

OPERATIONS MANAGEMENT IN HIGH VALUE MANUFACTURING

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ABSTRACT

This paper explores the issue of high value manufacturing from an operations management perspective and discusses the critical role that the operations management community must play in moving manufacturing organisations to ‘higher value ground’. An exploratory study was carried out in two phases. In Phase 1 existing literature was examined following a systematic review process. This was followed by a stakeholder analysis that included manufacturing companies, government agencies and consultancies and case studies of three organisations that had recently repositioned their businesses. Phase 2 comprised of a focus group based industry consultation exercise. The aim of the second phase was to validate and refine the findings from the initial phase and to generate the key ideas that would inform a future research agenda. This paper provides the foundation for further research by identifying those operational issues that are affecting industry as it seeks to move to higher value ground.

Keywords: operations strategy, high value manufacturing (HVM), repositioning

INTRODUCTION

A number of European countries are currently making significant efforts to encourage companies to move away from low skill, low value products and practices. Unable to compete with low cost economies it has been proposed that manufacturers within such countries need to reposition themselves on the value chain to a point where they are not reliant on low cost operations and an efficient business environment (Porter & Ketels 2003).

There has been much rhetoric around ‘repositioning’ illustrated by the emergence of phrases such as “moving up the value chain” and ‘high value’ but it is significant that the meaning of such phrases, and more importantly the route to achieving these modes of operation, has been less clearly defined. So while countries such as the United Kingdom are taking Porter & Ketels (2003) advice and encouraging manufacturing companies “... to move up the value chain and to reap the benefits of high-skilled, knowledge-intensive manufacturing operations” (DTI 2002) – there is still considerable confusion over what this means let alone how to achieve it. MacBryde and Watson (2006) point to the confusion over the term “moving up the value chain” while Livesey (2006) points out that, “unfortunately there is no accepted definition of a high-value manufacturer, making this high-value vision hard to achieve or to support in policy.”

Research Scope

The scope of this research is defined as those companies currently existing in high-cost economies that have historically been successful in manufacturing however are now finding that their business environment is becoming increasingly difficult due to three pressures: firstly the pressure of growing competition within the activity of manufacturing from companies operating in low-cost economies; secondly, the pressure generated by increasing operational complexity where technology push results in more complex products that need higher levels of intellectual capacity and innovation to design and build; and thirdly, the pressure of growing market expectation for higher and increasingly comprehensive customer service. The companies within this scope of study may be affected by any single pressure or a combination of all three.

Research Objectives

This paper extends the remit of the initial scoping study to embrace the following 3 objectives:

1. Highlight the lack of clarity in the literature in relation to the term high-value when applied to the concepts of value chain of operation of the firm
2. Identify the issues and challenges faced by organisations that wish to reposition themselves competitively
3. Outline how the operations management research community can aid organisations in their quest to engage in high value activity.

This paper begins by outlining the genesis of this research and the methodology that was implemented. It goes on to address the first research objective by examining, through a systematic review of the literature, what “high value” means at the level of the firm. In addressing the second research objective, the authors will present the findings of a stakeholder analysis, which sets out to identify the gaps in knowledge from a practitioner perspective. This will be combined with a short discussion on three case studies. Finally in addressing research objective three the authors will report on a follow-up study involving focus group discussions with industry and academics. This allows the authors to identify where the operations management research community can engage with industry in the quest for higher value operations.

METHODOLOGY

Funding from the Engineering and Physical Sciences Research Council (EPSRC) and Advanced Institute of Management (AIM) allowed the work presented to be conducted in two phases:

- Phase 1 - Scoping study consisting of a literature review, stakeholder analysis and pilot case studies (the scoping study was funded by the EPSRC and AIM)
- Phase 2 – Further industry consultation consisting of focus groups (this activity was supported through the Manufacturing Futures Network, supported by the EPSRC).

Phase 1 - Scoping study

The aims of the scoping study were to: 1) find out the current state of understanding within the literature with reference to high value; 2) Speak to stakeholders – for example consultancies, banks, investors, economic development bodies – to find out what they think the gaps in knowledge are. This phase was carried out between December 2005 and December 2006.

The researchers set out to conduct a multidisciplinary literature review to understand the issue of value chain repositioning from multiple perspectives and to identify gaps in knowledge in relation to supply chain repositioning. The methodology for reviewing the literature was based on a systematic approach to reviewing the literature (Leseure et al., 2004).

