Virtuous and vicious cycles on the road towards international supply chain management

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Abstract *An increasing number of companies claim to pursue international supply chain management (ISCM), but the empirical evidence of successful implementation programs is still scarce. This paper aims to contribute to theory-building in this area by presenting an exploratory causal model of goals, barriers, and enablers on the road towards effective ISCM. The model was established in a workshop with a panel of content matter experts. The results point at a disturbingly gloomy picture of vicious cycles frustrating the implementation of effective ISCM strategies. Fortunately, it appears that it is possible to apply the same generic mechanisms to create a virtuous cycle, for instance by promoting cross-functional careers and by actively responding to demanding customer needs. The challenge ahead is to test the model's content and validity.*

Introduction

The challenge of managing and controlling good flows between facilities in a chain of operations has always fascinated academics and practitioners in the area of operations management. Its key appeal has long been that a more co-ordinated planning approach would reduce costs in the supply chain while maintaining satisfactory customer service levels. This approach should obviously include all the blessings of good operations management, such as high product quality standards, volume and mix flexibility, and delivery speed and reliability (Thomas and Griffin, 1996; Holmes, 1995). In today's business environment, the relevance of this "integral" approach is further enhanced by advances in information and transportation technology and the ongoing process of liberalisation in the global economy. Container ships and ever improving communication facilities shrank the world. It has become possible to manufacture a growing range of goods where it is cheapest, and then ship them to customers around the globe (Carson, 1998). The enlarged geographic scope of facilities that results from this

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globalisation process has added substantially to the complexity of designing and managing supply chains (see for example Vos and Akkermans, 1996).

Thus, it comes as no surprise that supply chain management, as the integral approach to operations management is labelled nowadays, has become one of the top priorities on the strategic agenda of industrial companies. Still, observations in practice reveal that many companies continue to manage the main stages of their global supply chain (purchasing, manufacturing and distribution) independently. And until now, the operations management literature has shown very little empirical evidence of successful strategic moves towards supply chain management. At present, there are at best some survey reports containing "laundry lists" of critical success factors and roadblocks on the way towards effective supply chain management (Holmes, 1995). Some of the critical success factors listed there include the "usual suspects" of top management commitment, involving staff in cross-functional teams to plan and implement change, continuous feedback between management and staff, planning of new information systems, and actively seeking customer input.

However, there is at present little known on how these factors drive effective supply chain management, and even less on how they drive each other, let alone on what drives them in turn. What are the right levers to pull and buttons to push in the organisational change effort? In other words, we do not yet have causal relationships between the various factors driving effective supply chain management and their interrelations with performance improvements in areas like inventory management, supply chain costs, and customer satisfaction. And we do need to learn more on such causal relationships if we are to give good recommendations; not just laundry lists of what is important, but also explanations of why, when, where, and how. Without answers to such questions, it is difficult to arrive at sensible and robust growth strategies towards international supply chain management (ISCM).

This paper presents a first attempt to arrive at such a theory of why achieving effective supply chain management is so difficult. It presents evidence to show that across very diverse industries, similar underlying mechanisms may be blocking the achievement of this goal. Moreover, it suggests that both companies that are highly effective in ISCM and companies that are less successful share these mechanisms. What works as a virtuous cycle for the former group, continues to be a vicious cycle for the latter.

International supply chain management

The term supply chain management (SCM) has become a hot issue in the contemporary operations management literature. An indication of the growing impact of this acronym, is its appearance in the title of leading textbooks in the sub-disciplines of purchasing (Monczka *et al.,* 1998) and logistics (Christopher,

1998). Apparently, SCM may become a commonly accepted label for the ongoing discussion in operations management on managing integrated chains rather than managing the various processes on a functional basis.

The increasing use of the SCM acronym does not mean that there is consensus on its precise definition. Schary and Skjøtt-Larsen (1995) define SCM as "an integrative approach to dealing with the planning and control of the material flows from suppliers to end users". Cooper *et al.* (1997) explicitly include the customer perspective by defining SCM as "the integration of business processes from end users through original suppliers that provides products, services and information that add value for customers". Bhattacharya *et al.* (1996) are very output oriented when defining SCM as "key to delivering higher customer satisfaction with reduced lead times and costs". It is, however, possible to detect some common characteristics in the various SCM definitions:

- involves multiple echelons, processes, and functions like, for example, suppliers, purchasing, manufacturing, distribution, marketing/sales, and customers;
- clear focus on co-ordination and/or integration;
- main aim is to achieve a simultaneous increase in customer service and profitability.

The international dimension is typically not included explicitly in SCM definitions, although Houlihan (1987) already introduced the term ISCM in the 1980s. Nowadays, it is even more appropriate to consider the international factor as a common characteristic as well. In the past decades the business community witnessed a dramatic increase in the cross-border transfer of goods. In a recent survey of *The Economist* it is rightly stated that most popular brands of today are "really the product of an elaborate international web of suppliers and assemblers" (Carson, 1998). It has already been argued in the introduction that the complexity and volatility of this international business environment further complicates the task of managing supply chains.

