

# A critical review of survey-based research in supply chain integration

Taco van der Vaart\*, Dirk Pieter van Donk

*Faculty of Management and Organisation, University of Groningen, P.O. Box 800, 9700 AV Groningen, The Netherlands*

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## Abstract

Supply chain (SC) integration is considered one of the major factors in improving performance. Based upon some concerns regarding the constructs, measurements and items used, this paper analyses survey-based research with respect to the relationship between SC integration and performance. The review shows that there are significant differences in the factors and constructs used to measure SC integration. A detailed analysis shows that, at the level of items, three categories can be distinguished: attitudes, practices and patterns. So far, the distinctive role of each of these three categories and how they interact has not been addressed explicitly in research. An analysis of the performance measures adopted shows that, in the survey studies so far undertaken, there has been a clear preference for measuring the performance of the focal firm only, and this through using subjective measures. Based upon this initial analysis, this paper seeks to explore avenues for further research that could better distinguish attitudes, patterns and practices plus their interrelationships. We also argue for focusing further research on SC integration within individual buyer–supplier relationships and examine the impact of this relationship on performance. Further arguments are put forward for incorporating power and business conditions, given their relevance, in future SC integration research.

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## 1. Introduction and background

Over the past decade, one of the main themes in the supply chain management (SCM) literature has been the role of integration as a key factor in achieving improvements (e.g. Tan et al., 1999; Romano, 2003). Many authors seem to agree that integrative practices and a high level of integration have positive impacts on corporate and supply chain (SC) performance.

Recent work (e.g. Frohlich and Westbrook, 2001; Vickery et al., 2003; Childerhouse and Towill, 2003) has provided convincing empirical evidence for the relationship between integration and performance. However, a few years ago, Ho et al. (2002) raised some doubts with respect to the relationship between integration and performance in survey studies. Given that a large number of such survey studies have been published since 2002, it seems appropriate to review, analyse and re-evaluate the current state of affairs.

The aim of our paper is to review and analyse those survey studies that have been reported on the

\*Corresponding author.

E-mail address: j.t.van.der.vaart@rug.nl (T. van der Vaart).

relationship between SC integration and performance, and to highlight a number of concerns with regard to this type of research. Based on these concerns, we consider the potential consequences for the theoretical background that supposedly underpins the work done so far, and for future scientific work within the field of SCM.

### 1.1. Background to and motivation for the study

While much of the research reviewed in this paper is of good quality and has been published in reputable journals, we became puzzled by some of our initial observations with respect to the recently published survey research. These observations could be grouped under two headings and stimulated us to start a systematic and critical review of the literature.

An initial observation was that if we looked at all the surveys on integration, a large list of seemingly different constructs and measurements could be drawn up. However, individual authors usually used only a limited number of constructs and items taken from this large list. This finding is in line with Ho et al. (2002, p. 4415) who stated that there was little consistency in the basic definitions and contents of the constructs used in these studies. In practice, sound constructs and adequate methodologies are needed if one is to understand the relationship between integration and SC performance.

In general, it seems that the field of SCM suffers from a lack of clarity in its definitions. Tan (2001) and Croom et al. (2000) earlier described and classified the large range of SCM and SC integration definitions that then existed, ranging from purchasing type descriptions to almost transcendent definitions. Chen and Paulraj (2004) have more recently confirmed the inconsistency in definitions in the broader field of SCM research by reviewing the many existing constructs and measurement scales.

A second observation relates to the relationships between integration and performance. Different aspects of integration have been measured, sometimes without explicitly addressing the choices involved. Aspects of integration measured range from patterns of behaviour (Johnston et al., 2004) to operational practices (Frohlich and Westbrook, 2001). In addition, it seems that potential interactions between different aspects of integration are often ignored. Another issue with respect to constructs and measurements is that the level of analysis varies among the different studies. Some

survey-based research on integration considers single links and relationships (e.g. Johnston et al., 2004) whereas many other researchers measure integration or integrative practices and their relationship with performance as an organisational variable, valid for all links with suppliers and buyers. For instance, aggregated constructs have been used to measure the integrative practices of a buying company in its links with all its suppliers.

The above observations and concerns motivated us to conduct a systematic analysis of recent research, including papers published later than Ho et al.'s earlier review (2002). Using such an approach, we expected to acquire a thorough understanding of the status of survey-based SCM research and to generate ideas for future research.

The paper is organised as follows. Section 2 describes the methodology employed in our review, including article selection and the method of assessment. Section 3 describes some general observations regarding the papers selected and reviewed. Section 4 presents our main findings with regard to the constructs, dimensions, measurements and scales used in assessing integration. Section 5 addresses the same issues for measuring performance. In Section 6, we discuss our main findings from the review and present what we see as a more comprehensive framework for measuring SC integration. This covers various dimensions and aspects, and takes into account the possible interactions between the different dimensions. Section 7 presents our main conclusions.