Parallel to the literature review the stakeholder analysis set out to identify the key research issues for companies trying to reposition, for consultants (public and private) trying to assist them and for government bodies e.g. DTI. Approximately thirty semi-structured interviews were conducted and focused discussions at seminars and workshops were also utilised. Whilst the literature review examined existing academic knowledge, the stakeholder analysis looked at the practical issues associated with repositioning. During the stakeholder analysis the researchers spoke to companies who had made some kind of operational transition, companies who were in the process of considering a change and other stakeholders such as consultants, regional development bodies, banks and investors. The aim here was to find out what the “user community” thought were the key issues and to identify gaps in both knowledge and practice.

Having concluded the literature review and the stakeholder analysis, the research team were confident that the scoping study had shown a number of gaps in knowledge - both at an academic and industrial level - worth pursuing. The researchers decided to carry out three initial case studies based on companies that had successfully repositioned with the aim of understanding, why they took the decision to reposition, how they did it and what changed in the organisation. The case studies also investigated the success factors in each case. Another reason for conducting the case studies was to develop and test a research protocol that could be used in a larger study as part of a future research project.

The case studies were carried out in three different sectors using UK manufacturing companies that were identified as having ‘moved up the value chain’. The companies were studied using a case study protocol that included an interview protocol for semi-structured recorded interviews with key employees (typically all members of the senior management team). The companies selected for the pilot case studies came from the industry sectors of clothing manufacture, mechanical handling equipment and electronics.

Phase 2 – Focus Groups

It was hoped that the Phase 1 scoping study would identify gaps in knowledge around which academics and industry could focus. In actual fact the scoping study found there was a more fundamental problem as there was much confusion and uncertainty around the advice to “move up the value chain”. The research team realised that in the first instance there needed to be agreement as to what “moving up the value chain” really means therefore on completion of Phase 1, further research was carried out in the form of wider consultation with industry. Three industry focus groups were held to investigate key themes that had emerged from Phase 1.

Each focus group consisted of 12-15 representatives from manufacturing organisations with an interest in repositioning. Three groups were used, one comprised manufacturers with less than 100 employees, the second between 100 and 250 employees, and the third was made up of larger organisations. Each group had a facilitator and a scribe and was supported by representatives from the Manufacturing Advisory Service and academia. The questions that they were asked to discuss included:

- What are the key market challenges facing you as manufacturers?
- How are you responding?
- What difficulties are you facing in responding?
- What should academia and the public sector be doing to help?

FINDINGS FROM PHASE 1 - SCOPING STUDY

Literature Review

One of the problems with the term moving up the value chain relates to the different perspectives on value. A full discussion on the literature surrounding value can be found in an earlier paper (MacBryde & Watson 2007). For the purpose of this paper we can conclude that whilst the terms “moving up the value chain”, “high value manufacturing” and “value chain repositioning” are commonly used terms – there is considerable confusion over what they actually mean. Despite literature advising organisations to move to higher value strategies existing at both policy and strategy level (Wise and Baumgartner, 1999; Livesey, 2003; Edwards et al, 2004; Bititci, 2005), the failure of literature to address this at the operational level results in confusion within the organisation when executing a repositioning strategy.

Stakeholder Analysis

Parallel to the literature review the researchers carried out a stakeholder analysis to understand the practitioner perspective. During the stakeholder analysis the research team spoke to companies who had made the transition, ones who were in the process of thinking about it, consultants, regional development bodies, banks and investors. The aim here was to find out what the “user community” wanted to know.

The researchers found that the practitioners and policy makers were also confused about the terminology. Many of the policy makers, consultants and manufacturing personnel thought that the advice they were getting from the policy makers was to move position in the supply chain, in effect moving downstream towards the customer. Others recognised that there may be opportunities upstream in the supply chain – but that they needed to find ways of being more competitive.

The consultants suggested that there are some existing tools and techniques that can help companies to decide “where” to move, and how to move. However we found none that were developed specifically for the SMEs, and we also recognise that many of these tools lack academic rigor and testing. SMEs, investors and regional development organisations all independently commented that they would like to see a “how to” guide to help companies. There was some interest from SMEs and regional development organisations in gaining an understanding of the motives that drive companies to move in the value chain. In addition many of the small companies expressed an interest in finding out more from case studies of successful repositioning.