Klassen and Whybark (1994) conducted a Delphi study with an international panel of experts to define and rank key barriers to the effective management of international operations. The top five barriers found in their study contained a mix of contemporary managerial concerns and more technical issues. Examples of the top managerial concerns were a lack of global vision and manufacturing strategy. The highest ranking technical barriers included the complexity of global logistics, the management of a network of foreign plants, and concerns about culture and language differences. An important conclusion of Klassen and Whybark was that the key barriers to an effective management of international operations consist of a mixture of managerial concerns and technical issues. Although managerial concerns were found to be of a higher priority, more traditional technical concerns could certainly not be ignored.

Birou and Fawcett's research on international sourcing more or less supported this finding. Their ranking of key challenges to international sourcing includes technical issues like logistics challenges to cope with long supply chains, the search for qualified suppliers, culture and language differences, and duty and customs regulations. Their ranking of factors to cope with these challenges include contemporary managerial topics like assuring top management support, establishing long-term relationships in the supply chain, and understanding the opportunities in the global business environment (Birou and Fawcett, 1993).

Finally, it is important to take notice of the observation made by Scully and Fawcett (1993) that in decision making on the design of international facility networks explicit attention should be paid to the subsequent co-ordination of good flows. Meijboom and Vos (1997) also emphasise the importance of balancing configuration and co-ordination issues in international manufacturing and location decisions. Unfortunately, Scully and Fawcett observe that many managers appear to believe that once the configuration decisions have been made, the good flows through the supply chain "will somehow be manageable".

Theory-building using a policy-Delphi approach

In order to study a complex topic like managing international supply chains one needs an adequate research method. The method employed to obtain the findings that are reported in this contribution is somewhat unusual in the field of operations management. This paper does not describe the testing of an existing theory on supply chain management. Nor does it derive such a theory on the basis of empirical analysis of a number of firms by way of survey or multiple case studies. No attempt has even been made to test findings examining some mathematical model. Instead, this article describes the first steps towards developing new theory by means of a so-called policy Delphi-study (Vennix, 1990; Meredith *et al.,* 1989; Delbecq *et al.,* 1975) with a panel of content matter experts. In general terms, the Delphi study is a method structuring a group communication process so that the process is effective in allowing a group of individuals to deal with complex problems (Linstone and Turoff, 1975). The value of the Delphi technique has been well demonstrated in a wide range of applications on complex, interdisciplinary issues (Klassen and Whybark, 1994).

The results of our Delphi study should contribute to theory-building on supply chain management issues, a step in the research process which has been lamented as being sorely missing in production and operations management (Meredith, 1993; Neely, 1993; Platts 1993). Regarding the international dimension of SCM, Babbar and Prasad (1998), in a review of the research on international purchasing, inventory management and logistics for the period 1986 through 1995, state that the number of articles that develop theory was quite limited. They explicitly emphasise the need to search for fundamental mechanisms in managing the inherent uncertainties in global operations.

Because of the observed paucity of theory-building research, POM researchers have actually been systematically skipping one of the stages in the regular science process (Meredith, 1993). Our research project was explicitly set up to respond to Meredith's invitation to fill this "blind spot" in the operations management area. The research questions addressed in this project were the following:

- What are the main goals that companies pursue by implementing international supply chain management?
- What are key roadblocks and roadblock removers ("enablers") in achieving these goals?
- How do these factors interrelate?

The emphasis in our research design was on the third question. The results were expected to add new insights concerning the management of international operations. Klassen and Whybark (1994) conclude that, following their Delphi study, there indeed was a clear need for such research, aimed to better understand the relationships between the identified barriers and the alternative techniques ("enablers") that can be used by operations managers.

To address these questions, approximately 30 supply chain managers working for different companies in The Netherlands were invited by the authors to engage in a policy-Delphi study. This selection procedure differs from the one chosen by Klassen and Whybark (1994) in their Delphi study on the barriers to the management of international operations. They approached practitioners, academics and consultants, observing that in their final panel the industry group was under-represented, while the academics were over-represented. We explicitly set out to focus on practitioners, since the causal model to be developed should reflect business practice as closely as possible.

The list below shows the industry background of the participants able to convene for a half-day session.

- Electronics; domestic appliances.
- Electronics; audio and video.
- Measurement equipment.
- Machine engineering.
- Pharmaceutical industry.
- Air cargo.
- Publishing.
- Professional services.
- University.