## 2. General methodology and paper selection

The amount of literature on SCM is growing rapidly. For the present task, we selected 10 journals that can be considered as major academic journals within the area of Logistics Management and OM/OR, and that have contributed to developments in the field of SCM. From these journals, we identified all papers from 2000 onwards with the word *performance* in the abstract plus one or more of the words *supply*, *supplier* and *chain*. From all the retrieved titles, we initially selected a subset of 46 papers. In this selection process, abstracts were assessed to find out whether or not these papers really fitted with our research objectives—that is did they report survey research on the relationship between SC integration and performance—and if not, they were rejected. Table 1 shows the distribution of these papers across the 10 journals.

Table 1  
Overview of journals and selected papers

Journal	Number of papers (initial selection)	Number of papers (final selection)
International Journal of Operations & Production Management	8	3
International Journal of Physical Distribution & Logistics Management	2	0
International Journal of Logistics Management	5	4
International Journal of Production Economics	2	1
International Journal of Production Research	3	3
Interfaces	1	1
Journal of Business Logistics	5	4
Journal of Operations Management	14	13
Management Science	1	1
Omega	5	3
Total	46	33

In order to ensure that we only reviewed papers reporting on the relationship between integration and performance, we performed the further following steps. All 46 papers were examined in greater detail. Both authors independently assessed the articles, summarising the hypothesis, the SCM factors, the items (and variables) considered, the sample, the industries, the focus (e.g. key suppliers), performance measures plus any additional remarks that would help in making a comparison across our sample of articles possible. Results were then combined, and in the event of significant differences these were discussed until an agreed summary was established.

In this stage of the selection process, we rejected a number of papers for different reasons: upon further consideration, the research did not address the integration–performance relationship (Cassivi et al., 2004; Jayaram et al., 2000; Lockamy III and McCormack, 2004; Narasimhan and Das, 2001; Pagell and Sheu, 2001; Rosenzweig et al., 2003; Martínez Sánchez and Pérez Pérez, 2005; Sriram and Stump, 2004, Wisner, 2003) or the items used in the measurement of SCM factors and/or performance were not sufficiently documented within the paper (Corsten and Felde, 2005).

In two cases, we chose to replace a paper with an earlier work by the same authors. We did so because the earlier papers better fitted our objective (Carr and Pearson, 1999, 2002; De Toni and Nassimbeni, 1999, 2000). In the case of Carr and Pearson, the 2002 publication focused on the impact of the internal SCM factors of Purchasing/Supplier Involvement and Strategic Purchasing on the firm's

financial performance. Carr and Pearson (1999) is more suitable for our purposes because it links buyer–supplier relationships (BSRs) with the firm's financial performance. A similar situation applied to the two De Toni and Nassimbeni publications.

In other instances, we chose to combine a pair of papers because they were based on the same survey research and discussed the same constructs and items in terms of what was relevant for this review: Maloni and Benton (2000) and Benton and Maloni (2005) were combined, as were two papers by Giménez and Ventura (2003, 2005).

Fynes and Voss (2002) and Fynes et al. (2005a, b, c) are all based on the same survey. We decided to include only Fynes et al. (2005a) since it seemed the most suitable paper for our purposes. The other three papers have more of an internal focus concentrating on aspects such as quality practices, quality performance and manufacturing performance.

Despite the fact that Jayaram et al. (2004) and Kannan and Tan (2005) are also based on one survey and, similarly, the three papers by Droge et al. (2004), Scannell et al. (2000) and Vickery et al. (2003) all discuss another common survey, these papers are all treated separately because they include different SCM factors or constructs.

As a result of this “filtering”, we ended up with 33 papers for further analysis.

More generally, in this paper, we have restricted the discussion to external SCM factors. As a consequence, we do not consider internal factors raised in the selected surveys such as strategic purchasing (Carr and Pearson, 1999; Chen et al.,

2004), internal integration or collaboration (Droge et al., 2004; Giménez and Ventura, 2005; Stank et al., 2001; Sanders and Premus, 2005), firm IT capability (Sanders and Premus, 2005) and supplier evaluation communication strategy (Prahinski and Benton, 2004). Factors related to power and dependence (see, for instance, Duffy and Fearné, 2004) are not considered as SCM factors and therefore are also excluded. Instead, power and dependence are regarded as important contingency factors and, as such, are considered in Section 6 of this paper.

### 3. General description and findings

As one might expect, most of the surveys considered have as their main hypothesis that there is a positive relationship between the level of integration and the performance of the focus company. With respect to SC integration, most researchers choose to look at integration with suppliers and/or buyers and relate that directly or indirectly to the performance of the focal company. Important factors are seen as SC integration, BSRs and supplier development. A minority of the authors explore the idea of a broader chain including both upstream and downstream integration in their research (e.g. Bagchi and Skjoett-Larsen, 2005; Ramdas and Spekman, 2000; Frohlich and Westbrook, 2001). In general, the hypotheses on the relationship between integration and performance are confirmed.

