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### **An Assessment Methodology for Evaluating Supply Chain Management (SCM) Adoption**

**Dr. Andrew L S Goh**

Division of Business  
University of South Australia

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## Abstract

With the advent of the knowledge economy, knowledge management (KM) practices are often regarded as having a significant impact on business performance. As a result, companies are now eagerly leveraging from the competitive advantage offered by KM tools to manage their supply chains. In recent years, the use of supply chain management (SCM) solutions has become more prevalent in corporate sectors. However, as to how SCM solutions can be beneficial to businesses; and how SCM adoption should be evaluated have yet to be addressed.

This article first outlines the digital challenge facing today's businesses and discusses the KM issues relating to SCM solutions. It then describes the five components of SCM and highlights the management aspects of a supply chain that merit focused attention. Next, it turns to the workflow for effective SCM adoption to achieve better returns on investments. Based on a ranking protocol, an assessment methodology is proposed, using four levels of adoption, to evaluate the five components of SCM. An evaluative sample is shown to illustrate the results arising from the assessment methodology. In conclusion, the success of SCM requires deliberate efforts in understanding the challenges of SCM adoption, identifying suitable SCM tools; and then designing appropriate SCM solutions to deliver the best value for customers.

### **Keywords:**

Knowledge economy, knowledge management, information and communication technologies, supply chain management, assessment methodology.

## The Digital Challenge

In the 1970s, the development, acquisition and application of data management tools were seen to be the *raison d'être* for all competitive businesses. Subsequently, from the 1980s to the early 1990s, the managerial focus shifted to information management. With this shift came the emphasis on information technology (IT) that has, in two decades, revolutionised the way businesses are conducted. However, in the last few years, one key aspect of effective corporate strategies is the explicit utilisation of knowledge to continuously improve business performance. Presently, the use of knowledge and its management or termed generally as "knowledge management (KM)", as defined below, has emerged as a prioritised area of managerial concern (Goh, 2004; Maryam and Leidner, 2001; Barth, 2000; Amidon, 1997; Davenport, 1996).

Knowledge management (KM) is the systematic leveraging of data, information, skills, expertise, and various forms of assets and capital to improve organisational innovation, responsiveness, productivity and competence. It embodies the critical issues of organisational processes, through the use of appropriate technologies, to harness different types of knowledge assets.

Now, data management and information management, which are the traditional areas of managerial concern, are fast becoming secondary and in many instances, even obsolete. The prevailing shift to knowledge management and its deployment in functions such as finance, human resource and inventory management has resulted in a proliferation of KM tools for the corporate sector. Examples include the use of

expertise access tools, e-learning applications, web portals, chat technologies, electronic message boards, synchronous interaction tools, and data mining tools. Understandably, turning to KM tools is a natural option, although panaceas like enterprise resource planning (ERP) remain a “bitter pill” for organisations to swallow. Currently, supply chain management (SCM), essentially a KM initiative, is employed to meet the demand for customised products to be delivered in increasingly shorter life cycles while at the same time, keeping inventories at manageable levels – which has inadvertently elevated the prominence of SCM. Although its benefits correlate positively to cost savings, like all KM investments, there are considerable risks associated with such investments as they do not necessarily lead to expected benefits due to failures of adoption (Lindgren and Henfridsson, 2002; Clarke and Rollo, 2001; Storey and Barnett, 2000; Fahey and Prusak, 1998). To ensure that SCM solutions would eventually bring about intended benefits to organisations, IT decision-makers such as Chief Information Officers (CIOs) or Chief Knowledge Officers (CKOs) have to be aware of the potential pitfalls and vulnerabilities accompanying the use of these KM tools. Clearly, there is a need to identify new business processes and to exploit best KM practices for managing a supply chain. In particular, the challenges relating to effective SCM adoption and how it can be evaluated should be addressed.