All participants were content matter experts on the field of international supply chain management, all their firms were active in this area and they all

were closely involved in those activities. Some examples illustrate the international scope of the participants' companies operations. The domestic appliances company, with its home base in The Netherlands, has ten manufacturing facilities and about 60 sales offices around the globe. It achieves 35 per cent of its turnover in Europe, 40 per cent in North and Latin America, and 25 per cent in the Asia-Pacific region. The sales efforts of the publishing company may be restricted to the Benelux, but international elements are clearly present in its inbound good flows. Foreign suppliers of magazines and newspapers account for a substantial part of its product portfolio.

The workshop participants engaged in two group model-building exercises: a nominal group technique type brainstorming exercise (Hodgson, 1994) and a causal diagramming exercise (Richardson and Pugh, 1981). These exercises and the workshop as a whole were designed and facilitated by the first author using Participative Business Modelling, a consulting approach for developing conceptual causal models (Akkermans, 1995).

In the first brainstorm exercise, the nominal group technique exercise, a clustered and prioritised lists of relevant factors was elicited from the group on the basis of the first two research questions. The aim was to establish main drivers of ISCM, key barriers on the road towards ISCM and key enablers to achieve the benefits attributed to ISCM. It was anticipated that the results from this session would resemble listings resulting from previous research (Klassen and Whybark, 1994; Holmes, 1995).

In the second brainstorm exercise, these factors were then causally interrelated by the group in a group model-building session. The resulting causal model was afterwards summarised in a report and fed back to all 30 managers originally mailed. Both participants and non-participants were requested to make any changes or comments they considered appropriate. The findings of this Delphi style exploratory theory-building process are described in the remainder of this paper.

Research findings

Virtuous and vicious cycles on the road to ISCM

The causal diagram that was elicited in the workshop is fairly elaborate. It will be described step by step in the following sections. However, its core dynamics are quite straightforward, and disturbingly so. They are visualised in Figure 1. The gist of what this group of ISCM experts came up with was that all their companies seemed to be caught in a reinforcing loop of either success (a virtuous cycle) or failure (a vicious cycle), the latter being considerably more frequent than the former. Once companies are caught in such a loop, it seems virtually impossible to escape from it.

Let us walk through the scenario of the vicious cycle. If the current quality in managing your company's international supply chain is low, then your main stakeholders (top management, other company functions, external partners) will treat ISCM as a not very effective means of improving

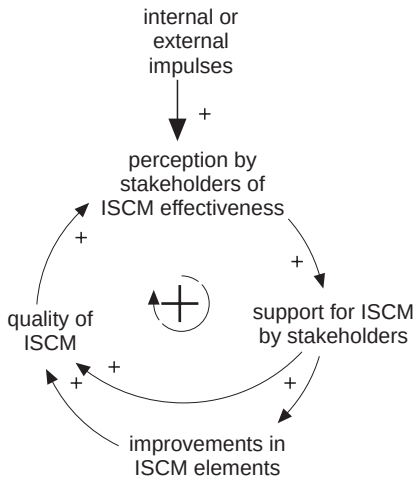

Figure 1.
Virtuous and vicious loops of international supply chain management (ISCM) dynamics

business performance. This will lead to few improvements in those elements that can bring about effective ISCM, such as thorough training of staff, reliable and detailed information systems, and clear organisational procedures. This will then again result in a continuation of the existing unsatisfactory level of ISCM quality. The low level of support with stakeholders will also have a negative impact on the quality level, because confidence in the other party's best intentions was seen as a critical prerequisite for successful ISCM as well. Precisely the same dynamics apply in the virtuous cycle scenario, but now the other way round: if your current quality level of ISCM is high, this will be observed by your stakeholders who will recognise its relevance and support it accordingly, thereby further boosting ISCM quality.

The alarming thought to emphasize at this point is that our experts could think of few ways of escaping out of the vicious cycle, rather than by some form of "survival of the fittest". That is, if internal or external impulses "prove" that effective ISCM is a very powerful approach to ensure sustainable corporate success, stakeholders will start paying attention. Still, for many companies that may be too late, it was added rather cynically.

As indicated above, Figure 1 is a strong simplification of the richness of the causal map (Eden, 1989; Vennix *et al.,* 1996) that the participants drew. Therefore, we will now build the total map step by step in a number of coherent "causal chunks" (Miles and Huberman, 1984), pretty much like the group generated their ideas in the second brainstorm session in front of a whiteboard, facilitated by the first author. While reading, please bear in mind the following: although the lines of reasoning in the following sections often depict the doom scenario of the vicious cycle, which is fairly representative for the workshop discussions, the same mechanisms can be read as creating a virtuous cycle.

Roadblocks

A history of local optimisation. The first line of reasoning that the group generated was that supply chain management is, by definition, a cross-functional affair. A long-term view is required to fully appreciate the benefits of cross-functional behaviour. Still, in many organisations a strong short-term focus prevails. And these two reinforce each other (see Figure 2). Because of this phenomenon, one also fails to see common goals between the various parties, both internal and external, involved in ISCM. The final result of these interactions is sub-optimisation for the system as a whole.

