivery targets at target costs). Developments in information communications technology (ICT) ensures components can be manufactured anywhere and by any capable and equipped supplier and then assembled to meet the design specifications using relevant technical capabilities and capacities at planned costs. On-going developments in additive manufacturing (3D printing) will, in the very near future, enable replacement service parts to be manufactured when required rather than being held in inventory.

Barkai and Manenti (2011) argue that current market trends, together with the digitisation of manufacturing, require the future production environment to be highly adaptable and reconfigurable to respond to rapid changes in market demand, technology innovation and changing regulations. Flexible manufacturing technologies employed by most automakers are a critical ability in this process and the foundation for profitable growth, but these alone will not suffice in a long-term strategy to fend off the competition. The authors suggest a practical "design anywhere, make anywhere, sell anywhere" strategy is needed, and propose, arguing that:

> Factories of the future will be a global network of production facilities managed as single virtual factory. This type of manufacturing network consolidates multiple resources and capabilities to form an end-to-end fulfillment network that we call fulfillment execution system (FES).

FES is an approach to a coordinated management of demand, capacity and resources, and outbound order fulfilment across the entire network of manufacturing plants and along the supply chain. Data gathered will be connected to corporate-level intelligent decision support tools, creating visibility and intelligence on operational data. It enables manufacturers identify problems, isolate root causes, understand the state of execution processes, and adopt corrective actions quickly across multiple plants.

IDC manufacturing insights' introduced global plant floor model in October (2012) following much the same approach: a network of factories, managed as a unique virtual factory that consolidates the number of different manufacturing plants in terms of resources, processes, and products with the ability to harmonize, supervise and coordinate execution activities across company's and suppliers' manufacturing operations, with greater level of real-time visibility; and, with Centres of Operational Excellence and plant-floor IT seen as essential to this transformation. Together, these concepts propose a coordinated international multi-plant operation that may located anywhere by using ICT facilities.

"Market centricity": a meeting place for marketing and operations management

Operations management has collaborated with marketing by considering resources and customer markets in what may described as market-centricity. General electric and Panasonic have pioneered the concept by focussing on specific local market needs and are designing product-service responses that can be manufactured "locally" using local manufacturing resources and sold to local customers; suggesting a new generation of value chain network thinking that is becoming based upon market-centric networks; large organisations such as general electric, ABB, Millenium pharmaceuticals, and Siemens are pursuing a strategy of entering new growth markets (such as renewable energy, life sciences/biotechnology and medical devices) and, by being innovative, compete by collaborating with product-service specific manufacturing resources (thereby avoiding foreign exchange problems) and using local distribution networks by becoming "local". See Immelt and Govindarajan (2009) and Wakabayashi (2009).

Design for manufacture and assembly (DFMA) and total cost of ownership (TCO) has been mentioned in the American business literature since the 1940s on. Boothroyd *et al.* (1984) and Ulrich and Eppinger (2000) have developed the concept and have demonstrated the benefits of product simplification, and early costing tools, in defining the concurrent engineering movement of the late 1980s. Each is a proven business method in its area. DFMA and TCO are low-risk applications; both need to be institutional for global companies' operations.

DFMA has been practised with notable success for some time; integrating the product-service design process with manufacturing operations to create strategic effectiveness and coordinating both the design and manufacturing processes to achieve production efficiency (i.e. manufacturing model, quality specifications, volume and delivery targets at target costs). John Deere and Harley Davidson leveraged DFMA over the years to achieve laudable results, including cost reductions of 50 percent, shortened product development cycles in the neighbourhood of 45 percent, and part count decreases of nearly half. Whirlpool management deemed DFMA as central to the firm's strategy to be the "number one cost leader" in all of its product categories at each of its price points. Years into the program, DFMA is now part of the company's staged gate process for product development and is used equally to redesign existing products as well as to optimise new product designs. Using DFMA software, engineers are able to evaluate individual products part-by-part; in addition to documenting the assembly process step by step. The software helps generate three key Pareto charts (cost, part count and assembly time) which establishes a baseline that allows the team to measure its success, not to mention, identify the parts and processes where there is the greatest

opportunity for efficiency improvements. Whirlpool's focus on the importance of performance – efficiency (part count), cost, and time suggests these as important drivers for organisational success.