## Exploiting Supply Chain Management

Supply chain management (SCM) has been viewed as an area of managerial concern that revolves around the procurement process. But in actuality, SCM involves an amalgamation of skills, expertise and technologies that allow a firm to perform the function of procuring raw materials and components the firm needs to make a product or service, manufactures that product or service and then delivers it to customers (Bowersox, Closs and Stank, 2001; 2003). In today’s global competitive environment, firms also use extended supply chains to create business value so that operational efficiency and revenue enhancement may come from integration and synchronisation with partners. In other words, collaborative activities with external partners to create an extended supply chain beyond the firm itself have become a new arena for value creation. Hence, a systems view of SCM has to be adopted to enable managers to harness the benefits of SCM and to be familiar with system management interventions that may be used to yield better results. Viewed from a systems perspective, there are five components of SCM that require specific consideration as described below:

**Plan** – constitutes the strategic component of SCM

- Needs a deliberate organisational strategy for managing all the resources required for meeting customer demands for a firm’s product or service.
- concerns the development of a set of metrics to monitor the supply chain to ensure that it is efficient, cost-effective and delivers customer value.

**Source** - concerns the choice of suppliers for supply chain

- develops a set of pricing, delivery and payment processes with suppliers and create metrics for monitoring and improving the relationships.
- Assembles processes for managing the inventory of goods and services received from suppliers, including receiving shipments, verification, transferring between manufacturing facilities, and authorising supplier payments.

**Make** - involves essentially manufacturing of the supply chain

- schedules the activities for production, testing, packaging and preparation for delivery.

- measures the quality levels, production output and worker productivity of the supply chain.

**Deliver** – refers to what commonly termed as "logistics."

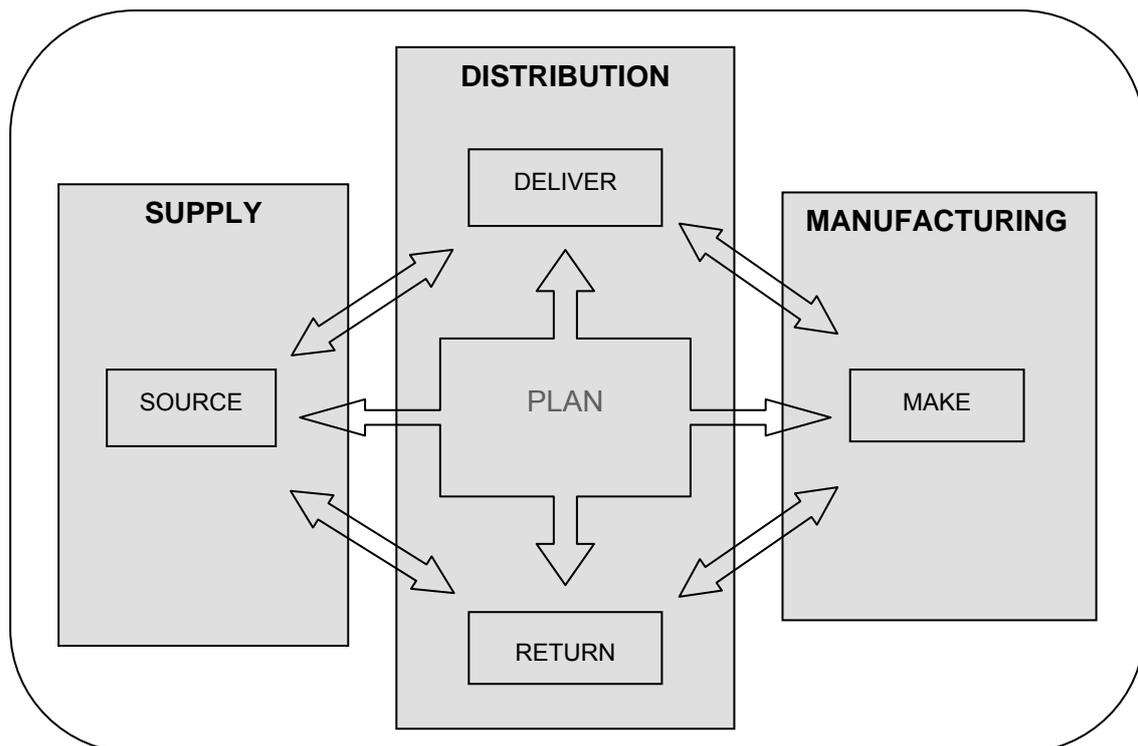
- co-ordinates the receipt of orders from customers.
- develops a network of warehouses
- selects carriers to get products to customers.
- sets up an invoicing system to receive payments.