The vicious cycle of insufficient communication between supply chain partners. A major problem is that the various partners in the supply chain usually hold different beliefs and act accordingly (see Figure 3). Since there are initially no common goals perceived between the partners (suppliers and customers within the chain), neither party sees a clear need for information sharing, but every partner does see the potential risks involved in an open exchange of information (labelled as "the open kimono approach"). Because of these effects, key information is not shared in a timely and complete manner, which is bound to result in an insufficient performance of supply chain activities.

The inevitable result is fire fighting of the many things that go wrong, which further reinforces the short-term orientation in the supply chain. And, as we saw before, in this short-term view one tends not to see the commonality of goals between the partners. The cycle is thus further reinforced and communication between the supply chain partners deteriorates further. The resulting picture is a far cry from the nowadays fashionable stories of "partnership" and "trust" in supply chains.

Functional silos as root causes for a lack of common goals. An intriguing question relates to the underlying causes of the lack of goal congruence between supply chain partners. As Figure 4 shows, our experts identified the existing organisational structure in many companies, that of functional silos, as

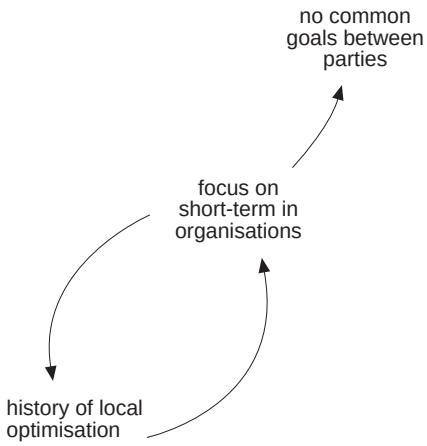

Figure 2.
A history of local optimisation

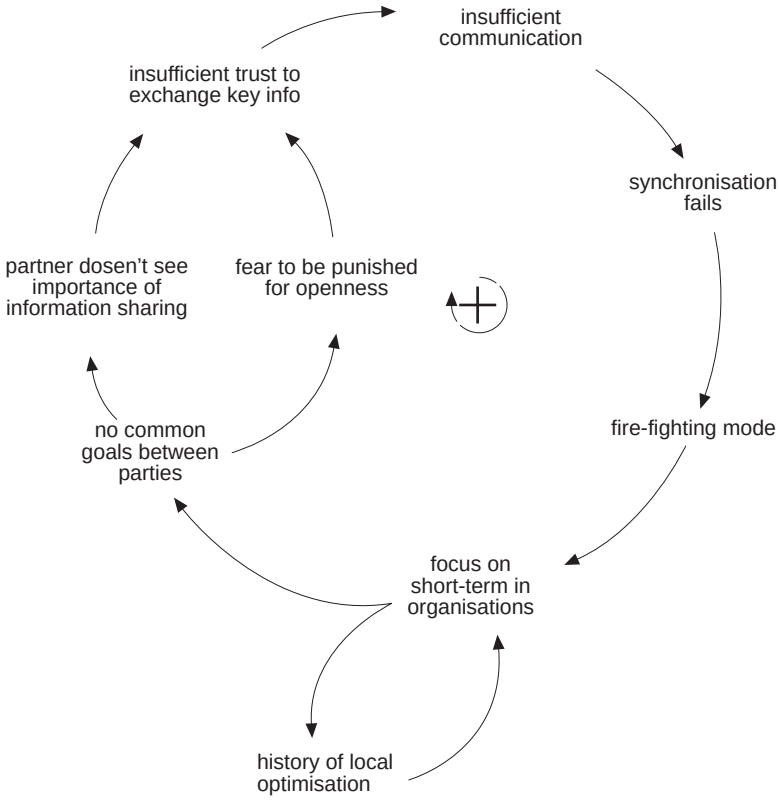

Figure 3.
The vicious cycle of insufficient communication

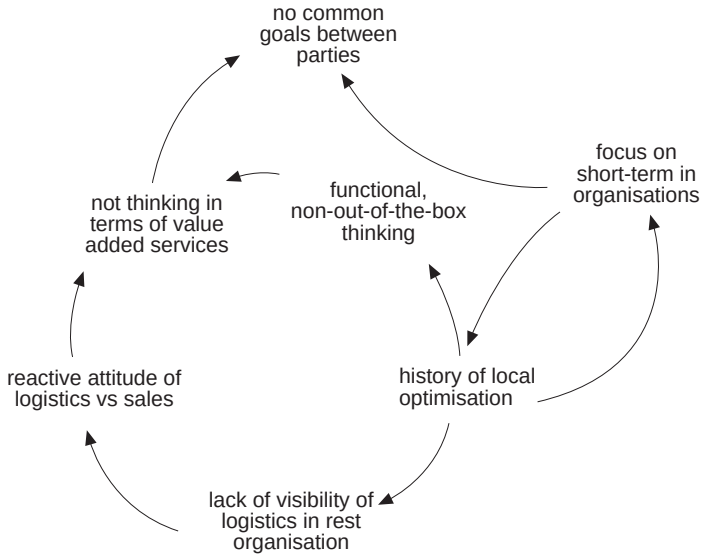

Figure 4.
Functional silos as the root cause for lack of common goals

one root cause. Three effects occur due to a history of local optimisation. The first is the above-mentioned short-term focus. Since it takes some time for ISCM benefits to materialise, this in itself reduces the commonality of goals. The second is that other functional silos do not acknowledge the potential of the logistics function. Other business functions typically associate