Extending DFMA into "producibility": a marketing and operations "joint venture"

Producibility can be defined as the management of the cost-effective processes necessary for the transformation of materials and components through manufacturing and commercialisation to the end-user customer. "Given a design, manufacturing can optimize the ease and economy of fabrication and assembly" (Dynamics Research Corporation, 2011). Producibility is becoming increasingly important as manufacturing becomes more dispersed and both market and customer centricity requires differentiation to add emphasis to the role of value chain network management. This can be offered by producibility that can be defined as:

> *Producibility* is the *total design management* activity that includes all relevant processes within the value chain network that create intra, inter-organisational, and international partnerships to achieve *stakeholder* satisfaction. It is a management process whereby the *product-service-design* process is integrated with the design of manufacturing processes and the subsequent operational processes of transactions management, physical distribution and service support management processes.

Benefits of adopting producibility are derived by integrating operational processes at the product design process: strategic effectiveness can be built into the value proposition using value engineering (being strategic in context, it develops product-services (PRODUCT-services or product-SERVICEs) that meet customer value delivery expectations, (i.e. feasibility, acceptance of a value proposition) at optimal manufacturing costs (viability, i.e. at costs that permit acceptable margins to be made), by integrating design, manufacturing and distribution processes operational efficiency (uses value analysis to evaluate possibilities for efficiency in production, distribution, and in the end-user customer applications; it is attempting to improve value delivery characteristics throughout the manufacturing business model, by reviewing; quality specifications, volume and delivery targets at target costs); and in the commercial business model (physical distribution, resale (end-user access) availability and "serviceability") designed into the total product-service package.

This essay highlights the benefits of extending DMFA into the operational processes of physical distribution and service support management. In the current business environment producibility should also consider distribution and service aspects. For example, Caterpillar and RR Engines – offer remote diagnostics fitted to wearing parts (having designed durability into vulnerable wearing parts) and that connect vendor and customers' service management with the service needs of customers whenever the product-service is in use.

Producibility at work: the "Ox" an example of "total" design

The Ox is an Ikea-inspired flat-pack truck, designed by UK engineers, for use in developing countries to help people in remote villages transport essential supplies. A charity headed by Sir Torquil Norman, founder of Bluebird Toys, set out more than two years ago to design a cheap but effective light truck to transport grain, fertilizer and water in areas where road surfaces are poor. The first "Ox" is complete and the Norman Trust

hopes to introduce the vehicles across Africa by the end of next year. The vehicles will shipped in parts that can be assembled in less than 12 hours by three people. The vehicle will help make remote areas more independent, allowing them to deliver goods to previously far-off markets and access aid and healthcare more easily. If it works it will enable young Africans to stay and work in their home villages rather than move to urban slums. If it is successful the economies of the whole continent could eventually be affected.

Parts will be manufactured by British companies and the parts will be consolidated at two locations, one in the Midlands and one in the south of England. The truck will be shipped in pieces, six to a container, which would normally only carry two fully assembled vehicles. When assembled at the destination, the truck will be able to carry about 2,000 kg, twice the load of most pick-up trucks; its engine can also be used to pump water, saw wood or run a generator. Sir Torquil said global car manufacturers had neglected the specific needs of developing countries.

Engineers have made the product as simple and durable as possible. The truck will cost between £10,000 and £25,000 but should last up to 25 years. The doors are identical so they can be fitted on either side and the vehicle has a central drive so it can be driven on the left or the right. The front window has three panes of glass, so if one gets damaged, another can be easily be replaced, and the seats can be removed and used as sand ladders to drive across difficult terrain or as ramps to load drums of water on to the back of the truck.