**Return** – refers to the problematic part of the supply chain.

- creates a network for receiving defective and excess products back from customers
- supports customers who have problems with delivered products.

To exploit SCM strategically, a firm needs to discard its conventional thinking about organisational structures and corporate functions. SCM is basically about making decisions on how to coordinate the production of goods and services, how and where to store inventory, whom to buy materials from, and how to distribute them in a cost-effective and timely manner. The top-down, command-and-control, function-based organisational hierarchy should thus be replaced by organisational structures centred on connections, linkages and synergies based on "shared expertise" to deliver the best results that SCM solutions can offer. Schematically, a supply chain may be conceived as consisting of three parts: (1) supply; (2) distribution, and (3) manufacturing, as depicted in Figure 1. In addition, three management aspects of a supply chain merit focused attention. First, the five components of SCM should be tightly integrated to ensure that the products or services could be delivered to customers efficiently (e.g. through efforts in information sharing). Second, the time durations for processes along the supply chain should be optimised (e.g. shortening activity time or eliminate value-depleting activities) to minimise delays. Third, the implementation of the supply chain must create new value and produce profits (e.g. improved quality and productivity) for businesses.

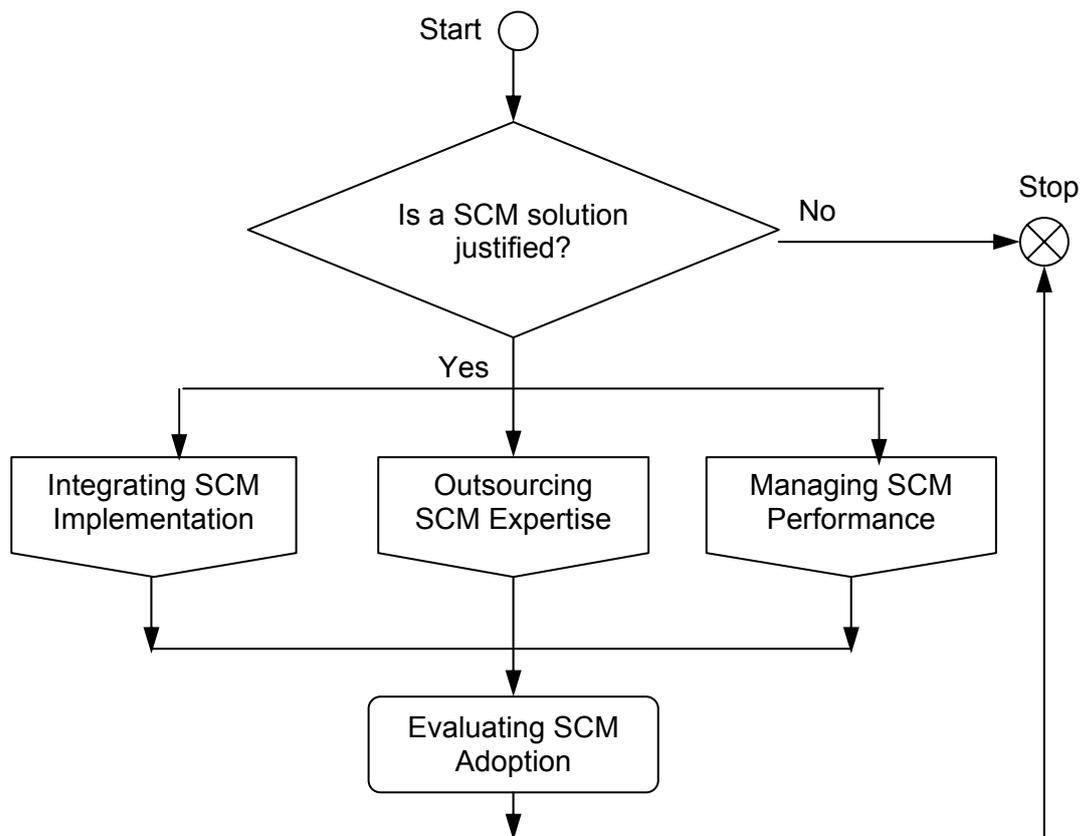
**Figure 1:** Schematic View of SCM



## Workflow for Effective SCM Adoption

Intense global competition has propelled managers to be constantly in search of new novel ways of adopting SCM solutions. One example is the development of a fully integrated computerised system to automate a company's management of a supply chain to meet customers' demands. However, until recently, most businesses, even large global firms with strong IT capabilities, have yet to fully harness the benefits of SCM. Nevertheless, the success stories of major SCM users, that have undertaken organisation-wide SCM implementation, have prompted companies to seriously consider adopting SCM as a strategic KM tool (O'Brien 2002; Dutta and Segev, 1999). At the same time, IT companies, under constant pressure to introduce new software tools, are also strongly pushing SCM adoption for businesses. Fundamentally, the heightened interest in SCM resulted from rising optimism that technological KM tools could offer an "intelligent means" of creating new customer value and hence improve business performance. To take KM issues into account, five aspects of SCM are identified, whereby organisational efforts should be allocated to achieve better returns on investments (e.g. cost savings or productivity enhancement). They are: (1) Justifying SCM Solution; (2) Integrating SCM Implementation; (3) Outsourcing SCM Expertise; (4) Managing SCM Performance, and (5) Evaluating SCM Adoption, as illustrated in Figure 2 (Goh, 2005; Ayers and Malmberg, 2002; Gold, Malhotra and Segars, 2001; Blumentritt and Johnston, 1999).

