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Supply chain management: theory, practice and future challenges

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Abstract

Purpose – The purpose of this paper is to critically assess current developments in the theory and practice of supply management and through such an assessment to identify barriers, possibilities and key trends.

Design/methodology/approach – The paper is based on a three-year detailed study of six supply chains which encompassed 72 companies in Europe. The focal firms in each instance were sophisticated, blue-chip corporations operating on an international scale. Managers across at least four echelons of the supply chain were interviewed and the supply chains were traced and observed.

Findings – The paper reveals that supply management is, at best, still emergent in terms of both theory and practice. Few practitioners were able – or even seriously aspired – to extend their reach across the supply chain in the manner prescribed in much modern theory. The paper identifies the range of key barriers and enablers to supply management and it concludes with an assessment of the main trends.

Research limitations/implications – The research presents a number of challenges to existing thinking about supply strategy and supply chain management. It reveals the substantial gaps between theory and practice. A number of trends are identified which it is argued may work in favour of better prospects for SCM in the future and for the future of supply management as a discipline.

Practical implications – A central challenge concerns who could or should manage the supply chain. Barriers to effective supply management are identified and some practical steps to surmount them are suggested.

Originality/value – The paper is original in the way in which it draws on an extensive systematic study to critically assess current theory and current developments. The paper points the way for theorists and practitioners to meet future challenges.

Keywords Supply chain management, Suppliers, Strategic management

Paper type Research paper

Introduction

“Supply management” can be viewed as both an emergent field of practice and an emerging academic domain. Neither perspective is fully mature but each has considerable promise. The future progress of each will be enhanced and indeed is ultimately dependent upon the other. Hence, the purpose of this paper is to take stock of developments in theory and practice to date and to identify barriers and possibilities. Moreover, given the off-remarked acknowledgement of the crucial importance of the behavioural and people dimension but the relative neglect of this in any substantive form, we give special attention to this aspect. Supply (chain) management is ultimately about influencing behaviour in particular directions and in particular ways. The underlying logics, drivers, enablers and barriers merit and require close attention.



A number of analysts have already sought to comprehend and substantially redraw the boundaries of, and the essential nature of, this domain of theorising and practice. For example, in one of the more coherent and developed attempts at a reconceptualisation, Harland *et al.* (1999) present the case for a new expanded body of knowledge and field of practice which they suggest should be labelled “supply strategy”. The rationale behind this is the intent to improve upon the more limited concepts of “operations management” and “operations strategy”. They suggest that supply strategy can embrace logistics, operations management, purchasing and supply management, industrial relationship marketing and service management. But, they suggest it is not just an aggregation of these: the underpinning idea is to exploit “relational strategies” in a holistic way.

When approached in such a way the field merges imperceptibly into the strategic management literature concerned with strategic partnerships (Storey, 2002). Strategic partnerships can be formed “horizontally” and “vertically” – the latter being expressions of supply or channel relationships. Closer bonds are:

... what separates partnerships from a more transaction based set of exchanges which are limited in scope and purpose (Mohr and Spekman, 1994, p. 140).

The essential point is to identify and describe a domain of theory and practice where there is potential for some additional gain by reconceptualising it in a particular way. The important idea captured at least in part by “supply strategy” (or “strategic supply management”) is that a mode of thinking and action which encompasses, and seeks to exploit, interlocking relationships could potentially be used as a powerful lever for competitive advantage (Ketchen and Giunipero, 2004).

Drawing upon an extensive three year research project which involved a number of supply chains encompassing a total of 72 companies in Europe, we seek in this paper to shed new light on the theory and practice of strategic supply management. We will argue that while there is an emerging body of theory which ostensibly offers a relatively coherent and compelling prescriptive narrative, predominant practice is at considerable odds with this conceptualisation. We will also reveal the substantial reasons why such a discrepancy exists and why it is likely to persist in most value chains for some time to come. It is certainly possible to find transient instances of impressive practice; but we maintain and show that these are vulnerable to erosion. Thus, while the field of supply (chain) management has promise in terms of its idealist allure, in practice it will remain under-developed unless new modes of skilful intervention are developed.

If supply chain management is to mature as a discipline there needs to be further progress in clarifying its domain, its central problems, its core components, its theories and its theoretical map (Tranfield and Starkey, 1998; Croom and Romano, 2000; Storey *et al.*, 2005). In addition, we need to attend to how this work in theory-building can be assisted by drawing on the study of practice. Under this latter heading we include most centrally how managers’ own cognitive maps, expectations and goals are constituted and what barriers stand in the way of the realisation of the idealistic notions such as “seamless end-to-end pipeline management” (Storey *et al.*, 2005). Thus, a further refinement of the objectives of this paper can be stated thus to:

- identify and clarify the core conceptual building blocks of the emergent discipline;
- examine these conceptual building blocks in relation to empirical data in order to develop a view on the fit between theory and practice; and

- identify the future challenges that these revealed outcomes pose for supply chain management as both a practice and a discipline.

The paper is structured in four parts. The first summarises the key elements in supply chain management theory; the second explains the methods by which we investigated supply chains in practice; the third identifies some of the crucial features of supply chain management practice; and the fourth discusses the implications of the comparisons between theory and practice. In particular, this final section identifies key issues meriting special attention in the future.

