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SUPPLY CHAIN AND LOGISTICS TECHNOLOGY INVESTMENT IN SMALL AND MEDIUM- SIZED ENTERPRISES (SMES)

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INTRODUCTION

Supply chain management (SCM) is fundamentally about integration. This refers to integration between functions within organisations (i.e. the internal supply chain), as well as the integration between those firms that comprise the extended enterprise (i.e. the external supply chain). Achieving higher levels of supply chain integration (SCI) depends on many factors. One critical factor is the way in which information flows are managed throughout supply chain operations. Information and communications technology (ICT) has a critical enabling role in this context. The ICT tools available to firms have increased in sophistication in recent years, presenting significant challenges for firms of all sizes. These challenges are particularly acute in small and medium-sized enterprises (SMEs) generally, and small third-party logistics (3PL) firms in particular. This article explores these issues with a view to identifying some of critical success factors for logistics firms, as well as for other organisations that form part of the wider supply chain.

INTEGRATION – SCM'S "BIG IDEA"

Virtually all contemporary definitions SCM place a strong emphasis on the need for a shift from traditional supply chain architectures - often characterised by fragmentation - to more effective configurations, which aim to replace fragmentation with integration. This is true both in relation to internal and external chains. Moving from fragmented to more integrated approaches inevitably requires changes to the ways in which both internal and external customer and supplier relationships are created and managed. Information and communications technology (ICT) has a potentially pivotal role in this. To understand this, the manner in which the various "flows" in the supply chain should be managed needs to be considered.

In essence, for a supply chain to achieve its maximum level of effectiveness and efficiency, material, money and information flows throughout the entire chain must be managed in an integrated and holistic manner, driven by the overall customer service and cost objectives of firms. The view of an external chain shown in Figure 1 (Right) indicates the way in which material (products and services), money (funds) and information flow between the companies which participate in the chain. Similar flows typically occur between the functions which comprise the internal chain.

MANAGING INFORMATION FLOWS

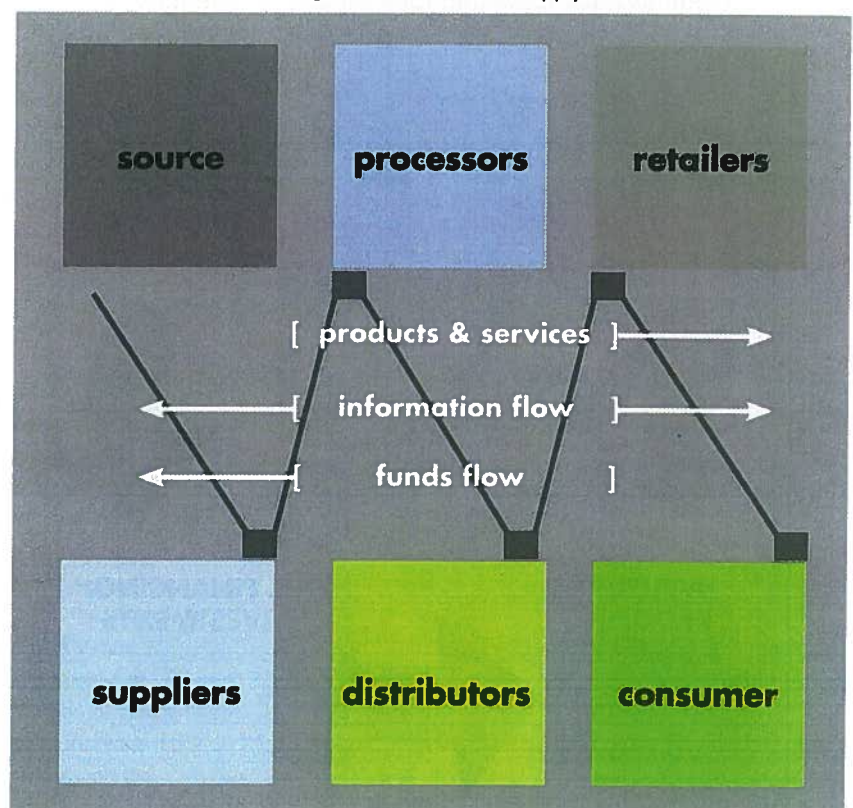
As shown in Figure 1 (Right) information flows in the supply chain are bidirectional. From an SCM perspective, it can be argued that managing the information flows is the most critical of the three main flow management

activities. This is because the flow or movement of materials or money is usually triggered by an associated information movement. Effective management of material and money flows is, therefore, predicated upon the effective management of the related information flows. The "bullwhip effect" to which Jay Forrester referred in the Harvard Business Review over half a century ago is essentially the product of poor information management in the supply chain and leads to a requirement to hold excessive levels of inventory. The corollary of this is that if levels of demand visibility are high throughout the supply chain then inventory levels can be reduced. In other words, good information effectively becomes a substitute for high levels of inventory.