It is difficult to make general statements with respect to the targeted population in the selected survey studies. Most pieces of research have covered a range of industries, but the automotive and food industries seem to have been the most popular. It is also striking that the response rates (in so far as they are reported) have generally been low (around 30% at best) with the notable exceptions of Ramdas and Spekman (2000) and De Toni and Nassimbeni (1999), who report 75% and over 60%, respectively. Relatively high response rates can be linked to a strong relationship of the researcher with a dominant player in the chain such as by Vickery et al. (2003) who, when investigating the first tier suppliers of General Motors, Ford and Chrysler, achieved a better response rate than most (38%). Very low response rates (around 10% or less) are encountered in surveys that target members of professional societies such as APICS and ISM (e.g. Jayaram et al., 2004; Dong et al., 2001). Low response rates

could mean that the outcomes of a survey will be harder to generalise, especially if the non-responses are concentrated in specific groups of respondents. Most surveys rely on a single respondent for each unit investigated, although a number of surveys do use multiple respondents within each unit investigated, or respondents from two companies to investigate the relationship between the two (e.g. Johnston et al., 2004). A final general remark is that most items are measured in the questionnaires with Likert scales (with 5, 7 or 10 points).

The overall conclusion from the above is that while empirical research tends to confirm the anticipated relationship between the level of SC integration and performance, the response rates and the choice of respondents and populations limit the validity and generalisability of the results in a number of cases. We will now proceed to have a closer look at how integration is actually measured.

### 4. SCM factors in survey-based research

The starting point for investigating the current status of survey-based research in SCM literature is the factors or variables used to investigate the relationship between SCM (or SC integration) and performance. In this section, we focus on the factors, constructs and items used in the selected surveys. The second column of Table 2 reflects the large number of different SCM factors that have been employed in the surveys. It seems logical to cluster these SCM factors into recognisable groups. In so doing, an initial group of factors seems to capture the relationship that a firm maintains with a supplier or customer. Examples of such factors are BSRs, closer customer relationships, relationship strength, relationship quality and social bonding. The aim of the factors placed in our next group seems to be to measure the mindset of the buying firm with respect to its suppliers. Examples are long-term orientation, involvement in decision-making, sourcing policies, trust, commitment and supply management orientation. The third and final group of SCM factors that we could distinguish relate to practices or technologies. Examples are operational practices, information practices and integrative information technologies.

The difficulty with this initial grouping is that different authors use a wide variety of items and constructs to measure the same, or at least closely related, SCM factors. For instance, both Carr and Pearson (1999) and Prahinski and Benton (2004)

Table 2  
SCM factors and items in SCM research

Article	SCM factor	SCM Items		
		Attitude	Pattern	Practice
Bagchi and Skjoett-Larsen (2005)	Involvement in decision-making		F	
	Supply chain relationships		F	
	IT integration			F
Benton and Maloni (2005), Maloni and Benton (2000)	Relationship (second-order factor)	F		
Carr and Pearson (1999)	Buyer–supplier relationship	x	x	x
Chen et al. (2004)	Limited number of suppliers	F		
	Communication		F	
	Long-term orientation	F		
De Toni and Nassimbeni (1999)	Operational practices			F
	Sourcing policies	F		
Dong et al. (2001)	Supply chain integration	x		F
Droge et al. (2004)	Supply chain integration	x	x	x
Duffy and Fearné (2004)	Structure of economy		F	F
	Relationship climate	F		
Frohlich and Westbrook (2001)	Arcs of integration			F
Fynes et al. (2005a)	Relationship quality (second-order factor)	F	x	x
Giménez and Ventura (2003, 2005)	External integration		F	
Humphreys et al. (2004)	Transaction-specific supplier development			F
	Infrastructural factors of supplier development	F	F	
Jayaram et al. (2004)	Structural mechanisms	F		x
	Relationship building practices	F	x	
Johnston et al. (2004)	Buyer's benevolence	F		
	Buyer's dependability	F		
	Joint responsibility	F		
	Shared planning	F	x	
	Flexibility in arrangements	F		
	Supply chain integration	F	x	
	Supply chain coordination	F	x	
Kannan and Tan (2005)	Supply chain development	F		
	Information sharing		F	x
	Extendedness of the relationship	F		
Kaufmann and Carter (2006)	Social bonding	F		
	Behavioural transparency	F		
	Information sharing			F
Kulp et al. (2004)	Collaboration			F
	SCM practices (second-order factor)	x	F	x
Li et al. (2006)	Information exchange (operational and strategic)			F
Moberg et al. (2004)	Information technology commitment	x		x
	SCM commitment	F		
	Trust	F		
	Relationship commitment	F		
	Integration with suppliers		x	F
Narasimhan and Kim (2002)	Integration with customers		F	x
	Information sharing and trust with suppliers	x	x	
Narasimhan and Nair (2005)	“Supply chain proximity”			F
	Buyer–supplier relationship (second-order factor)	F	x	
Prahinski and Benton (2004)	Information practices			F
Ramdas and Spekman (2000)	Partner selection practices	F		
Salvador et al. (2001)	SC interactions			F
Shin et al. (2000)	Supply management orientation	F		x
Sanders and Premus (2005)	External collaboration			F
Scannell et al. (2000)	Upstream SCM practices	x	x	x
Stank et al. (2001)	External collaboration		F	
Stanley and Wisner (2001)	Cooperative purchasing/supplier relationship		F	x
Tan et al. (2006)	Supply chain integration	F	x	