The theory of supply management

It is apparent that much of the focus in the increasingly voluminous literature on supply strategy, operations strategy and supply chain management is directed at meaning making. Often this comprises assertions about what it essentially “is”. The precepts of SCM as currently portrayed are a mixture of three elements: description, prescription and the identification of alleged trends.

Description

Debates here relate to scope and focus. Some academics openly declare that they use the terms supply chain management and purchasing “synonymously” (Stuart, 1997). Pragmatically there may be much to commend this but the identification with one function and one process seems to miss much of the idea of supply chain or network management. Others evidently have a more expanded notion in mind, for example, the lean supply approach focused on the “purchasing activities of vehicle assemblers and the supply activities of the component (and component system) manufacturers” (Lamming, 1996, p. 183). Accordingly, Lamming argues, for the merits of the broader concept of “supply management”. Some purchasing specialists see SCM as about developing relations with suppliers (Giunipero and Brand, 1996), while others say that good supplier management is not enough; there is an additional requirement for a wider, more integrated, all-encompassing perspective embracing all processes from sourcing through make and transportation and on to merchandising to final customers (Davis, 1993).

In the battle over definitions and descriptions, part of the agenda is undoubtedly an attempt to re-position functions and *quasi*-professions such as operations management and logistics. We return to this point later. Rather than try here to determine the precise construct, we acknowledge the value of adopting a constructivist approach – that is exploring how actors themselves engage in meaning-making. Through this latter approach we have the opportunity to explore how relevant actors construe their prime objectives, the scope of their activities, the allocation of responsibilities, the barriers to desired practice and the enablers. Accepting the value of this approach does not deny the contribution of theory and model-building of the kind more conventionally found within supply management.

Prescription

Problems arise when the shift from description to prescription is relatively covert. Beneficial attributes are often attributed to certain features. For example, one definition suggests that:

... any chain or network connected through electronic means can be considered virtual if it facilitates efficient and effective flows of physical goods and information in a seamless fashion (Chandrashekar and Scharj, 1999, p. 27).

Some prescriptions stem from observed superior practice in particular domains. The IMVP prescription deriving from Toyota and its suppliers leading to the lean production formula is arguably of this type. Another example might be the prescription for mass customisation and agility (Pine, 1993; Goldman *et al.*, 1995; Meier and Humphreys, 1998).

Prescription can be valuable, but for the discipline to advance there needs to be also rigorous testing – and serious exploration of the causes of failure.

Trends identification

The literature on supply chain management tends to move rather imperceptibly between description, prescription and trend identification. Key trends which have been identified include, most notably, “cooperation” rather than competition, a shift from the “antagonistic” model to a collaborative model (Matthyssens and Van den Bulte, 1994; Carr, 1999), the increasing use of supplier-evaluation tools (Carr, 1999), a trend towards supplier management, and so on. While the alleged trends may be similar, different kinds of assessments are sometimes made. Some authors suggest an irresistible trend while others note the relatively limited take up to date (Skjoett-Larsen, 1999; Kemppainen and Vepsalainen, 2003).

Another facet of the trends dimension is the concern with the “impacts” of SCM on various functions such as purchasing (Andersen and Rask, 2003; Wisner and Tan, 2000), the impacts on suppliers required by retailers to replenish stock based on actual sales (Abernathy *et al.* 2000), and the increasing use of tools and techniques such as “Quick Response” (QR) and “Efficient Consumer Response” (ECR). A trend, possibly mainly restricted to the auto industry, is towards a pattern of differentiation in the supply chain with, for example, a few “system integrators” at first tier supply level (Senter and Flynn, 1999).

While most trend analysis implies progress – for example, Hines *et al.* (2004) – Fisher (1997) claims that despite all the technology and the new techniques, supply chain performance in many instances has “never been worse”. The reason, he suggests, is that managers lack a framework for determining which methods are appropriate. This implies the need for managers to adopt far more of a contingent rather than a “best practice” approach. It further suggests a need to fit supply chain characteristics to product strategy. Similarly, partnership may not always be the right approach in every circumstance (Lambert *et al.* 1996).

The underlying claimed “trend” is that supply management consciousness is accelerating up the corporate agenda and there does appear to be some evidence for this. For example, many companies have appointed supply chain directors and there has been talk of competition between supply chains rather than simply competition between individual firms (Christopher, 1998). Perhaps even more prevalent has been the trend towards the conscious examination and rationalisation of supplier networks and the development of “collaborative” or “partnership” relationships between buyers and suppliers (Balakrishnan, 2004). Such initiatives have come to be seen as of strategic significance by general managers rather than simply tactical gains by functional specialists (Storey, 2002).

But these examples point to a problem for supply management as a potential discipline. There is already a reasonably well-developed field concerned with buyer-supplier behaviour (or purchasing) and this has its own set of core concerns. Many of these concerns relate to the choice of supplier, managing relationships with suppliers and so on (Monczka and Petersen, 1998). But this sub-field rarely attends to the wider vision of the supply chain management concept with its notions of end-to-end pipeline management and the seamless, efficient, flow of information and materials/products through the whole network or chain – from source, through make, and on to delivery to the end customer. Thus, while there are certainly overlaps between the dyadic buyer-supplier behaviour domain and the supply chain (or network) concept there are also some substantial points of difference.