Case Studies

The case studies also highlighted the different “flavours” of repositioning in terms of value and the implications for operations management. In all cases the researchers witnessed a change in the activities within the organisations and likewise in all cases the companies identified what the customers valued and focused on those activities.

The clothing manufacturer changed the scope and nature of their activities. Recognising that they could no longer compete on the basis of price, this company moved into higher value markets by moving into branded products and outsourcing its manufacturing activities to lower cost countries. The key driver for this move was a recognition that the cost base was too high to compete on price. In making this move there were significant operational changes. Firstly in operational strategy, secondly in relation to design of processes and thirdly in relation the structure of the supply chain network. This supply chain reconfiguration involved outsourcing the manufacturing activity. With these changes, the challenge was no longer on optimising primary operate processes, but rather process design activity shifted towards looking at increasing the effectiveness (and indeed efficiency) of the manage processes (Bititci et al 2003).

The mechanical handling company moved up the value chain as it used its capabilities for designing and manufacturing mechanical handling equipment to offer new products and services that were suitable for different manufacturing environments. By listening to customers, this company saw that it could add value by providing additional products and services, and move into markets with higher margins. In this case the key operations challenges were the change in operations strategy, with an increased “service” element added to the product offering. This changed the performance criteria and meant a realignment of key performance indicators. Also the addition of bespoke solutions for companies, involved extra activities that had not previously been carried out by the company. Indeed the company also started to offer some of its manufacturing capabilities as a service in its own right. This resulted in a shift in terms of product and process design. In this case the researchers again noted an increased focus on the design of “manage processes” and not just operate processes.

The contract electronics manufacturer moved up the value chain by taking on activities that their customers had previously carried out such as logistics and by adding new product introduction (NPI) support to the customer. Taking on the additional logistical activities happened as a result of a customer request. The addition of the NPI capabilities was partly opportunistic due to the skills that were available within the existing workforce. In this case the operations management changes included significant alteration in operations strategy, clear redesign of the network, a move to managing outsourcing and the addition of product design capability. Finally in this case the researchers again witnessed a shift in terms of process design. In terms of processes the company was still trying to increase the efficiency of operate processes (both in their own production sites and also in their outsourcing partners sites) but it was also turning attention to the design of processes to help manage innovation and network management.

What we can conclude from the case studies is the key role of operations management in repositioning. One interesting point to note is that in all three cases the focus of process design is shifting towards design of ‘manage processes’ – e.g. Manage strategy, manage innovation, manage design – and not purely on maximizing the efficiency of the ‘operate processes’.

Conclusions from Phase 1 - Scoping study

From the review of literature we can conclude that whilst the terms “moving up the value chain”, “high value manufacturing” and “value chain repositioning” are commonly used terms – there is considerable confusion over what they actually mean. The different academic debates on value and the value chain, although interesting, bring flexibility and ambiguity into the subject areas and ultimately do not directly help companies understand how to reposition.

Companies are being advised to adopt higher value strategies, but they do not necessarily know how to achieve this. Whilst there is some literature at policy and strategy levels (Wise and Baumgartner, 1999; Livesey, 2003; Edwards et al, 2004; Bititci, 2005), there is little literature that explains the practicalities of how a company would execute a repositioning strategy. It is evident from the literature that there is a gap in knowledge and practice in terms of defining the destination and operational route to a high value strategy.

The stakeholder analysis corroborates the findings from the literature in relation to the confusion over terminology. In addition stakeholders were unclear as to how to operationalise a repositioning strategy.

The case studies demonstrate that there are alternative routes for manufacturing companies to move into higher value. The case studies suggest however that moving to higher value will mean changing activities and processes within the organisation. Key challenges for operations managers in such organisations will therefore include:

- Designing new processes and activities

- Managing these new processes
- Managing the transition.

Managers within all three case study organisations felt that they were taking a leap of faith rather than following a well understood plan while using tried tools and methodologies. In all three cases studies the companies adopted a new value proposition, for example the clothing manufacturer moved from a value proposition based on low prices, to one based on branding and the electronics company took over some work originally done by their customer. This in turn required a different operations management focus. Most of the managers interviewed reported that they had moved beyond many of the traditional operations management models that they had been using which focused on efficiency by reducing cost and eliminating waste etc. And yet they did not have a new set of tools and models for their new environments.