logistics with problems like late and unreliable deliveries. This has led to a rather defensive attitude of logistics versus, for example, sales. The supply chain people will try to do what sales have agreed with the customer. This then brings us to the third effect of functional silos: creative, out-of-the-box thinking, which is often process-oriented and cross-functional, does not develop. This in turn leads to little thinking in terms of value-added services together with the customer or the supplier.

The role of top management. In many surveys, top management support serves as a prerequisite to achieve the benefits of ISCM. Unfortunately, our panel's perception was that top management showed little interest in and vision for strategic supply chain issues. Partly this was because top managers could not monitor the real costs or benefits of logistics performance (see Figure 1), and partly because their supply chain partners did not know any better either. Consequently, top managers tend to cling to the ISCM hypes of the season, rather than developing a thorough and lasting focus on the fundamentals. And when senior management fails to see the potential for sharing a common goal with the partners in the supply chain, how are others to make the achievement of this goal possible? This then becomes a fourth main reason for a lack of goal congruence between supply chain parties (see Figure 5).

Self-fulfilling prophecies for management. The lack of top management interest has again multiple root causes (see Figure 6). It has already been argued that a lack of visibility concerning relevant logistics costs and benefits is one of them. Still, even when top management has such financial figures, this often does not help, our panel observed. In the present stage of ISCM performance, top management is too often unpleasantly surprised by the associated costs, and all the more reluctant to invest further in such a black hole. And, since operations managers are often already on the defensive as a result of high inventory and transportation costs and sub-optimal performance, strength of the supply chain management leadership is not such that top