So, in the light of the discussion so far, where does the emergent discipline of supply (chain) management stand today? Academic disciplines normally have core sets of concerns or problems, but the variability and uncertainty within supply management of its core concerns is one of the problems it faces (Ho, 2002).

Our review of the literature on supply chain management suggests that the field is characterised by idealism and fragmentation. It uses overlapping terminology which is in turn drawn from multiple-disciplinary bases. Croom and Romano (2000) show how 11 different subject literatures – including, for example, purchasing, logistics, marketing and organisational behaviour – have contributed to the supply chain domain. Despite recent attempts to map the terrain (Chen and Paulraj, 2004; Giannakis and Croom, 2004; Mills *et al.*, 2004), the field remains disparate. None the less, when comparisons are made across the literatures there are some basic shared “visions” which help form an underpinning “big idea” – or a number of interlocking big ideas which help constitute and describe supply chain management. In Table I, we draw upon a wide literature in order to enumerate and categorise these core ideas.

This dichotomous representation suggests of course a rather stark set of alternatives. It nonetheless represents widely held assumptions about the “paradigm shift” to partnering, strategies of co-operation, and SCM.

The unit of analysis itself – the supply “chain” – is itself a matter of some contention. Sometimes the internal supply chain is seen as a suitable arena; alternatively the dyadic relation between buyer-supplier is the unit of analysis, or a chain or a wider network. Then, within the confines of any of these, intervention may be directed at efficiency improvements of existing processes, the redesign of interfaces, or (more rarely one assumes) radical restructuring of the supply chain components (De Treville *et al.*, 2004). Critiques of the discipline of supply chain management suggest that it is atheoretical and relies too much on prescription and description (Cox, 1999; Croom and Romano, 2000).

As Table I suggests, there are a number of interlocking ideas and propositions which constitute the theory and prescription of supply management. The central underpinning ideas relate to alignment and integration. Whether sub-components or services are made or bought, the prescription is that the interface between each value-add phase should be subject to careful planning and management. Other important related concepts include core competences, supplier segmentation, strategic purchasing and supplier integration (alignment; supply-base management, and reduced supplier base). Other fundamental ideas include win-win relations between partners in the chain, goal congruence, avoidance of opportunistic behaviour, supplier

Dimension	Conventional management	Supply chain management
Unit of analysis, focal point of allegiance	Function, department, or firm as main unit of analysis	Supply pipeline as unit of analysis (materials flow planning; echelons; structures; value chain; network)
Use of information and knowledge	Information denial; lack of transparency	Information & knowledge sharing; transparency
Beneficiaries	One-sided benefit; win-lose	Mutual benefit; win-win
Targets	Optimisation; cost reduction; price central	Maximisation: Wider set of issues: value creation: quality, service, safety, etc.
Time horizons	Short-term wins; periodic negotiation	Long-term gains; life cycle (total value) costing
Relationship episode	Transactional	Longer term, deeper, multi-faceted relations
Range of "partners"	Multiple competitive sourcing	Single or reduced sourcing
Scope of task	Fragmented tasks; impermeable rigid boundaries; discrete activities	Interdependency; Co-makership; permeable flexible boundaries; overlapping activities
Connectivity	Independent logistics	Integrated logistics
Reactive vs proactive	Reactive buyers	Proactive buyers
Process of supplier selection	Competitive tendering	Total screening
Scope of attention	Role specific behaviour and knowledge	Expansive knowledgeable and behaviour
Replenishment device	Inventory	Information

development, strategic alliances, variants of vendor managed inventory (VMI), and the sharing of risks and rewards. Beyond these core concepts, there are some points of difference depending on the particular approach to supply chain management that is proselytised.

Make or buy is a crucial preconditioning decision which determines the need for the amount of external relationship management. How much difference it really makes whether the supply chain extends across different ownership structures rather than a single vertically integrated organisation is a moot point and is yet to be subject to sufficient systematic empirical investigation. It would be fair to contend that the question of where to locate the decoupling points in order to address issues of replenishment exists relatively independently of the ownership make/buy decision. The whole issue of relationship development across partners is however highly connected with the nature of the independent units. But again, the precise nature of the practical managerial challenge to forging win-win collaborative partnerships across the supply chain irrespective of whether the partners are officially internal or external to the focal organisation is itself also relatively under-explored. Some analysts focus entirely on internal tensions, for example, between the marketing and logistics functions (Ellinger, 2000), while others ignore this and focus only on the external (Cox, 1999).

Much of the theory in supply management is based on idealised schemas of optimal routes and quantities for demand fulfilment when considered from a whole-network or chain perspective. These idealised schemas may vary in detail when advanced by various proponents but there are a number of relatively common elements. These common elements are constituted by a number of technical possibilities. Table II summarises the characteristics underpinning the ideally managed supply chain.