Table 2 (continued)

Article	SCM factor	SCM Items		
		Attitude	Pattern	Practice
Vickery et al. (2003)	Information sharing		F	x
	Supply chain characteristics	x	x	x
	Customer service management		x	x
	Geographical proximity		x	x
	JIT capability			F
	Integrative information technologies			F
	Supply chain integration	x	x	x

F: main focus of items; x: other items.

examine the link between the buyer–supplier relationship and performance. Carr and Pearson use only six items to measure the BSR factor ranging from loyalty and frequent face-to-face communication to direct computer links with suppliers. Conversely, in Prahinski and Benton (2004, p. 42), the BSR is a second-order factor defined as “the supplier’s perception of the buying firm’s behavioural and operational relationship attributes: buying firm’s commitment, cooperation and operational linkages”. A closer look at the items reveals that Prahinski and Benton only use items that concern the supplier’s perception of the buyer’s attitude towards the supplier.

For another example of differences in the measurement of the same or closely related factors, we refer to SC integration (Vickery et al., 2003) and external integration (Giménez and Ventura, 2005). Vickery et al. operationalise SC integration using aggregated items such as supplier partnering, closer customer relationships and cross-functional teams. Giménez and Ventura use specific items including informal teamwork, shared information and joint development of logistical processes.

Our conclusion from this is that it will not be fruitful to assess the survey studies on the level of the SCM factors since authors measure closely related SCM factors using different items, and with different levels of aggregation. Moreover, there are also differences in the homogeneity of the sets of items used to measure these SCM factors. Again we refer to Carr and Pearson (1999) as an example of an instance where a heterogenous set of items is used to measure BSRs, with items varying from loyalty and frequent face-to-face communication to direct computer links with suppliers.

#### 4.1. Supply chain practices, patterns and attitudes

The picture becomes a lot clearer if we assess the papers based on the level of items used to measure the different SCM factors. Based on a close examination of all the items used in the selected surveys, we propose categorising these items as either attitude, pattern or practice. SC practices are seen as tangible activities or technologies that play an important role in the collaboration of a focal firm with its suppliers and/or customers. Examples are the use of Electronic Data Interchange (EDI), integrated production planning, packaging congruence, Vendor Managed Inventories (VMI) and deliveries synchronisation (see, for instance, De Toni and Nassimbeni, 1999; Frohlich and Westbrook, 2001; Kulp et al., 2004). Related to these practices are the SC patterns, or interaction patterns, between the focal firm and its suppliers and/or customers. Example activities are regular visits to the supplier’s facility, frequent face-to-face communication, high corporate level communication on important issues with key suppliers and formal, periodic written evaluation of suppliers (see, for instance, Bagchi and Skjoett-Larsen, 2005; Carr and Pearson, 1999; Chen et al., 2004; Duffy and Fearn, 2004; Stanley and Wisner, 2001).

The final category includes those items that measure the attitude of buyers and/or suppliers towards each other or towards SCM in general. Examples of items used in the questionnaires are “we expect our relationship with key suppliers to last a long time”, “we view our suppliers as an extension of our company”, “problems that arise in the course of this relationship are treated as joint rather than individual responsibilities” and “the responsibility for making sure that the relationship

is works for both the other party and us is shared jointly” (see, for instance, [Chen et al., 2004](#); [Johnston et al., 2004](#)).

#### 4.2. A summary of the measurement of SCM factors

Reviewing the research by focusing on three types of items is new, but does fit into existing research since other contributions have also distinguished, implicitly or explicitly, between various groups of items in a way that comes close to our proposed grouping. For instance, [Duffy and Fearné \(2004\)](#) distinguish between the structure of the economy and the relationship climate. Items used to capture the structure of the economy cover patterns and practices, and the relationship climate corresponds with “our” attitudes. The two key variables in [Humphreys et al.’s](#) work (2004) are transaction-specific supplier development and infrastructure factors linked to supplier development. The set of items used to measure the first factor are labelled as SC practices. We see the items they use to measure the various infrastructure factors as a combination of attitudes and SC patterns.

Assessing all the items used in the 33 papers and labelling these as attitude, pattern or practice provides us with new insights into the research done so far. It is especially noteworthy that different authors measure identical (or closely related) SCM factors as an attitude, pattern or practice; or see them as a mixture of attitudes, patterns and/or practices.