Barry Coleman, executive director of the charity organisation "riders for health", suggests the Ox would meet a real need in the parts of sub-Saharan Africa, where his charity manages and maintains vehicles for health workers. He said good quality transportation was essential to tackle poverty and ill health in Africa. "The wrong vehicles end up in the wrong places doing the wrong things – things for which they were not designed", he said. "These vehicles generally last for a couple of years before they implode. The institutions shrug their shoulders and say, well, it is Africa, what do you expect?" Mr Coleman praised the Ox design as "extraordinarily versatile" – calling it a truck, bus and ambulance in one – and said it would create jobs in the developing countries as people would be needed to assemble it (Kuchler, 2013).

Producibility at work: Viatran Inc an example of a disciplined approach

TCO identifies relevant costs thereby enabling a realistic comparison of alternative value propositions to be made. Viatran is an international manufacturer of pressure and level transmitters for oil and gas services, steel production, injection molding, die casting, and chemical production industries. For Viatran TCO is the sum of the piece part, associated logistics and all of the soft costs (training costs and wage hikes, escalating shipping fees, and an impaired asset base back home, travel and other expenses – that are in corporate budgets and not included in decision that attracted them to off-shore suppliers) The company does not differentiate between "offshoring" against "reshoring" or "in-shoring," rather it quantifies and acts on geographic risk when protecting its intellectual property; they use costs of the operational alternatives to derive the decision of manufacturing in the market in which a product is sold.

"Build where you sell" is increasingly happening in America and elsewhere; and is the essence of reshoring policy. Viatran has expanded its definition of TCO to include not only the physical length of the ultimate supply-to-demand fulfillment line, but also the associated lead times of the entire process, i.e. the order-to-cash complete. This requires

full review of the bill of materials (and of suppliers' BOMs) in order to understand the total amount of time it takes to respond to a demand request and the total amount of material liability (for Viatran) within the supply pipeline. Viatran also believes that by shortening the demand-fulfillment chain, they should also shorten the overall lead-time of the supply fulfillment change resulting in increased operating profit. It also leads to improved management of the operating profit because it reduces inventory investment; lead time is a component of all replenishment systems, whether it is safety stock, min-max, Kanban or eKanban.

Viatran suggests that currently regional manufacturing and distribution is the quickest way to fulfill demand while minimizing risk, being close to the customer in their instrumentation markets, speed of delivery is the order winner. Their goal is to be the most responsive business within the most cyclical markets, and to deliver the exact price and quality the market needs. This takes a concerted effort to reduce part count, "right-tolerance", select commercial off-the-shelf (COTS) materials and components when they perfectly match requirements, lean the organization, using TCO.

TCO is also used to provide Viatran with an insight into the lifecycle of costs. It helps management see the complete organisation. However, is even more helpful is the impact that robust product design has on operating profit and efficiency in every upstream department. Just as there are hidden costs that damage the offshore activities, there are hidden efficiencies from a cost driven design effort that offer far-reaching benefits.

What Viatran have learned from DFMA is to simplify everything that shows a measured benefit, including our TCO. Relevant management (product managers, operations personnel, engineers and supply-chain personnel) meet as an integrated group to "score designs" (Viatran and competitors' products) with DFMA and look past the BOM and ERP readouts to see detailed estimates for manufacturing: tool-wear rates and material waste, process times and labor impact (everything missed from offshore bids). Part consolidation is an essential part of the lean and value engineering programs. Fewer parts, easier manufacture, fewer and shorter supply lines lead to lower cost and enhanced profitability. Part-count reduction eliminates a search for low-cost options and enables Viatran to "build where they sell". "Human overhead is more a knowledge asset in a world where metrics matter and teams see excellence and cost avoidance as everyone's work". Future steps will be taken to improve the understanding of the role that design plays in generating business profits (Biagioni, 2013).