Nestled beneath the dominant big idea of supply chain management as a whole (i.e. the notion of an aligned and possibly integrated network of processes from end customer to source and design of product and service) are a number of sub-theories. These include for example lean (Womack *et al.*, 1990), agile (Goldman *et al.* 1995) and market segmentation (Gattorna, 1998). The latter leads to the concept of a differentiated approach to supply chain provision (Fisher, 1997). These ideas have fuelled recent development (Cigolini *et al.*, 2004; Lee, 2002; Randall *et al.*, 2003) and critique (David *et al.*, 2002).

Usually remaining implicit in the core component ideas shown in Tables I and II and in the sub-theories are a number of issues and activities. These can be understood

1	Seamless flow from initial source(s) to final customer
2	Demand-led supply chain (only produce what is pulled through)
3	Shared information across the whole chain (end to end pipeline visibility)
4	Collaboration and partnership (mutual gains and added value for all; win-win; joint learning and joint design and development)
5	IT enabled
6	All products direct to shelf
7	Batch/ pack size configured to rate of sale
8	Customer responsive
9	Agile and lean
10	Mass customisation
11	Market segmentation

Table II.
Idealised supply
management
characteristics

as a series of mainly unanswered and yet crucial questions: who is responsible for “managing” these activities? Just because supply chains may exist it does not necessarily follow that they are actually managed. Even if they are managed in parts, it does not necessarily mean that they are managed across the whole spectrum. How do the actors reach-through the various echelons in order to achieve the desired aligned goals? What levers do they pull? What barriers do they encounter and how do they seek to overcome these? These particular questions are especially pertinent given that, as has already been noted, most definitions of the field are based on metaphors (pipelines, chains, networks) rather than “objective entities” (Saunders, 1994). Managing objective entities is difficult enough, but how do managers cope with and engage with the metaphorical forms? These, and similar questions, which have so far been massively neglected in the literature to date, formed the heart of our empirical research project.

Researching current supply practice

As we said at the outset, one of our central objectives was to examine the theory and practice of supply chain management. Hence, to complement the summary of supply chain theory in the previous section we set out to compare that with contemporary practice. In order to map current practice we designed a large study which explored a range of supply chains across multiple echelons. Notably, in the core part of the study we delved into the supply chain management practices of six “blue chip” firms (and their suppliers and customers), which we will refer to as Pharmaco, Householdproductsco, 4PLDrinks, TelevisionCo, ElectronicsCo and 4PL Electronics. These cases were selected on the basis that, according to information in the public domain, these players were likely to exhibit leading-edge sector practice. A summary of the six case environments is shown in Table III.

Pharmaco is a large manufacturer and retailer of pharmaceuticals and related healthcare products; HouseholdproductsCo is a manufacturer of a range of skincare and beauty products; 4PL Drinks is a division of a global logistics corporation which specialises in third and fourth party logistics in partnership with a number of alcoholic and non-alcoholic drinks manufacturers; TelevisionCo designs and makes a whole range of domestic electrical goods including televisions of both high and low specification; ElectronicsCo designs and supplies sophisticated telecommunications network equipment; and 4PL Electronics is a joint venture between a major logistics provider and a computer equipment manufacturer. As the sales figures in the third column of Table III reveal, these were all substantial businesses. The companies listed in the fourth column indicate the number of supply chain partners that were also researched. The final column shows the number of interviews conducted in each case.

Company	Sector	Sales	Companies	Interviews
Pharmaco	Process	£4.3 bn	4	29
HouseholdproductsCo	Process	£115 m	6	48
4PL Drinks	Transport	£30 m	6	31
TelevisionCo	Electronics	\$2.4 bn	8	27
ElectronicsCo	Electronics	\$4.1 bn	2	40
4PL Electronics	Transport	\$1.7 bn	6	19

Table III.
Summary of the six case
environments

Interviewees were selected according to the key supply chain processes they managed in each of the firms. We were primarily interested in the evidence provided by directors and middle managers covering all supply processes (plan, source, make and deliver). Interviews were conducted in the UK, Ireland, the Netherlands, Germany and Italy. The duration of each interview was usually between one and a half hours to two hours. All interviews were recorded and transcribed. Some key informants were interviewed on multiple occasions. We undertook extensive site tours and collected large amounts of documentary materials relevant to SCM. The project commenced in 2001 and continued into 2004. The scope of the six supply chains that we studied was plotted, based on an adapted version of the New and Payne (1995) supply chain taxonomy. This is shown in Figure 1.

From this body of research we have started to compile a picture of current supply chain practice, and have identified a number of organisational and behavioural barriers to the realisation of the more idealistic depictions of the “seamless, end to end” chain that should be responding to customer demand. Despite the considerable interest among practitioners in the idea of supply chain management – and this interest was certainly found among many of our respondents – its practice usually differs markedly from the idealised prescriptions identified in the previous section. The research into practice also helped us identify the nature of the more significant (real-life) trends in supply chain management today.

We interrogated supply chain practice through a series of four fundamental questions:

- (1) Who was “managing the supply chain” in practice? (That is, which individuals or groups are actually engaged in such practice?)
- (2) What type of “supply chain” activities were they managing?
- (3) What were the key enablers and inhibitors to this process?
- (4) What external factors were driving the strategic imperative of supply chain management?