A number of interesting questions emerge from this finding. An initial question relates to what measuring one SCM factor using all three types of items (as did [Carr and Pearson, 1999](#)) actually means, and how one should understand such a factor.

A second question concerns whether, and if so how, attitudes, patterns and practices influence each other. Surely, the daily interactions within a relationship will affect the attitudes towards each other and towards SCM (see also [IMP Group, 1990](#)). In this context, it is also worth noting that, in our selected papers, attitudes dominate in the items used to measure SCM factors. This is surprising, especially if we take into account the fact that the research reviewed confirms a positive relationship between integration and performance, and therefore between attitudes and performance.

A third question relates to what circumstances influence the attitudes of parties within a BSR.

[Benton and Maloni \(2005\)](#) have already considered this in investigating the antecedents of a relationship. Their attention is focused especially on the question as to how power bases effect critical relationship elements (p. 5).

Based on this evaluation of SCM factors and items, it seems justified to conclude that there has been excessive variation in the way authors try to capture SC integration, and that authors have failed to build sufficiently upon the research of their predecessors. Another observation from the 33 examined papers is that too little consideration has been given to the distinctive roles of attitudes, patterns and practices in SCM, and to the interrelationships between these three factors. We will return to this issue in Section 6 of this paper.

## 5. Performance measurement

[Table 3](#) provides an overview of how performance was measured in the papers considered in this review. It is clear from the second column of this table that authors make a range of choices with respect to the links they include in their research. Authors may focus their attention on the integration of a focal firm with one or more customers, with suppliers or with both customers and suppliers. Within the OM literature, there seems to be a preference for the relationship of a focal firm with its suppliers. It is not surprising that in the logistics management journals, such as *IJLM* and *JBL*, there is more attention given to the relationship of the focal firm with its customers. Less than one-third of all the papers reviewed examine both upstream and downstream relationships of the focal company. Another relevant distinction between the various papers is that the authors make different choices with respect to the number of links included in the survey. Roughly there are three options: one can choose to focus on the relationship with one important SC partner, the relationships with key SC partners or the relationships with all partners. The research by [Kaufmann and Carter \(2006\)](#) is an exception because they do not examine relationships; instead they focus on a representative case of a single international transaction with a supplier. A general conclusion is that more than half of the papers have attempted to measure the extent of integration in a company’s relationships with all of its suppliers and/or customers.

Table 3  
An analysis of performance measures adopted

	SCM factors measured in relationship of focal firm with (1) and for (2) other partners		Performance measured of	Overall performance measures (market share, financial, etc.)	Operational costs measures	Customer service measures	Measurement characteristics
	(1)	(2)					
Bagchi and Skjoett-Larsen (2005)	C, S	Key	F			x	Su
Benton and Maloni (2005); Maloni and Benton (2000)	C	1	F,C,R	x			Su
Carr and Pearson (2002)	S	Key	F	x			O, SrP
Chen et al. (2004)	S	Key	F	x		x	SrP
De Toni and Nassimbeni (1999)	S	Key	F		x	x	SrC
Dong et al. (2001)							
Buyer sample	S	1	F,S		x		Su
Supplier sample	C	1	F		x		Su
Droge et al. (2004)	S, (C)	All	F	x	x		SrC
Duffy and Fearne (2004)	C	1	R	x			Su
Frohlich and Westbrook (2001)	C, S	All	F	x	x	x	SrP
Fynes et al. (2005a)	C	1	F		x	x	SrC
Giménez and Ventura (2003, 2005)	C	2	F w.r.t. C		x	x	SrP
Humphreys et al. (2004)	S	1	F,S,R		x	x	O, Su
Jayaram et al. (2004)	S	All	F	x			SrC
Johnston et al. (2004)	S	1	R	x	x		Su
Kannan and Tan (2005)	C, S	All	F	x		x	SrC
Kaufmann and Carter (2006)	S	Transaction	S			x	Su
Kulp et al. (2004)	C	All	F,C		x	x	SrC
Li et al. (2006)	C, S	All	F	x	x	x	Su, SrC
Moberg et al. (2004)	C	All	F		x	x	SrC
Narasimhan and Kim (2002)	C, S	All	F	x			O, SrC
Narasimhan and Nair (2005)	C, S	All	F	x	x	x	SrC
Prahinski and Benton (2004)	C	1	F	x	x	x	SrC
Ramdas and Spekman (2000) <sup>a</sup>	C, S	All	F			x	S
Salvador et al. (2001)	C, S	All	F			x	O
Sanders and Premus (2005)	S	All	F		x	x	Su, SrP
Scannell et al. (2000)	S	All	F		x	x	SrC
Shin et al. (2000)	S	All	F,S		x	x	SrP
Stank et al. (2001)	C, S	All	F			x	SrC
Stanley and Wisner (2001)	S	All	F			x	Su
Tan et al. (2006)	C, S	All	F	x			SrC
Vickery et al. (2003)	S	All	F	x		x	SrC

C: customer, S: supplier, F: focal firm, R: relationship, Su: subjective, O: objective, SrP: subjective relative to  $x$  years ago, SrC: subjective relative to competitors.