The Ox is an example of producibility and of a marketing/operations joint venture. A market opportunity was identified together with relevant market characteristics; customer profiles, product applications and locations, a clear value proposition was developed – an all-purpose utility truck capable of providing power for providing electrical power for pumping water and for wood cutting. Research design and development defined and developed the concept. Clear parameters were given for cost evaluation; simple construction to facilitate a KD containerised transportation method, for assembly at its destination, to be capable of performing a range of other tasks as well as hauling a substantial payload. The eventual manufacturing process options will clearly be refined but will likely be based upon distributed manufacturing and simplified modular structure. There is a suggestion that the vehicle has been designed to be assembled and serviced by local auto mechanics.

Viatran offers an example of a disciplined approach to producibility using recently developed (and refined) techniques to answer – what? why? who? how? when?

and where? – the product-service will be created. Viatran has identified the critical performance issues that apply throughout the demand chain analysis – supply chain response – demand chain management continuum by identifying customer expectations for performance management (innovative solutions, product quality and reliability), time management (the ultimate supply-to-demand fulfillment line, the order-to-cash cycle), and cost management (inventory investment) topics and monitors its performance capability against these criteria.

Stakeholder satisfaction and sustainability an essential feature

The examples of "The Ox" and Viatran suggest that a coordinated marketing/operations activity creates stakeholder prosperity (stakeholders include; customers, suppliers, shareholders, government, regulatory authorities and the community). In a successful organisation productivity has a direct impact on stakeholder prosperity; it contributes to return on invested capital (ROIC), facilities utilisation and continuity of employment in the organisation and in suppliers. Profitability is the necessary link with productivity in maintaining stakeholder prosperity and is considered to be an indicator of corporate sustainability. Producibility is the integrating process that has stakeholder satisfaction as a primary objective. For producibility to be strategically effective and operationally efficient it should ensure the end-user customer receives the expected levels of performance demanded. These are typically based upon specific product-service performance requirements such as quality, reliability and specific "output" expectations. Initial investment, operating and maintenance costs are components of customer cost management; time2market and time4customer responses are management of time constraints imposed by customer expectations. It is also suggested (by the Viatran example) that increases in prosperity may be realised by increases made to any of the three components. However, it is likely there will be countervailing effects if one of them was disproportionally increased and this created an unacceptable level of cost (or perhaps a reduction of revenue receipts) in one of the other components. For example, if the resource inputs were changed (an increase in materials quality, or perhaps a reduction in customer response lead time over and above customer's expectations) and revenues failed to respond it follows that rather than increase overall stakeholder prosperity would decrease due to disturbing the equilibrium of the components.

Value contribution as a control variable

"Value" can be an ambiguous concept. It is both tangible and intangible; tangible value is created through transactions processes, for example by successfully converting a collection of resources into a successful product profitably resulting in a positive margin that is distributed to the owners of the resources. The intangible aspect of value is an indirect relationship; we claim that value is created when the life span of a component can be extended and reduces maintenance costs and downtime for the end-user of the finished product thereby reducing costs and increasing profitability. Another example: automobile designers are now designing vehicles based upon platforms; these offer benefits of reduced costs in manufacturing (economies of scale) and lower assembly costs (and subsequent repair and maintenance costs) later in the vehicle's lifecycle because they offer a an opportunity to develop "experience" benefits (increased familiarity) that reduces the labour time required to complete assembly and repair tasks.

A number of organisations (e.g. The Volkswagen Group, Volkswagen, 2012) use financial target systems focused on the continuous and sustainable increase of the "value" of the company generated by vehicle design and assembly activities. Volkswagen uses value contribution, as a control variable linked to the cost of capital, in order to use resources efficiently and to measure the success of this. The concept of value-based management allows the success of an innovative, environmentally oriented, product portfolio to be measured. Value contribution is calculated using operating profit after tax and the opportunity cost of invested capital. Operating profit shows the operational performance and is initially a pre-tax figure. The cost of capital is multiplied by the invested capital to give the opportunity cost of capital (or WACC – weighted average cost of capital). Invested capital is calculated as total operating assets (property, plant and equipment, intangible assets, inventories and receivables) less non-interest-bearing liabilities (trade payables and payments on account received). See VW Annual Report (2012) for an example of the application of EVA[1] as a corporate control model.