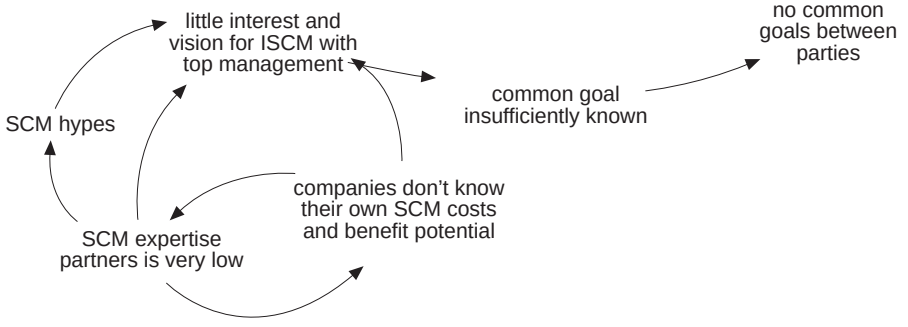

Figure 5.
The role of top management

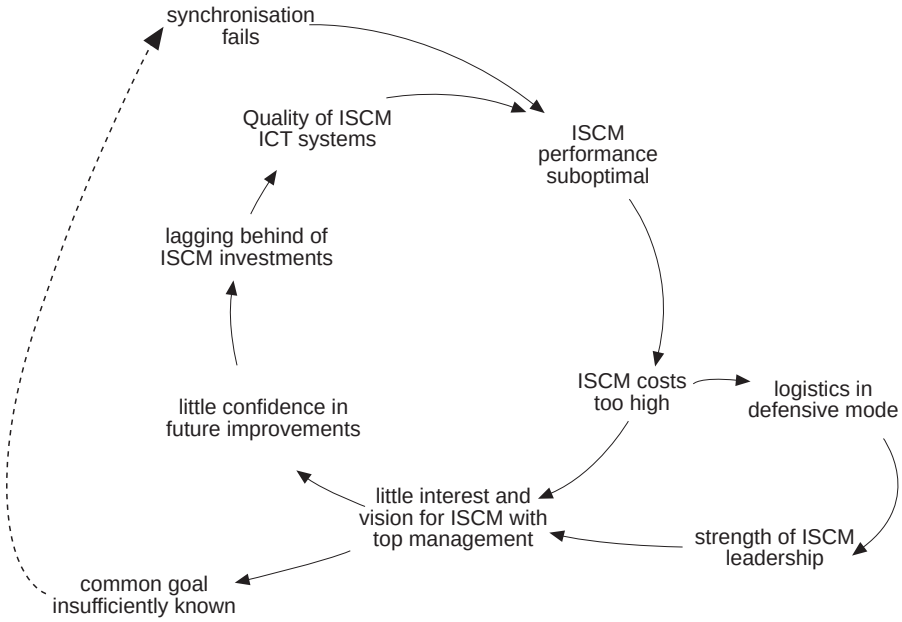

Figure 6.
Self-fulfilling ISCM policies for top management

management is easily convinced of the short-sightedness of this reluctance. Interestingly, top management is thus creating its own self-fulfilling prophecy, since supply chain performance could actually be improved by investments that are now denied. For instance, the field desperately needs better information technology (IT) systems (enterprise resource planning, ERP, being a premier example) to ensure better quality of information exchange between parties.

Finally, a vicious cycle can also be discerned on the attitudinal level. As we already saw in Figure 3, a lack of interest with senior management in ISCM leads to lack of clarity on the common goals with other parties. This in turn leads to insufficient communication between supply chain parties, which again leads to sub-optimal performance. This observation also emphasises that investments in IT alone are not enough; they should be accompanied by improvements in "soft", human communication patterns.

Sales' understandable but short-sighted frustrations. A self-fulfilling prophecy also results from the frustration that sales people tend to have with supply chain performance (see Figure 7). Presently, this performance is often obstructing them in their job: logistics systems are not flexible enough, data are incorrect or missing or not transmitted correctly and on time. Ultimately, this may lead to lost sales and all the more reason not to expect much from the logistics people. Yet in this way of reasoning one fails to see that innovative, out-of-the-box initiatives in the supply chain may create value-added services

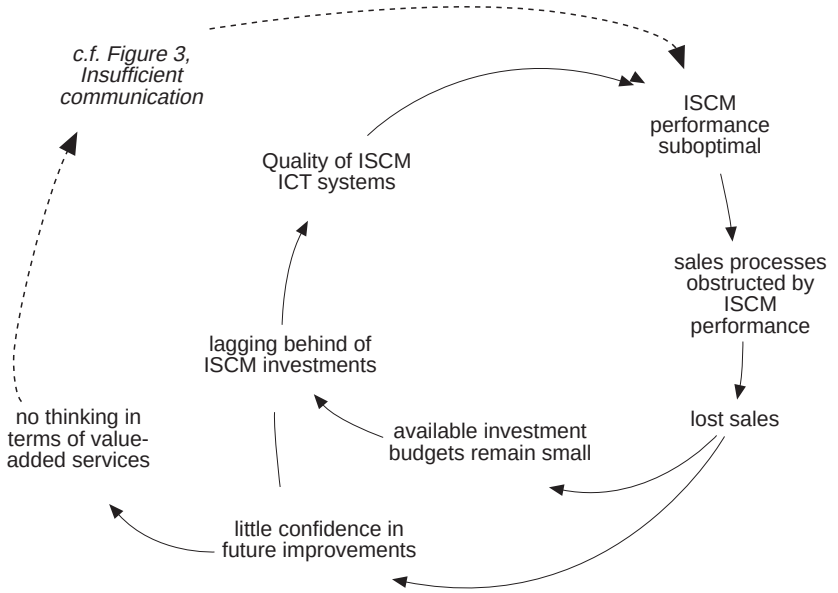

Figure 7.
Sales' understandable but shortsighted ISCM frustrations

for customers that can lead to great sales successes. By not supporting the logistics function here, the sales function is missing out on great selling opportunities as well.

Enablers

So far, the discussion was restricted to the mechanisms underlying the barriers on the road towards effective ISCM. This coverage is fairly representative for the discussions in our panel of experts. Fortunately, there was at least some time left to look at potential enablers or "roadblock removers". The key enablers identified were the following:

- demonstrating business success of ISCM by innovative newcomers;
- customers demanding ISCM services;
- promoting cross-functional careers;
- leveraging the potential of information and communication technology (ICT) systems.