<sup>a</sup>The work by Ramdas and Spekman (2000) does not fit very well into the table as they examined 22 extended supply chains.

### 5.1. Performance measurement and the relationship with integration

How to critically assess the links in which integration is measured is a very important issue in trying to evaluate the way other authors have

investigated the relationship between SCM factors and performance. A comparison of the second and third columns of Table 3 provides some remarkable insights. Let us first consider the extreme cases. On the one hand, there are a considerable number of papers that relate the level of integration with all

suppliers and/or customers to the performance of the focal firm (see, for instance, Jayaram et al., 2004; Sanders and Premus, 2005). At the other extreme, there are a few papers that relate the level of integration in a single relationship to the performance of that particular relationship (Benton and Maloni, 2005; Duffy and Fearne, 2004; Humphreys et al., 2004; Johnston et al., 2004; Giménez and Ventura, 2003, 2005). A question here is whether it is useful to only relate integration in a SC to the performance of the focal firm, particularly when performance is measured in overall terms such as market share and Return on Investment (ROI). Especially with such general measures, there are many other (both economic and managerial) variables that impact on performance items. It seems rather optimistic to try to establish relationships between the attitude of a firm towards its suppliers and its financial performance since, for instance, the fact that a firm is loyal to its suppliers has no immediate relationship with its ROI. Therefore, to us, it does not seem surprising that Vickery et al. (2003) failed to find a significant direct relationship between SC integration and firm performance. If the extent of integration is only measured in one or a small number of a firm's relationships, it will be especially difficult to establish a relationship between integration and overall firm performance.

Based on the previous arguments, it seems potentially more fruitful to relate the level of integration in a single relationship to the performance of that particular relationship. If we assume that integration means investing in a BSR, it would make sense to measure performance in terms of the aims of these efforts with respect to this particular relationship. Common aims are to reduce reaction times and/or the need to hold stocks, to increase one's visibility in the chain and to attain a more effective and efficient way of communication.

## 5.2. Performance measures

The surveys also differ with respect to the items used to measure performance and the way performance is measured. Table 3 shows that the majority of the surveys examined the effect of SCM on a combination of overall measures, operational costs measures and customer service measures. Chen et al. (2004), Droge et al. (2004) and Vickery et al. (2003) examine both direct and indirect relationships between SCM factors and financial performance.

In terms of indirect relationships, they look at the role of customer service as a mediating variable. Others have only examined direct relationships and use factors that include financial as well as customer service items in their research (e.g. Kannan and Tan, 2005). Table 3 also shows that there is a smaller group of surveys in which performance is restricted to customer service or financial performance (e.g. Stanley and Wisner, 2001; Narasimhan and Kim, 2002).

With respect to the measurement of performance, most authors adopt subjective assessment methods (see Table 3). Subjective assessment in this context means that, through the survey instrument, the perceptions of the respondents are measured (for example by using Likert scales ranging from very much decreased to very much increased performance). The use of subjective assessments is, in some cases, justified by referring to Narasimhan and Das (2001) and Venkatraman and Ramanujam (1986). In a recent paper on subjective measures, Ketokivi and Schroeder (2004) conclude that perceptual measures are a viable option in large-sample studies provided rigorous examinations of the validity are performed. In Section 6, this viewpoint is discussed in a wider context.

Almost two-thirds of the 33 papers assess performance by relating it to past performance (a number of years previously) or to the performance of major competitors. For instance, in Chen et al. (2004), financial performance is operationalised using items that indicate the extent of changes in (1) ROI, (2) profits as a percentage of sales, and (3) net income before tax over the past 3 years. Vickery et al. (2003) measure customer service relative to major competitors and with respect to five items: product support, pre-sale customer service, responsiveness to customers, delivery speed and delivery dependability/reliability. Others use perceptual measures to assess performance but these are not related to previous performance or to that of major competitors (e.g. Ramdas and Spekman, 2000; Stanley and Wisner, 2001; Johnston et al., 2004). Stanley and Wisner, for example, ask the focal firm to assess the *current* level of service and quality it provides to its external customers in terms of items such as fast delivery of products/services and flexibility in responding to customers' changing needs. Only a small number of papers (Carr and Pearson, 1999; Humphreys et al., 2004; Narasimhan and Kim, 2002; Salvador et al., 2001) include objective measures such as percentage of on-time

deliveries (Humphreys et al., 2004) and ROI (Carr and Pearson, 1999).

## 6. Discussion and a framework for further research

An important conclusion based on Sections 4 and 5 is that there is little consensus on how to capture the essence of SC integration, or on how to measure the effects of SC integration on performance. In this section, we take this concern as a starting point for a discussion on the current status of survey research in SC integration. In the discussion, we focus on the interrelationships between the various SCM factors, on the relationship between SCM factors and performance, and on the conditions and circumstances that have an impact on the SCM factors.