FINDINGS FROM PHASE 2 - FOCUS GROUPS

The findings from the focus group discussion will be presented within two categories that emerged as part of the focus groups' plenary session. These categories are 1) enabling the strategic change in operational focus and; 2) operationalising the new business model.

Strategic Change in Operational Focus

In terms of strategic focus the research indicated that the initial issue faced by companies was in understanding the nature of their revised value proposition. This concurs with those issues identified within Phase 1 of this research. The lack of clarity in the terminology used to express value creation inhibits the creation of a strategic vision. The most common comment being, "no-one can tell me (for my industry sector) what high value means". This issue is not purely a semantic one because without a clearly understood destination the change in direction is difficult to make. The strategic change that was most commonly understood by participants as moving up the value chain is the transition from a product (or production) oriented company to a customer solutions (or market) oriented company.

However from a basis in manufacturing there seemed to be a perception of two routes that could be taken: firstly, an increased emphasis on the process of design and its inherent creativity; and secondly an increased emphasis on customer service so expanding the range and improving the accessibility of offerings. This duality however created something of a strategic tension as both of these choices were perceived as moving either to the left or to the right on the value chain with no tangible sense of 'moving up' or 'creating additional value'. Also some participants already claimed that their organisations were already operating in development, production and service but did not see this as creating value in a way that was needed to generate further business success. The general view was of increased range and scope but with no clear sense of generating a higher value proposition. This suggests that the perception of industry is that repositioning the business within or expanding the business across the value chain does not always lead to increased value.

There seemed to be little common language that indicated a universal approach to value creation across industries indicating that generally tools used to develop operations strategy, such as benchmarking, are of little use. Each company and industry when approaching this dilemma seemed to have differing sets of contingent factors such as competition, product technology maturity and operational capability to consider.

Operationalising the new business model

Assuming the organisation is able to establish a strategic direction, the process of change in mode of operation to meet the new model seems to be inhibited by 3 factors. Firstly, the research revealed a

common lack of strategic change management skills with companies that may already be poor in operationalising strategy for their existing business finding the enactment of a more complex strategy to be quite simply beyond them. The participants suggested that the key change management skill that was missing was leadership. Secondly without a clear strategic change process operational change was restricted at a more grass roots level. Cultural factors such as the historical inertia associated with a strong tradition of manufacturing created resistance to anything that was not directly related to the manufacturing process. This loyalty to the core business of manufacturing was also reflected in employee attitude with little value placed upon the softer skills necessary to create a service-based or innovation-based business. The mechanics of change management were also lacking within activities such as re-engineering the organisation to create new processes and organisational structures. Thirdly, in many cases the skills and knowledge required to maintain the new mode of operation were missing. Skills in process engineering and assembly were strong however these need to be complemented by skills in innovation and customer relations. Emphasis needs to change from managing information to creating and trading in knowledge. Flexible operation needs to replace rigid structures.

In summary problems exist initially in creating the new strategic vision, then subsequently in enabling the process of change and finally perpetuating the new mode of operation. It is also worth noting that companies indicated a lack of a clear environmental support structure to help them through the process of strategic redefinition with both government and academia being criticised. Support from academia is considered difficult to access and sometimes expensive and there was a view that universities seem to be more interested in competing with each other rather than providing a unified service to industry. This situation is made worse as government funding to academia does not reward universities for industry collaboration. In addition government mechanisms for support to industry in general are unclear. This therefore leaves many companies with nowhere to turn for help.

These findings can be summarised into two key themes, one for industry and one for academia. For industry a new operational view needs to be created where the shackles of tradition are removed and the organisation is able to focus on value-adding activity. To create this new view the organisation must understand, for its context, all facets of the value proposition. This has 3 elements: firstly, understanding the meaning of the term value and how it is interpreted throughout the supply chain for their direct customers, their customers' customers and for the ultimate end-user; secondly, defining the scope of their organisational activities and how these contribute to the value proposition; thirdly, structuring their organisations to best achieve the value potential for each set of activities. This would involve reviewing activities and processes in light of the new understanding of the value proposition.

For academia a research agenda must be generated which analyses the many current models that claim to define value and restructures these into a useful model or methodology that companies can apply, regardless of industry sector and mode of operations, that will aid them in identifying the value proposition that best suits their context.

DISCUSSION

Based upon the findings from the literature review, scoping study and focus groups a number of key themes that require further research emerged.