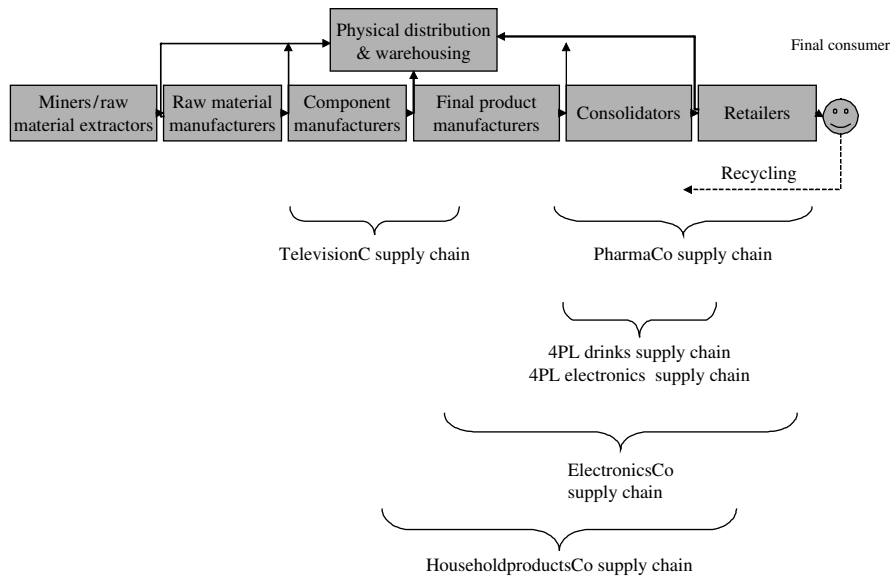


Figure 1.
Scope of the six supply chains studied

This kind of dual theoretical and empirical approach is in tune with the point made by Croom and Romano (2000, p. 75) that:

Theory, practice
and challenges

... the inductive-deductive dichotomy is best addressed through the constant reflection of empirical against theoretical studies.

Results: supply chain practice(s)

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The description of results is structured into four-sections, each one capturing the findings from one of the fundamental questions used for exploring the supply chain.

Who is "Managing" the supply chain?

The holistic concept of "seamless, end to end" supply management – as distinct from a series of units or functions engaging in sub-optimal behaviour – is clearly laudable. However, it implies some considerable effort to reach through the supply chain: upstream beyond the first tier suppliers, and downstream beyond a focal firm's customers – the so-called "arcs of integration" (Frohlich and Westbrook, 2001). Alternatively, it would require an unusual degree of co-ordination between tiers. Rarely asked by the proponents of such "integrated" supply chains is who precisely is meant to be doing this "managing"? In practice we found very few instances where any such active agent could be identified. The modal pattern was a number of practitioners who sought to manage parts of the supply chain. These parts were normally circumscribed by legacy practice and also by the expectations of other senior colleagues who defended "their" functional areas of responsibility. As the results in Table IV demonstrate, it was still more common to have a logistics director than a supply chain director – usually with a focus on outbound logistics.

With the shift to outsourcing there had been a significant reduction in the scale and scope of in-house manufacturing facilities. Where these remained, the procurement of parts was predominantly a procurement and/or purchasing function responsibility, the exception being TelevisionCo, where supplier base management had been recently integrated into their already cross-functional, market-orientated supply teams. Manufacturing and assembly operations were managed by separate manufacturing functions. Normally, even people with the title "Supply Chain Director" did not actually manage the whole chain nor did they usually expect, or seek, to do so. They were confined to inward or outward logistics. In manufacturing their writ rarely extended to production planning and in retail they were usually not able to interfere too strongly in the affairs of the trading directors.

Supply chain theory would suggest that the supply chain should be managed from end-to-end. Our research found very few examples of this but it did illuminate the barriers to its achievement in practice. There were one or two instances where very senior directors carrying multiple responsibilities were able to transgress these norms but these were exceptional. Even where 3PL or 4PL companies were hired to take charge of supply chain management they tended to restrict their activities – or have them restricted – to limited segments of the chain. Even the tightly-coupled logistical operations between 4PLCo Electronics and their customer did not include the provision of information about products in the process of manufacture – the first alert was given when a product was ready to be shipped from the factory gate. Management of the supply chain was analogous to a relay race, with responsibility being passed from one company of actors to another, as illustrated by the array of management mechanisms found.

Table IV.
Supply chain
"management"
mechanisms

Company	SC director	Logistics director	Shared understanding of who managed the SC?	Mechanisms for managing the SC
Pharmaco	Y	Y (reports to SC director)	Dependent on category	Category specific supply chains managed by a category team and a supply team supported by the logistics function Cross-functional teams highly effective at "managing" the seasonal supply chain
Householdproductsco	N	Y	N	Functional hierarchy, with demand fulfillment responsibilities split between logistics and manufacturing. Project-based initiatives to integrate management activities across internal functions. Unsuccessful attempt to introduce boundary spanning, customer-service logistic personnel
4PL Drinks	1 (of 4)	3 (of 4)	Y	Cross-competitor consortium of independent competitors facilitated by 4PL. Category-specific retail supply teams supported influential buyers. Standardised on-shelf merchandising practices institutionalised through select training Stores. Key supplier collaboration through retail in-plants conducting data analysis and peak merchandising activities
TelevisionCo	Y	Y	Y	Matrix organisation. Process-orientated, hierarchical SCM structures supported by functional infrastructure. Internally integrated, market-orientated supply teams which planned and co-ordinated demand fulfilment operations. Pilot projects linking forecasting activities, collaborative planning and loyalty improvement programmes with key customers. Cross-competitor supply agreements to facilitate channel postponement
ElectronicsCo	N	Y	Y	Project managers – act as a link between the customer and the supply chain Use of a 4PL to manage outbound supply chain and they were seen to have clear accountability
4PLCo Electronics	N	Y	Y	The 4PL had clear accountability for managing a regionally-specific, outbound logistics SC. This had been assigned by the customer