Successful, innovative newcomers in ISCM. Innovative newcomers in an industry, not burdened by a long history of local optimisation, may well demonstrate the business impact of added value services based on innovative ISCM concepts. In Figure 8 this will, for good or for bad, force changes in the structure of international supply chains. The essence is that these structures should become more process-oriented. One participant mentioned the example of using alternative distribution channels, like the Internet, to sell products like books (Amazon.com), CDs, and personal computers (Dell). These newcomers are often able to change the established business fundamentals by tearing

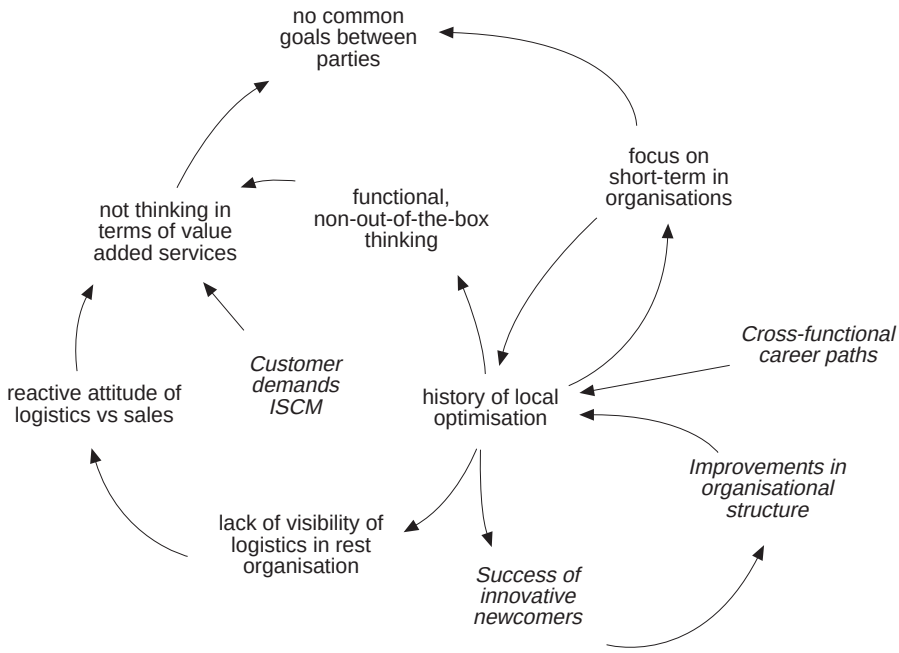

Figure 8.
Potential enablers to revert a vicious ISCM cycle into a virtuous one

down the functional silos, identified as a major root cause for disappointing performance in supply chains.

Customers demanding ISCM. Figure 8 also depicts another way to turn around a downward spiral of poor ISCM performance: enforced by a demanding customer (or by a demanding supplier one could add). This is already happening in many industries such as retail, automotive, and electronics. One participant remarked that his company, operating in the very competitive sound and vision industry, was more or less forced to improve supply chain performance by one of its larger American customers. The efforts resulted in a much closer co-operation with this customer, ultimately doubling the company's sales volume in the USA. This supports the point made earlier that the sales function may really prosper through close co-operation with supply chain managers. Suppliers who cannot keep up with the ISCM demands from their customers will eventually lose their business and perish.

Promoting cross-functional careers. A third enabler in Figure 8 is the introduction of cross-functional career paths, as pioneered by leading Japanese firms several decades ago. In the long run, this will generate management teams capable of thinking across existing functional boundaries, which we found to be an essential prerequisite for the development of successful ISCM policies. Supply chains do not exist in a vacuum, implying that due attention should be paid to interfaces with other functions like marketing, R&D, manufacturing, and finance. These other disciplines should also have the required know-how and capabilities to achieve ISCM goals.

Leveraging the potential of ICT systems. Information and communication technology (ICT) was the final enabler mentioned by the expert panel. ICT's impact is shown in Figure 9.

Currently, the quality of ICT systems for ISCM was perceived as below standards. Substantial improvements in this area are required to generate more detailed data on the real costs and benefits of ISCM. This might well show that many of the costs attributed to the logistics function are in fact caused elsewhere. Moreover, advanced ICT systems should be able to demonstrate the potential of enhanced ISCM performance on the bottom line, thereby giving those responsible for supply chain management a stronger voice in discussions with top management regarding the necessary investments. It should be added, though, that the current management load of implementing the new generation ERP systems was felt to be a substantial burden already for many experts in our panel. In other words, the pressure on (scarce) managerial resources and capabilities may well slow down the change process towards ISCM.

Discussion and concluding remarks

What are the implications of our Delphi workshop findings for the theory and practice of international supply chain management? We would like to raise three main points.