(1) What is high value from an operations management perspective?

In all elements of the research there was much discussion around the lack of clarity in defining the high-value operational end-state. The literature review highlighted basic inconsistencies in the terminology, this deficiency was emphasised by the stakeholder analysis where industry indicated that policy makers and academia were preaching the gospel of higher value while they themselves were not clear on the meaning of this. This was further evidenced as it seems that those businesses that have changed their mode of operation had done this on something of an ad-hoc basis. The focus groups also

indicated that industry found it difficult to define their strategic goal as they were unclear about what their customer values. This lack of clarity in end-state resulted in confusion in relation to the mode of operation that the organisation should adopt. A key question raised by a number of participants in relation to operational strategy was “What will my new business look like in years to come?” This question was closely followed by the related question “what activities and processes should I be investing in to achieve this new mode of operation?”.

There seemed to be general agreement that low cost repetitive activity was not adding value in this geographical context as the low cost economies were far better able to compete in this arena. There were however exceptions to this rule in relation to products and services that enjoyed a local advantage because of brand, for example Whisky, geographical location of natural resource, for example oil and gas, or perishability for example fresh food products.

There appeared to be two schools of thought in relation to high value activity. The first is to focus on the intellectual aspects of the conversion process such as research, development and design where our education system and our engineering tradition still bestows a competitive advantage. An example of this is the mechanical handling company that used its intellectual capital to offer a more customised design service. The second is to focus on a customer solution driven model by expansion of the service aspects of the business such as better customer after-sales service and better emphasis on an integrated solution rather than discrete products. An example of this was the contract electronics manufacturer that increased the service level by managing the supply chain for their customer. Research is now needed that will clarify the different types of high value operational activity that companies can engage in and how these link to competitive advantage.

(2) Design and management of new processes

It is evident from the case studies that any successes achieved were due to the creativity and hard work of individuals rather than the robustness of the company processes. The stakeholder analysis also showed that practitioners did not ‘know’ how to design and manage new high value processes.

There has been much work done on robustness of production processes such as lean manufacture and six sigma and these tools and techniques are well documented and understood. However our research indicates that equivalent tools for creation of robust design and service processes are less well disseminated within the more traditional manufacturing sectors. This is interpreted as an awareness issue as there is work ongoing in the areas of the design of design process and design of service processes however this work has not become main stream by finding its way into university curriculum’s or textbooks.

In addition the case studies indicated that certain management processes needed to change in a high-value setting. The clothing manufacturer found that more time was now spent on market analysis and strategic decision-making. In the case of the mechanical handling company it was found that traditional performance measurement systems were no longer appropriate and they had to design more dynamic measurement systems.

Research is needed into the design and management of knowledge intensive processes.

(3) Management of the transition to high value operation

All phases of the research highlighted the need to develop a better understanding on how to make the transition to a high value operation. This understanding can be made up of a number of elements including defining the destination and the focus of strategic change. Even when the high value strategy has been generated and is clear, transition can be difficult due to the lack of change management skills to facilitate this transition. Research is needed to better understand the transition path that companies need to achieve high value operations.

CONCLUSIONS

This paper set out to explore the issues surrounding high value operations; identify the key challenges faced by organisations in pursuit of this; and outline how the operations management research community can aid organisations in engaging in high value activities.

In relation to the first objective this paper has highlighted the confusion around the meaning of high value. It is immediately clear there is a definitional problem in relation to this term with a number of meanings competing to be recognised ranging from an engineering view, where value means achieving maximum functionality at least cost, to the financial view where value is understood as profit. This already poorly defined term called value is then applied to a number of contexts including value to the customer, value within the supply chain and combined with other terms to form phrases such as value proposition or value chain so compounding the definitional complexity. Finally to confuse things further phrases such as ‘moving into higher value business’ and ‘value adding activity’ are created with no underpinning definition of what the higher value business can be.

From this work it is proposed that the first step in clearing this confusion should be to separate the concept of value into 2 discrete aspects; firstly the customers perception of value or, put another way, what makes the customer engage (and be satisfied with) another organisation as a supplier; and secondly, from an organisations internal perspective, what are the activities that can be carried out that initiate and sustain that engagement.

Much of what has been written about high value has come from disciplines like economics, marketing and finance. However we believe that these high value activities exist within the remit of operations and therefore the operations management research community have a significant role to play in identifying this concept of value.