Scope of managed supply chain activities

Reaching out across the supply chain and “interfering” in suppliers’ operations was still relatively unusual. Exceptions related to major third party or sector-level initiatives such as ECR in supermarket retailing – though even these appeared to be limited to a focus on a few strategically significant first tier suppliers. The assumption in some of the literature that supply chains are managed by powerful customers who influence suppliers to conform may be broadly correct in the motor industry where there are a few international large assemblers, but it is a generalisation that does not apply in many other sectors. Indeed, in many instances the reverse may hold true (Bates and Slack, 1998). Even “in-sector” ECR generalisability is problematical. For example, our case research revealed clear “push backs” even from the champions of ECR: powerful brand holders sometimes resisted customer-led attempts at supply chain management.

Despite this evident lack of holistic SCM, we did find evidence of internally-focused integration attempts, particularly within globally dispersed supply chains. Such efforts tended both to simplify control, whilst reducing costs and cycle times within internal logistics activities. For example, TelevisionCo had embargoed any more than two cross-continent airfreight moves during component manufacturing operations which were distributed around the globe.

Attempts to improve internal functional co-ordination ranged from the appointment of senior managers with designated responsibilities to the nomination of operational individuals with specific accountability for selected boundary-spanning activities. Between these extremes, the institution of formal cross-functional teams was used by some to improve pipeline integration.

In certain cases, sophisticated key performance indicators (KPIs) were agreed and monitored between SC partners. Often in the form of balanced scorecards, these measures were weighted to drive SC practice in a particular direction. Customer-orientated measures were balanced against internal priorities. The weaknesses of such formalised performance measurement systems were compensated for by pragmatic exception policies.

Both ElectronicsCo and TelevisionCo produced (among other things) two major different products: on the one hand, “off-the-shelf” products, and on the other “fully customised systems”. Off-the-shelf products tended to be high volume, low variety and low value items that would flow through the logistics infrastructure (including a range of distribution channels) to the end customer. Fully customised systems, on the other hand, were very high value, highly customised systems made and, in the case of ElectronicsCo installed, to specific customer requirements. ElectronicsCo employed project managers to ensure that the systems were installed to customer requirements both in terms of specification and time-line, and they even set-up dedicated warehouses around the world to facilitate installation as required. The scope was similar for Householdproductscos supplying washing and bathing products to a wide range of retail customers. However, the main difference here was that Householdproductscos did not have contact with the end consumer. The narrowest (though paradoxically the most clearly “managed”) scope was the 4PLElectronics supply chain. The scope was limited to the outbound logistical operations of their close partner in Europe. This 4PL joint venture company did not even have information about products in the process of manufacture – their first alert was when a product was ready to be shipped from the factory gate. In consequence of the typically constrained scope of intervention

the notion of “seamless end-to-end pipeline management” was far beyond actual practice – and indeed some distance even beyond aspirations.

Enablers and inhibitors

The research found that a number of factors can either serve to enable or inhibit supply chain management depending on the context and the way in which the factor is utilised. The case research identified three core enablers and inhibitors, the understanding of which is central to turning supply chain rhetoric into reality. These are: transparency of information and knowledge; supply chain behaviour; and performance measurement. The results in relation to each are considered in turn.

Transparency of information and knowledge. Most of our cases illustrated a move away from forward prediction based on short-term, EPOS data. Rather, consolidated analysis of base trends over the medium-to-long term were used to provide forward-looking forecasts. These were then overlaid with promotional activities, an approach adopted, for example, by a shared customer of Householdproductsco and 4PL Drinks.

When judged in these terms we found, at best, pockets of good practice rather than whole-firm exemplars. Rich information was largely found to be restricted to specifically identified users in particular relational contexts. For example, extended collaborative planning, forecasting and replenishment practices had been instigated with one internal customer within one of the market-orientated supply teams at TelevisionCo. Even where this occurred, the persistence of such privileged arrangements was vulnerable to erosion, revision and withdrawal. In another case, a supplier to Householdproductsco had championed a Supplier Managed Inventory system with their major customer. Replenishment activities were driven by customer production schedules. The customer, however, seemed keener to abandon the system than work through emergent issues.

A further forecasting refinement was attempted by one upstream, component supplier. An application was introduced to amalgamate component sales' forecasts at system-level. This provided a more accurate prediction of future sales, since aggregated data could be compared against external market trends. The impetus behind this project was customers' tendency to over-forecast their requirements to secure supply in this rapidly growing marketplace, when they knew manufacturing capacity was scarce.