We have already argued that there has been too little consideration given to the distinctive roles of attitudes, patterns and practices in SC integration or to their interaction. Examining the relationship between SCM factors and performance without measuring, investigating and understanding the interrelationships between the different SCM factors seems at best risky. Given the complex interactions between attitudes, patterns and practices, it seems necessary to take into account these interactions when investigating the relationship between, for instance, attitudes and performance. For example, one would anticipate an interaction between attitudes (e.g. trust) and practices (e.g. on-line access to planning systems). Similarly, we would expect there to be a relationship between ICT usage and the communication patterns in a BSR.

In line with these arguments, and the ones provided in the previous sections, it seems logical, especially from a conceptual point of view, to focus on the relationship between SC practices (or patterns) and performance. In this respect, our finding that many authors instead focus on attitudes (see Table 2) is a surprising one. In our view,

attitudinal aspects are primarily relevant if one wants to understand the level of integration (practices and patterns) within particular relationships (see Fig. 1). It is not sufficient to have a positive attitude towards collaboration and SCM: in some way, this positive attitude has to lead to actions (practices and patterns). However, as noted earlier, one should not overlook the fact that daily interactions will affect attitudes and vice versa.

One of our conclusions was that many surveys measure the output performance of the focal firm on an aggregate level. Here, we will discuss other approaches for investigating the relationships between SCM factors and performance. One straightforward approach is to measure integration within a single relationship and then to relate the SCM factors to the performance of this BSR. One advantage of relating integration to the performance of an individual relationship is that it is relatively easy to acquire reliable, less subjective, performance measures for the performance of a single relationship, especially when compared to the use made of overall and financial performance measures in many of the surveys. Further improvements and triangulation become possible if data are not obtained from a single respondent within each focal firm, as has often been the case with the survey research, but from several respondents, preferably from both parties in the BSR (e.g. Johnston et al., 2004).

By now it should be clear that we have doubts about what is exactly being measured if SCM factors are related to the multiple relationships of a company with its suppliers and/or customers. Our first argument is that, in the case of multiple relationships, integration is somehow being measured as an average of the relationships with either key partners or all partners and that, especially if there is a large variation in SCM practices among these relationships, there cannot be an unambig-

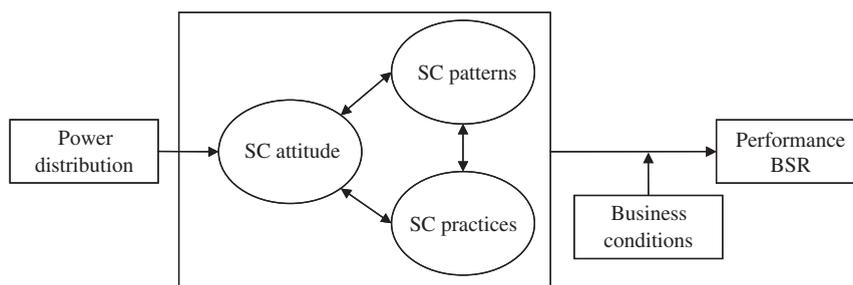


Fig. 1. Proposed research model.

uous relationship between integration and performance. The situation becomes even more complicated if the SCM practices are related to an “average performance” or to overall measures representing the performance of the focal firm. A second argument stems from the earlier finding that not all relationships require the same practices and patterns to achieve superior performance (Ramdas and Spekman, 2000; Van Donk and Van der Vaart, 2004). In the discussion, we will return to this point and consider the relationship between business conditions and SC integration.

A further remark concerns the relationship between improved performance and SC integration. In our view, there is more face validity for such a relationship between a firm and the purchasers of its outputs than between a firm and its suppliers. This is especially true if high-level aggregate measures such as market share are used to evaluate performance. It seems logical to us that a higher level of integration with buyers should improve the relationship with the end-users of the products through improved customer service, lower costs, better use of information, etc. and that this should result in higher margins, market shares and profits. The justification for improved integration with suppliers seems much less clear. The survey research so far undertaken seems to ignore this difference.

The final issue discussed in this section concerns the attention given, or rather not given, to the role of business conditions and power in SCs in the survey studies reviewed in this paper. It is remarkable that a large majority of the papers consider only the relationship between integrative practices and performance. Only a few authors include business conditions or power in their research model. It appears that most contributions implicitly or explicitly assume that higher levels of integration will improve SC performance. Essentially, we disagree with the assumption that greater integration is always better. Based on both theoretical concerns and empirical evidence, we have shown that business conditions influence and determine both the optimum level of integration as well as the type of integrative activities employed (Van Donk and Van der Vaart, 2004; Van der Vaart and Van Donk, 2006). One of the key factors in the type of practices employed is the influence of demand characteristics and uncertainty, a topic that has also been addressed by Fisher (1997), Mason-Jones and Towill (1998) and Childerhouse and Towill (2002). Frohlich and Westbrook (2001, p. 185)

addressed this point in their statement: “Our knowledge is relatively weak concerning which forms of integration manufacturers use to link up with suppliers and customers”. However, a number of survey studies are now taking up this challenge and do take into account the role of business conditions and/or power; these have included Benton and Maloni (2005), Duffy and Fearné (2004), Fynes et al. (2005a), Kaufmann and Carter (2006), Maloni and Benton (2000) and Ramdas and Spekman (2000).