**Figure 2:** Flowchart for SCM Adoption



## Justifying SCM Solution

While SCM solutions may enhance business performance, a “big-bang” approach to SCM adoption does not necessarily guaranteed results. It is more prudent to amply justify how a supply chain should be designed, implemented and managed to handle procurement, manufacturing and logistics and other business functions as part of the company’s operations. For instance, in markets where prospective customers are located in remote places and orders are few in quantities, they may be better served by locally appointed representatives or agents, instead of via an online transaction portal (Lykins, 2002; Seow, 2002). SCM solutions may be more justifiably applicable in mature markets where road infrastructure and transportation networks are sufficiently developed enough to ensure efficient delivery and prompt payment collection. Thus, companies should not be blinded by technological SCM tools, thinking that they offer the “best means” for managing supply chains and thus deliver maximum customer value. The overriding issue of SCM adoption should be centred on whether the targeted markets are “ready” (e.g. well-entrenched in IT usage) to establish a “virtual presence” for electronic transactions – in which a suitable SCM solution provides a useful mechanism for creating orderly information, increasing process efficiency and enhancing customer value. Should one be unsure whether SCM investments will turn in business value, it may then be more appropriate to start with incremental enhancements. In instances where there are no real justification for a SCM solution, customer orders may be placed via electronic mail or simply the plain old telephony system instead of developing a full-fledged SCM system.

## Integrating SCM Implementation

While SCM solutions can be used to overhaul the cycle from customer order back to buying parts required to fulfil the order, a lack of synergistic integration may lead to sub-optimal performance. Thus, SCM solutions need to be integrated to cater to a wide range of products, thereby resulting in lower development costs, inventory and lead times. For example, eBRIDGE™ has been employed by companies for integrating SCM implementation to enable back-end accounting applications to exchange information with suppliers, customers and other IT applications, including procurement solutions, warehouse management systems or even third party warehouse providers. Exploiting the full benefits of SCM requires an integration of SCM capabilities and IT resources already available within the company and should improve the way internal functions collaborate. If integration is properly executed, it provides not only higher efficiency, but also draws upon the company’s existing line-of-business (LOB) systems (e.g. finance systems, inventory systems, billing systems) to offer better delivery service. Hence, integrating SCM implementation offers a holistic approach to executing a company’s SCM strategy. For instance, some international companies are already integrating SCM solutions to encompass customer relationship management (CRM) and data warehousing systems (DWS) for their global reporting systems, by leveraging the strategic advantages of existing IT systems, processes and other application tools.