Supply chain behaviour. Predominantly, traditional inter and intra-organisational boundaries remain mainly intact. Dyadic buyer-supplier relationships remained the mainstay of supply interactions. These were supplemented by a variety of support roles – whether replenishment or product development-focussed.

Clear power differentials existed within buying decision-making units, particularly within retail organisations. There was substantial evidence of attempts to divorce traditional elements of buyer-supplier negotiation from “collaborative” activities. Customer-focussed key-account management structures had evolved to “face up” to major customers.

However, such so-called “man-to-man marketing” on the customer side, often led to greater intra-organisational complexity. The most complex network of supply relationships we studied was found within TelevisionCo. Twenty-six parallel business line teams were responsible for executing order fulfilment activities for their respective markets. Each of these cross-functional management teams was responsible for

the sourcing, capacity planning and operational control of technologically similar semiconductor products through a common configuration of manufacturing and test operations. However, managing the intra-relationships between these organisational units and an externally-facing sales organisation (to provide a single point of customer contact) raised internal co-ordination challenges.

Where boundary-spanning specialist “in-plants” were used, these tended to be in “adjoining” organisations (i.e. supplier-customer). There was a wide variety of roles, from project analysts working on information system co-developments and data analysts handling promotional evaluations, to goods despatch handlers and specialist merchandisers. Whilst the employing companies’ declared clear benefits from these interactions, the scope of individual roles was often constrained and precarious.

Promotional activities, increasingly common within UK multiple retailers, created additional challenges. These planned events commonly generated an uplift from base demand of 70-100 per cent. Such demand stimulation required cohesive supply chain planning if on-shelf availability was to be sustained. However, such was the cut and thrust of commercial competition that promotions were frequently not pre-announced to branded suppliers for fear of a competitor seizing the initiative. Instead, regional safety stocks were held in an attempt to underpin supply continuity.

Performance measurement. The predominant method of performance measurement was the use of KPIs that cascaded down from top level business objectives and measures, through the organisation into a series of functional measures. The alternative method found in just two cases was the use of a balanced score card (BSC), which, in the case of 4PL Co Electronics, was sophisticated. The main results in relation to performance measurement used in SCM are shown in Table V.

However, even the BSC was cascaded down from business objectives to functional objectives. Pharmaco made a conscious effort to try and keep the BSC for different activities at the “highest” level possible. For instance, the BSC for distribution was for an entire region and not at individual Regional Distribution Centre (RDC) level. However, the management at the RDC found it to be an inadequate tool for managing the operation of the RDC and the regional manager in conjunction with the RDC managers were in the process of developing a hybrid system that measured both RDC and regional performance. Furthermore, the cascade, whilst seeming to be eminently sensible in linking metrics, has the pitfall that the sum of the parts does not equate to the whole. All too often, metrics pursued at a functional level for the benefit of functional targets, jeopardised the performance of the supply chain as a totality. A good example was found in 4PLCo Electronics. The performance measurement system employed in this supply chain was exemplary in many respects. Metrics were collected at all stages in the supply chain – daily, weekly, monthly and quarterly – and were actively reviewed through telephone calls, face-to-face meetings and business review meetings. The format and content was identical across the supply chain and the measures were used to drive performance improvement and also reward. And with reward, here-in lies the danger. There has been a shift over the last ten years or so towards metrics that are specific, measurable, achievable, realistic and timely (SMART). This has led managers (particularly middle managers) to expect targets that are wholly within their span of control. This in turn leads to functionally driven behaviour. 4PL Electronics had measures that showed that they consistently achieved their 3-day delivery target. However, in reality, for the sample studied, the large

Company	Type of metric system	Consistent application across the SC	Review period
Pharmaco	BSC used across the business affecting consistency of usage	Need for review Internal echelons	Monthly
Householdproductsco 4PL Drinks	Cascade of KPIs Various, customer-specific service level arrangements	No No	Monthly As specified by the customer
TelevisionCo	Balanced scorecard within each business line linked to divisional strategy and targets	Yes, for certain key measures	Weekly, monthly, quarterly
ElectronicsCo 4PLCo Electronics	Cascade of KPIs Customer developed their own metric system that was a developed version of the BSC	Yes, for measures co-ordinated by 4PL Yes, highly co-ordinated by 4PL	Weekly, monthly, quarterly Daily, weekly, monthly, quarterly

Table V.
Performance
measurement
characteristics

majority of orders were delivered after the date the customer had originally requested, and on average they were 16 days late. 4PL Electronics were only measured on the part of the supply chain they were in control of and not on what the customer actually wanted.

Drivers

Supply chain management is becoming of increasing strategic importance, and the fieldwork concurred with the literature in identifying globalisation, outsourcing and fragmentation as three major drivers. Evidence to support each of these drivers is summarised in Table VI which shows that, for all cases, evidence of each practice was found to a greater or lesser extent.