ICT AS AN ENABLER OF SUPPLY CHAIN INTEGRATION

Recent years have also seen rapid developments in ICT used to facilitate SCM and, in particular, to enable higher levels

Figure 1: The External Supply Chain

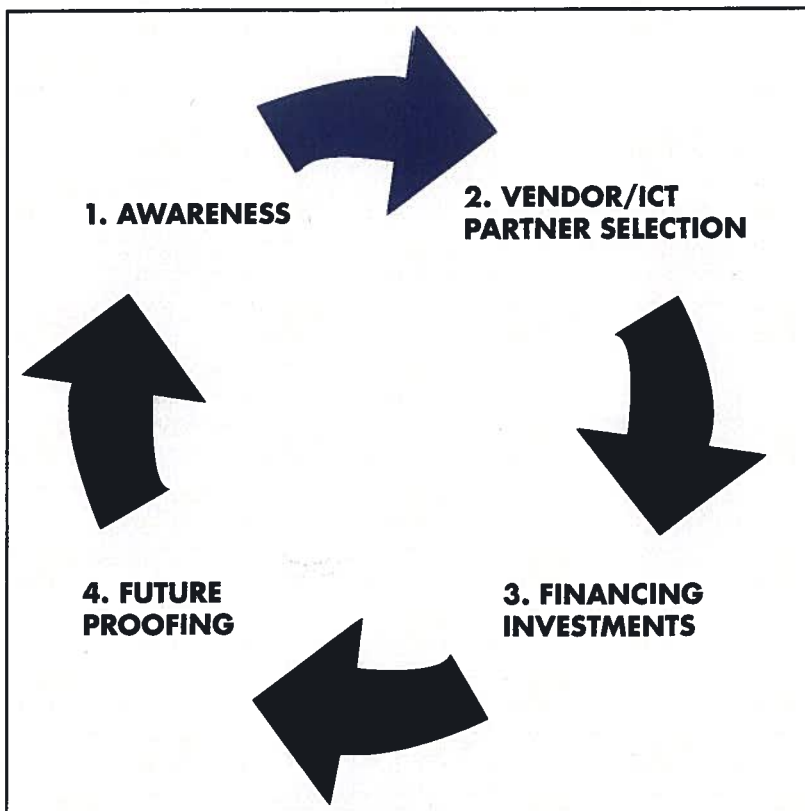


of SCI. NITL's taxonomy of supply chain ICT solutions identifies four primary categories as follows:

1. **Point solutions:** used to support the execution of one link (or point) in the chain (e.g. warehouse management systems or WMS);
2. **"Best of breed" solutions:** where two or more existing stand-alone solutions are integrated, usually using middleware technology;
3. **Enterprise solutions:** based on the logic of enterprise resource planning (ERP), these solutions attempt to integrate all departments and functions across a company into a single computer system that can serve all those different departments' particular needs; and,
4. **Extended enterprise solutions (XES):** refers to the collaborative sharing of information and processes between the partners along the supply chain using the technological underpinnings of ERP.

The move away from point towards enterprise solutions in many ways reflects the shift from internal and functional management orientations to more externally-focussed, process orientations in recent years. This facilitates supply chain responsiveness as companies can act based on real demand

Figure 2: Technology Investment Challenges for SMEs.



rather than depending on the noisy data that is an inevitable consequence of orders being transmitted from customers to suppliers in an external supply chain.

TECHNOLOGY ADOPTION IN SMES

NITL, often in collaboration with its research partners in Ireland and abroad, has conducted a significant amount of both quantitative and qualitative research into technology diffusion and adoptions patterns. This work focuses on examining the extent of technology adoption by firms generally and by SMEs in particular. This research has also had a focus on identifying the critical success factors and barriers to implementation as they apply to technology adoption.

Documented research suggests that SMEs in many sectors are in danger of becoming marginalised as a result of lack of investment in technology generally and ICT specifically. The reality is that smaller firms have a number of challenges that they must address in this area as a direct consequence of their size – see Figure 2 (below).

Firstly, smaller firms struggle to stay abreast of developments in technology as they usually can not afford specialist staff in this area. The recent rapid rate of development in technology has accentuated this problem. Secondly, even where smaller firms have a reasonable perspective in relation to the technology offerings in the market place, they often struggle to interact with technology vendors on anything like a level playing field. In other words, the mismatch in technological knowledge between the vendor and the prospective customer creates an immediate imbalance in the relationship. This can result in confusion being created in the mind of the latter and lost sales for the former. More enlightened vendors are increasingly cognisant of this dynamic. In view of this issue, it is perhaps not surprising that smaller firms often feel more comfortable doing business with smaller technology vendors with a proven track record in meeting the needs of other SMEs. Thirdly, even where an SME has a good working knowledge of the available technology and has identified a possible partner/vendor to work with, there are often issues around lack of ability to finance the required investment. There is significant evidence that this problem has been exacerbated by the lack of credit available as a result of the banking crisis. Finally, smaller firms often have serious issues (or even perceived issues) in relation to the "future proofing" of technology investments. This is primarily a product of the rapid rate of development of ICT tools. Given the significance of the investment for many smaller firms this concern on their part should not come as a major surprise.