In relation to the second objective this papers identifies the key challenges faced by organisations. These can be summarised as: firstly, understanding the needs of the customer in terms of the value they are looking to gain from supplier activity; secondly, identifying key competencies within the organisation that result in value for the customer; thirdly, envisioning the desired operational end-state that will deliver the value that the customer wants; and finally carrying out the transition process to achieve that end-state. In addition this research identifies a further challenge that is accessing support from either government or academia to help in the entire process of change.

In relation to the third objective there are three key research themes that emerge for this study. Firstly, in relation to the term value and its presence at each point in the supply chain, it is clear that tools are required to help companies analyse the supply chain within the industry that they are part. Tools that will help them understand the needs of the customer, both tangible and intangible, so identifying the value-adding activity that they can provide. Secondly, the methods available for designing value-adding processes such as research and development and service delivery are immature in comparison with the methods that are available for designing more repetitive manufacturing processes. Work needs to be done to produce robust techniques to ensure efficient design of the value adding processes that are required. Thirdly, once implemented these value-adding processes need to be managed effectively. The challenges required here differ from those faced in managing repetitive processes in a number of ways: 1) the value adding elements are based on more complex activities that cannot be totally captured within a procedure i.e. conception cannot be totally separated from execution; 2) these activities are more likely to be staffed by knowledge workers working in a more empowered and autonomous way so requiring a more flexible operational control system; 3) the supply chain is likely to be more flexible and dynamic where boundaries between organisational

responsibilities may be less well defined. Techniques to help managers to meet these 3 challenges will be required.

By identifying the inconsistencies in the current debates, both in academia and industry, surrounding the concept of high value activity this paper has taken us some way towards developing a research agenda to assist operations management to move forward and meet the current challenges facing industry. This study has used the three methods of literature review, case studies and focus groups, to engage with these issues. This paper recognises that more research is required to further unpack these issues. It is proposed here that further research should be conducted that goes deeper into specific industry sectors using case study methods to investigate further examples of both successes and failures. While this paper suggests that there are common issues and challenges that exist across sectors there may also be sector specific factors that affect the operation of companies. This additional research will allow the research community to generate a more detailed research agenda.

REFERENCES

- Bititci, U. (2005), *How Can We Make It In Scotland?*, University of Strathclyde working paper.
- Bititci, U.S., Martinez V., Albores, P & Mendibil, K (2003), "Creating And Sustaining Competitive Advantage In Collaborative Systems: The What And The How", *Production Planning And Control*, Volume 14, Number 5, pp410-424.
- DTI (2002) *The Government's Manufacturing Strategy* <http://www.berr.gov.uk/files/file25266.pdf>
- Edwards, T., Battisti, G., McClendon, W. P., Denyer, D. & Neely, A. (2004), *How Can Firms In The UK Be Encouraged To Create More Value?* Advanced Institute of Management (AIM)
- Leseure, D. M., Birdi, D. K., Bauer, D. J., Denyer, D.D. & Neely, P. A. (2004), *Adoption Of Promising Practice: A Systematic Review Of The Literature*. Advanced Institute of Management (AIM)
- Livesey, F. (2003), *Manufacturing Services To Rival Business Services*. London Development Agency. London Production Industries Commission.
- Livesey, F. (2006), *Defining High Value Manufacturing*. Cambridge, University Of Cambridge Institute For Manufacturing.
- Macbryde, J. and Watson, E. "Repositioning in higher value markets through strategic management of operations" In *Managing operations in an Expanding Europe*, Abstracts of the 14th International Annual EurOMA Conference. Ankara, June 2007. ISBN 978-975-6090-23-7
- Porter, M. E. & Ketels, C. H. M. (2003), DTI Economics Paper No. 3 *UK Competitiveness: Moving To The Next Stage*.
- Watson, E., MacBryde, J., Burns, N., Szwejczevski M., Randle, B., Annon, D. & Battisti, G. (2006) "Repositioning in the Value Chain: How can companies do it and is it worth it?" In Mendibil, K. & Shamsuddin, A. (Eds.) *Moving up the Value Chain*, proceedings of the EurOMA 2006 Conference. Glasgow, June 2006. ISBN 0-947649-52-2
- Wise, R. & Baumgartner, P. (1999), "Go Downstream: The New Profit Imperative In Manufacturing". *Harvard Business Review*, Sept-October p133-142