Concluding comment

Geographically dispersed customers in both emerging and established global markets now demand higher quality products in a greater variety and at lower cost in a shorter time. As product profit margins continue to shrink, organisations seek to reorganise their activities and realign their strategies to provide the speed and flexibility necessary to respond to windows of market opportunity; moving from centralised, vertically integrated, single-site manufacturing facilities, to geographically dispersed manufacturing networks resources. Additionally, in order to acquire technological know-how and assets quickly, relevant partners are recruited to create an integrated and coordinated inter-organisational unit. A solution will be an increase in design for manufacturing or producibility engineering currently being practiced by global organisations that have adopted a market-centric strategy in which research, design and development, manufacturing and marketing share a local focus.

It is clear that more research is required. Business organisation structures are dynamic and the changes will not only reflect the short-term "drivers" of performance, cost and time management but also "industry performance drivers" such as knowledge management, technology management, relationship management and, process management. The examples of general electric and Panasonic are typical of the application of producibility in an emerging market where expenditure levels on both "necessities" (healthcare equipment) and "luxuries" (domestic consumer durables) are being made possible by joint problem solving by marketing and operations management working together. The "Ox" project is a glimpse of the future; it is a project in which performance management (transporting materials, generating power for lighting and pumping water), cost management (the manufacture and physical distribution of a product), and time management (product delivery and assembly, repairs, and product longevity) have each been addressed by the design team and thought through using the producibility concept.

Note

1. Value contribution corresponds to the economic value added (EVA) concept (Stern *et al.*, 1996).

References

Anderson, J., Narus, J. and van Rossum, W. (2006), "Customer value propositions in business markets", *Harvard Business Review*, Vol. 84 No. 3, pp. 90-99.

Barkai, J. and Manenti, P. (2011), "The assembly plant of the future", *Industry Week*, 12 January.

Biagioni, J. (2013), "America's offshoring debacle – accounting for what happened", May 17, available at: www.industryweek.com

Boothroyd, G., Dewhurst, P. and Knight, W. (1984), *Product Design for Manufacture and Assembly*, Marcel Dekker, New York, NY.

Dynamics Research Corporation (2011), White Paper, Dynamics Research Corporation, Andover, MA.

EMEA Research (2012), *Designing the Factory of the Future*, IDC Manufacturing Insights, London, 18 October.

Immelt, J. and Govindarajan, V. (2009), "How GE is disrupting itself", *Harvard Business Review*, October.

Kuchler, H. (2013), "British engineers design flat-pack truck for developing countries", *Financial Times*, 14 May.

MacMillan, I.C. and McGrath, R.G. (1997), "Discovering new points of differentiation", *Harvard Business Review*, July/August.

Neely, A., McFarlane, D. and Visnjic, I. (2011), "Complex service systems – identifying drivers characteristics and success factors", paper presented at 18th European Operations Management Association Conference, Cambridge, July.

Slywotzky, A.J. and Morrison, D.J. (1997), *The Profit Zone*, Wiley, New York, NY.

Stern, J., Stewart, G. and Chew, D. (1996), "EVA: an integrated financial management system", *European Financial Management*, Vol. 2 No. 2, pp. 223-245.

Ulrich, K. and Eppinger, S. (2000), *Product Design and Development*, Irwin McGraw-Hill, Boston, MA.

Vandermerwe, S. and Rada, J. (1988), "Servitization of business: adding value by adding services", *European Management Journal*, Vol. 6 No. 4, pp. 314-324.

Volkswagen (2012), available at: www.annualreport2012.volkswagenag.com/technologyspecial

Wakabayashi, D. (2009), *Wall Street Journal*, *The Australian*, 10 July.

Webster, F.E. (1994), *Market Driven Management*, Wiley, New York, NY.

Further reading

Walters, D. and Rainbird, M. (2007), *Strategic Operations Management: A Value Chain Approach*, Macmillan, Basingstoke.

Walters, D. and Rainbird, M. (2012), *Managing in the Value Chain Network*, Prestige Books, Sydney.

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