However, an additional driver was also uncovered that did not feature so predominantly in the literature – market polarisation. It could be argued that this potentially has the most significant effect of all. For Pharmaco, Householdproductsco and TelevisionCo the mid-high markets that they traditionally served have disappeared and been replaced by a polarised high-end/low-end market profile. ElectronicsCo has such a broad range of products that these naturally fall into polar extremes of the volume: variety continuum yet the supply chain strategy used to deliver these products is not significantly different. This has serious implications for supply chain management.

Challenges for SC management and future prospects

The challenges facing SCM as theory and practice stem from their interplay and misalignment. The research reported here reveals the substantial gaps between theory and practice. One central challenge is to the very idea of “managing” the supply chain. Who could and should have this responsibility? Arguably one ideal would be a separate function independent of the existing array of functions which are partially but not fully involved. Such a developed function might act as the arbitrator of supply and demand. A number of our respondents envisaged that this development could be supported by the maturation of the 4PL concept. Alternatively, some commentators suggest the need to redefine the purchasing role (Mehra and Inman, 2004). A related challenge is to increase the scope of SCM involvement – the “arc of integration” (Frohlich and Westbrook, 2001). This can only be achieved if the enablers identified above are harnessed more effectively – the greater transparency of information and knowledge, the formation of appropriate relationships, and the design and use of appropriate measurements.

So what are the prospects for the future of SCM? There do appear to be some trends working in favour of a higher profile and a more developed role for supply management. But we suggest they fall well short of the more full-blown claims of many of the advocates. We suggest that business models and supply chain practices are changing in tandem. The most important elements are as follows.

First, supply chain management can be seen as part of a wider set of trends involving outsourcing, cross-boundary working, new organisational forms characterised by flattened hierarchies, teams, empowerment and so on rather than rigid command and control (Ruigrok *et al.*, 1999). These trends present an opportunity for the development of SCM.

Second, the trend towards outsourcing and the increasing importance of intangibles heightens the need for, and the potential of, supply chain management. As contract

Table VI.
Evidence of SC drivers

Company	Globalisation	Outsourcing	Fragmentation	Market polarisation
Pharmaco	Refocused retail operations in UK but increasingly sourcing from abroad	Closure of internal manufacturing facilities and products increasingly sourced externally	SKU proliferation	Aim for mid-high end of market. Under competition from low cost competition, e.g. similar Christmas gift at significantly lower price
Householdproductsco	Development of global brands. Source many commodity base ingredients from abroad	Sub-contract the manufacture of some products	SKU proliferation	Historical middle market disappeared. Aiming for mid-high end market
4PL Drinks	Global location was a distinctive product feature, intrinsic to customer value	Outsourcing was used judiciously for a wide variety of reasons: to balance uncertain demand, to promote region flexibility; to reduce costs	Customer-specific packaging, exclusive products; specific transit or merchandising pack configurations	Increasing significance of UK grocery market shares, when compared to traditional off-trade marketplace. Category competition for merchandising space
TelevisionCo	Global supply chain developed to minimise manufacturing/assembly cost	Strategically use outsourcing to provide additional flexibility and security	SKU proliferation Shortening life cycles	Mature market fragmented into high and low end. Used to serve middle. Growth markets turbulent, uncertain and with rapid technological convergence
ElectronicsCo	Global supply chain with regional distribution	Outsource all non-core activities including logistics	SKU proliferation	Customised systems and merchandised products are at extremes of volume: variety continuum
4PL Electronics	Global inbound, regional outbound	As a 4PL are duty bound to outsource some 3PL activities	Increasing requirement for customised services	Due to limited scope of many supply chains difficult to operate at high-end and add value

manufacturing becomes the norm so the value added role of brand owners who have valued relations with customers are recognised as having important intangible assets and skills.

Third, the trend towards fragmentation and variety in product and service offerings necessitates greater thought and skill in managing decoupling points and postponement of final product composition. Hence, the drivers impelling attention to crucial issues of alignment are certainly present but this does not mean that the task is given to supply chain specialists. This indeed appears to be the source of much confusion; simply because there is an apparent need for someone to take a helicopter view of the whole terrain does not mean that this happens in practice. There are undoubtedly issues of professional status and standing intruding here. In most firms the supply chain function (in whatever guise it happens to adopt) rarely has the political standing to allow it take command of these critical strategic issues.

Fourth, globalisation necessitates greater attention to logistics and to other component elements of supply chain management. The same arguments noted above in relation to fragmentation also recur here. The need is evident; the power to respond is problematic and uncertain. The dispersion of nodes in the supply chain across the continents offers new business opportunities to freight handling companies and third party logistics providers. But these interventions cannot be described as constituting “supply chain management” in the holistic senses described in the early part of this paper. There are wider forces at play – outsourcing, global sourcing, volatile customer demand, heightened competition, shorter product life cycles, and customisation. Then there is the shift to virtuality – leased merge centres, contract manufacturers, innovators who market a concept and have others make it and so on. The pretence that “supply chain management” is a mode of intervention or a self contained discipline which is effectively grappling with these forces is an exaggeration. This is not an arena where a neatly managed activity is underway. That said, the change of mindset triggered by the constellation of forces as described in this paper and elsewhere could provide the opportunity for sophisticated and capable managers to engage in practices which approximate to the vision as described above. There could be a professionalisation opportunity here, or at least a pathway for further occupational development.

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