## Outsourcing SCM Expertise

Depending on organisational requirements, a SCM solution can be chosen from a whole host of options that cater to a wide range of budgets and business needs. As SCM is essentially concerned with the flow of goods and services from various

sources; and SCM tools may be employed to track procurement, manufacturing, inventory, distribution, logistics, design and financing, the types of expertise required to manage a supply chain are highly complex. Because of this inherent complexity, there is no such thing as a “one-size-fits-all” SCM solution. Rather, a company has to first extract and evaluate the intrinsic supply chain(s) embedded within the organisational set-up and through appropriate changes, transform them into a highly effective supply chain. However, a common barrier of supply chain change is often the managerial mindset to look within company walls for a SCM solution. But increasingly, companies find that they compete more successfully if they limit themselves to what they do best. Besides, the cost of acquiring supply chain competences (e.g. distribution networks) as a “sideline” activity may be highly prohibitive. Thus, functions like transportation, warehousing, supplier quality tasks and other IT-related SCM capabilities are now being outsourced and companies are also eager to forge SCM partnerships. To do this well, it is crucial to pick the right SCM outsourcing partners (e.g. to implement multiple-level global supply chain through all players including suppliers of suppliers); and to utilise appropriate SCM tools to manage supply chain networks.

## Managing SCM Performance

Managing the performance of a supply chain for a complex business operation is both an art as well as a science. The supply chain processes involved for a complex operation not only overlap, but are also intricately intertwined. Hence, despite the opportunities offered by SCM, which offers a whole host of web-based capabilities, its performance depends on a multitude of factors. The reasons behind lacklustre SCM performance tend to be related to factors such as logistics bottlenecks, short product life cycles, demand uncertainty, supplier reliability or lack thereof. Moreover, ineffective SCM solutions are also the end results of SCM users that merely installed IT systems without really addressing SCM adoption. Under such circumstances, even with well-established information and communications technologies (ICT) infrastructure and strong IT capabilities, companies may still find it difficult to extract maximum value from SCM investments. To manage a company's SCM performance well, SCM users need to continuously appraise and bridge existing gaps in SCM along the supply chain through collaboration, supply chain design and characterisation (e.g. improving cash flow). To cite an example, Dell Computers – the moment a customer submits an online order, all of its global suppliers, whether in IC chips, electronic components and parts are immediately notified of the order; and they instantly react without delay so that the order will be delivered in a week. Thus, one way of improving SCM performance is to implement changes that leverage the potential to be demand-driven like shifting SCM solutions from build-to-forecast to build-to-order to achieve better profits.

## Evaluating SCM Adoption

Given the high investments involved in SCM, the costs of a SCM solution should be offset against its long-term benefits on business performance. But to maximise the return on investment, it is crucial to set specific goals such that the business process requirements along a supply chain are clearly defined (e.g. shortening cycle time in a critical path process). Because today's SCM market has emerged as an industry where the technologies involved require users to selectively utilise KM tools in terms of enterprise deployment, an evaluation of “one's preparedness for SCM” is vitally important for organisations to make the right decisions about SCM investments.