In terms of business conditions, Fynes et al. (2005a) found support for the hypothesis that the greater the competitive intensity, the stronger the relationship between SC relationship quality and SC performance. However, they did not find support for technology turbulence having a similar moderating role. Kaufmann and Carter (2006) examined the role of uncertainty using the following variables: dynamism regarding the purchase item, complexity of the purchase item, cultural distance and geographical complexity. Of these, they found that only the complexity of the purchase item had a significant impact on the SCM factors (extendedness of the relationship and behavioural transparency). Earlier, Ramdas and Spekman (2000) had examined the differences between SC practices in functional product SCs and those in innovative products chains.

The general conclusion is that, in complex business conditions, higher levels of integration are required and different SC practices are appropriate. That is, there should be a fit between the SC practices and the business conditions (see also Van Donk and Van der Vaart, 2004; Van der Vaart and Van Donk, 2006).

With respect to the role of power and dependency, Duffy and Fearné (2004) found support for the hypotheses that: (1) suppliers in those BSRs characterised by greater interdependence achieve higher levels of performance, and that (2) suppliers in BSRs characterised by greater asymmetric dependence achieve lower levels of performance. Benton and Maloni (2005) found that power-affected SC BSRs had a significant positive effect on performance.

Based on the issues discussed in this section, we propose a research model as depicted in Fig. 1. This reflects our view that future research should focus more on understanding the interactions between attitudes, patterns and practices. Through the proposed model we would also like to promote

more research into the moderating role of business conditions in the relationship between integration (patterns and practices) and performance of the BSR. With respect to the role of power it would be very interesting to analyse the path from power distribution to attitudes, and from attitudes to patterns and practices.

## 7. Conclusions

This paper started by expressing our concerns regarding the current usage of survey-based research in investigating the relationship between SC integration and performance. Based on an analysis of 33 papers, selected from 10 reputable journals, a number of the concerns have been confirmed.

A general conclusion is that many of the studies considered have hardly built on previous work. Most authors seem to develop a new model with new factors and new measurement scales. As a result, it becomes difficult to group the SCM factors into clearly recognisable clusters.

However, a detailed analysis at the level of the items used to measure SCM factors did provide greater insight, and resulted in an attractive categorisation of the items used in the 33 survey studies. We were able to distinguish three distinct categories of items: those measuring attitudes, those measuring patterns and those measuring practices. We argue that this is an important distinction, and one that should be incorporated in future empirical research. In this respect, it would be interesting to examine the distinctive roles of attitudes, patterns and practices in SC integration. Moreover, we stress that it is important to acquire a better understanding of the interactions, or interrelationships, between these three key factors. In this context, we found it remarkable that researchers seem to choose to measure integration using attitudinal items.

The assessment of how the various authors measure performance and how they relate SC integration to performance also provided a few noteworthy conclusions. Firstly, in many of the survey studies, there is a clear preference for relating integration with SC partners to the performance of the focal firm as a whole. In doing so, these studies favour subjective measures that relate performance to that of competitors or to that of a number of years previously. Moreover, a considerable number of papers link aggregated measures such as ROI, profit and/or market share to SC integration.

Secondly, we observed that, despite our concerns over methodology, the majority of the surveys do report a positive relationship between integration and performance. Apparently, these results have led to a general belief that a relationship does exist between attitudes and overall performance. However, the question is whether we always understand the nature of this relationship. For instance, it is not that easy to see how a positive attitude towards a supplier results in improved performance by a focal firm when this is measured in terms of profits or market share.

We acknowledge that our study is limited, and that not all the relevant journals have been taken into account. However, this does not alter the fact that the concerns and conclusions are valid for the papers studied in this article. Increasing the number of papers taken into account would not resolve any of the points raised above, and in all probability would increase still further the variety in concepts, factors and measures. It is also quite possible that the authors of some of the articles reviewed share our concerns over the variety in the measures used, but have valid arguments for their own particular choices.

Based on the above conclusions, we have proposed a framework for future research. This framework takes into account attitudes, patterns and practices plus their interrelationships. With this framework, we promote the view that the measurement of performance should be focused on the performance of the BSR itself and not on that of the focal firm. Finally, in presenting the framework, we argued that power and business conditions should be measured in SC integration research since these are among the main factors shaping and influencing integration.

We are well aware of the fact that the proposed framework needs further empirical testing, and therefore we are cautious in offering managerial advice. However, we believe that making a distinction between attitudes, practices and patterns could help managers in understanding their relationships with buyers and suppliers.

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