TECHNOLOGY ADOPTION IN SMALL 3PLS

The third party logistics (3PL) sector provides a very good illustration of this issue. It is an interesting sector in that it is characterised by a very small number of large players (i.e. multinationals with a strong – often global – footprint) and, concomitantly, a very large number of smaller firms. Our research points to the fact that smaller firms being increasingly marginalised as tier suppliers to their larger counterparts. This is largely though

not exclusively driven by the digital divide between the two ends of the size spectrum. Larger firms have invested significantly in technology as a means of developing more highly differentiated service offerings to their customer base. This has allowed them to develop their offerings into areas that are more technology-intensive and more knowledge-intensive, thus adding increased customer value and the likelihood of higher profit margins. Meanwhile, smaller providers are often forced to continue to compete largely in the purely transportation space – a sector characterised by dangerously low margins in what has essentially become a commodity business.

The changing role of 3PLs in the wider supply chain also has a potential impact on technology investment. Manufacturers and retailers are increasingly focusing on what they regard as their core activities or competencies. One consequence of this is that activities regarded as “non-core” are being outsourced through a process of vertical disintegration. In addition to activities such as transportation and warehousing, other “value-adding” supply chain activities have also been outsourced to third-party organisations with 3PLs often well positioned to take on this work. This has not only made the role of 3PLs more critical in terms of the overall success of the supply chain but has also resulted in the so-called “logistics strategic conundrum” – while many of their customers are narrowing their focus 3PLs are often simultaneously broadening the scope of their operations. Two technology issues are critical here. Firstly, many of the value-adding logistics services now being undertaken by 3PLs are information-intensive and require a significant investment in ICT. Secondly, the process of vertical disintegration has resulted in a shift away from the traditional model of “control through ownership” towards models which are based on management and control through effective supply chain relationship management. ICT is a key enabler in this scenario and again often results in a significant ICT investment requirement. The challenge is made more acute where 3PLs are forced to adopt the different technology platforms used in their various customers’ operations. This in turn can result in “islands of automation” within 3PLs where multiple standards, systems and platforms co-exist with limited connectivity. In this scenario, ICT becomes an impediment rather than an enabler of supply chain integration.

CHALLENGES AND SOLUTIONS

The above raises important issues for smaller firms including, but not limited to, the following:

- Education and awareness creation around the role of technology in the creation of competitive advantage;
- Management of relationships between SMEs and technology vendors;
- Financial appraisal of possible investments in technology and their actual financing in the current economic climate; and,
- Possible approaches to the future-proofing of ICT investments.

Unless these issues are addressed there is a danger that the marginalisation of SMEs in the wider supply chain will become more acute with the digital divide making it impossible for smaller firms to survive. This issue is particularly serious in an Irish context where the vast majority of indigenous firms are SMEs. 3PLs face unique challenges in this arena as a result of some of the issues discussed previously. Attention has been sharpened on these challenges in many sectors as a result of the centrality of information management – and, therefore, ICT – in the planning and control of increasingly global and virtual supply chain configurations. Given that any supply chain is only as strong as the weakest link in the network, the marginalisation of SMEs in general, and small 3PLs specifically, has the potential to increase the fragility of the extended enterprise, thus impacting negatively on the competitiveness of all firms in the chain.

CONCLUDING COMMENTS

There can be little doubt that the effective adoption of appropriate technology has the potential to make a positive contribution to the success of all firms – including smaller 3PLs. This requires a mindset shift in relation to the way in which firms upstream and downstream in the supply chain interact with each other. There are no simple solutions to the challenges presented in this article. However, our research suggests that the adoption of supply chain principles of inter-firm integration and partnership-based collaboration has the potential to make a positive impact. In the past this is an area which has fallen into the “lip service trap” – in other words, “if we talk about this (i.e. integration and partnership) for long enough we begin to believe that we’re actually doing it!”. Traditionally the focus has often been largely on the so-called “hard-wiring”, i.e. the technology itself. What is often more important – and more difficult – is the so-called “soft-wiring”. This is concerned with the people dimension and, in particular, with the nature of relationships between the entities that comprise the wider supply chain. Our work suggests that unless these issues are engaged with in a more meaningful and positive manner then the huge potential offered by technology will not be realised.

ABOUT THE AUTHOR

Edward Sweeney FCILT is Director of Learning at the National Institute for Transport and Logistics (NITL) based at the Dublin Institute of Technology (DIT). In addition to his work as an educator, he is also active as a consultant in a variety of business sectors. Edward is an experienced researcher with over 200 publications to his name. His latest book is entitled *Supply Chain Innovation for Competing in Highly Dynamic Markets: Challenges and Solutions* (eds. Evangelista, P., McKinnon, A., Sweeney, E., Esposito, E.) and will be published by IGI Global in October.