A first striking and rather surprising observation is that the international dimension was not identified as a major obstacle on the road to ISCM. One of the premises of this research project was that the international scope would add substantially to the complexity of supply chain management. The first

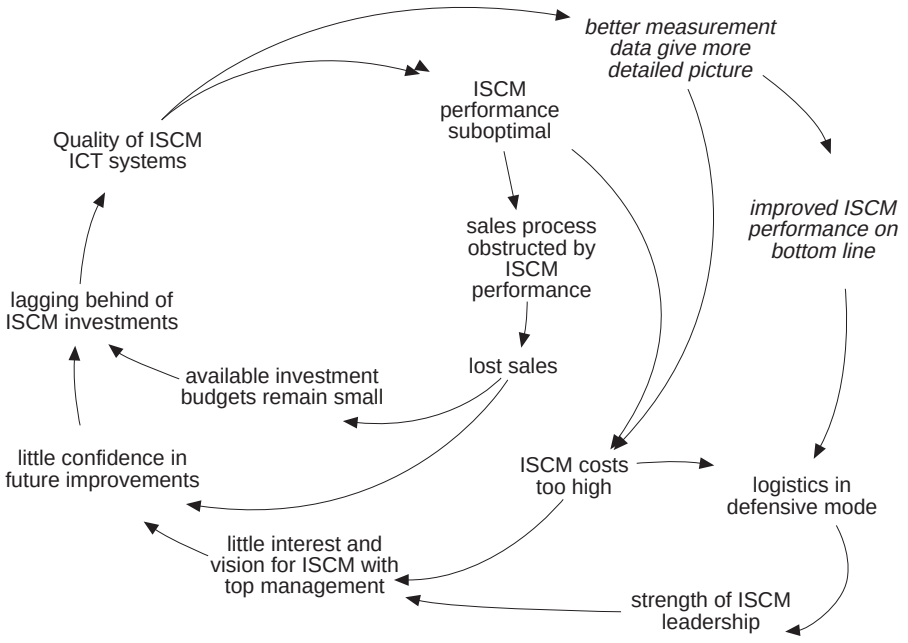

Figure 9.
Leveraging the potential of ICT systems for ISCM

brainstorm session did in fact generate some potential roadblocks in this area, like delays due to congestion in infrastructural facilities and the administrative hassle due to differences in national regulations. However, the main reasons underlying the failure to establish effective supply chain management should be sought in other areas, such as lacking management attention and a prevailing dominance of functional thinking. In general, these findings are in line with Klassen and Whybark's conclusion that managerial concerns dominate as barriers to effective ISCM. More specifically, two additional remarks concerning our workshop findings are in order. First, the functional thinking barrier is likely to be positively correlated with the geographical dispersion of facilities (see also Schary and Skjøtt-Larsen, 1995, p. 275). A quote from one of our experts, European logistics manager of the measurement equipment company, illustrates this point: "To sell our new European supply chain structure, I made a tour to convince our national sales subsidiaries throughout Europe. Some were enthusiastic immediately, some remained sceptical, and some were clearly negative". Second, it should be noted that in the brainstorm sessions no attention was paid to differences in operations in industrialised versus developing countries. A lot of the more technical barriers mentioned by Klassen and Whybark (1994) will particularly have a negative impact on the performance of operations in developing regions. It is plausible to assume that companies use inventory buffers to compensate for poor infrastructure, inefficient processes and greater uncertainty (Babbar and Prasad, 1998). Alternatively, firms may invest in upgrading the capabilities of their facilities located in developing regions, but this change process will definitely require a long-term commitment.

A second finding concerns the underlying mechanisms in explaining success or failure in managing (international) supply chains. In this respect, success refers to the ability to achieve a simultaneous increase in customer service and profitability. Earlier in this paper it was established that theory-building in this area is still scarce. The results of our workshop indicate that the mechanisms that enable or block effective ISCM management appear to be fairly generic across industries. This came as a surprise to both the participants and the facilitators. Even though a wide range of industries was represented (see the earlier list showing industry background of participants), all experts recognised the basic mechanisms described by their fellow participants. Moreover, the same mechanisms seem to apply to companies who are successful and those that are not successful in achieving effective ISCM performance. What was a vicious cycle for the one, was a virtuous for the other. As one participant observed: "I now understand why we don't have any problems in managing our internal operations and why at the same time our suppliers appear to be struggling so hard".

Finally, many of the observed roadblocks for effective ISCM appear to be deeply embedded in the organisational structures and cultures of companies. Functional silos, short-term thinking, lacking top management awareness, antagonism between sales and logistics, are all factors that are not solved

overnight. Our workshop panel was particularly sceptical regarding any substantial changes in supply chains where functional thinking is still the dominant attitude. Probably even more disturbing is the fact that many roadblocks appear to be systemic: once operating, they reinforce each other and themselves. This implies that it may be hard to change one factor without working on the others, and that a one-time impulse is unlikely to be sufficient to break away from a downward spiral. For instance, no wonders should be expected from substantial, and often underestimated, investments in sophisticated ICT systems, like ERP, if not accompanied by appropriate organisational change programs. Synchronisation of processes in the supply chain can never rely solely on technological progress.

Obviously, the results from our workshop form just an initial exploratory theory of how the organisational change process towards properly managed international supply chains works. The various causal models can be used as guidelines to develop sensible growth strategies for companies. What will be required next is empirical testing of the model's validity and a critical examination of its content by other researchers and practitioners. The debate has only just begun.

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