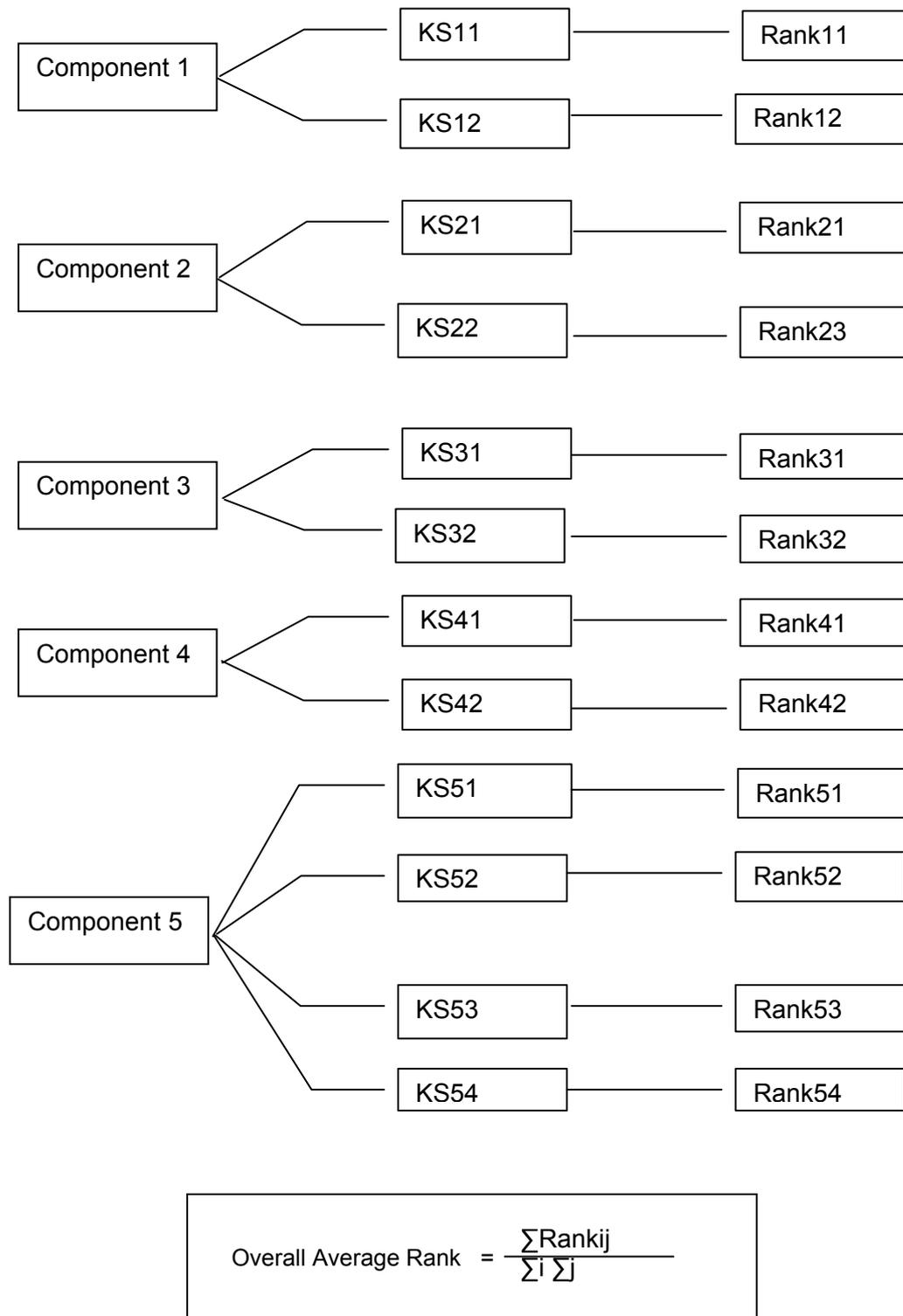
Currently, SCM implementation operates a host of best KM practices that focus almost exclusively on deployment methodologies. At the same time, there are only a few methods available for evaluating SCM adoption. One example is the Siebel System Value Diagnostic for ranking an organisation's level of SCM adoption. However, in evaluating SCM adoption, one must realise that the payback for SCM solutions is more than just "crunching numbers" – but involves competitive positioning and benchmarking.

**Figure 3:** Adoption Assessment

	<b>Level of Adoption</b>	<b>Description</b>
Level 1	Substantial Improvement Opportunities	Developing and implementing strategies to increase competitiveness and to generate financial returns
Level 2	Early-Stage Adopter	Building on early successes to further create competitive advantage and to increase returns on investments
Level 3	Emerging Leader	Focused achievement of best practices to intensify industry leadership
Level 4	Best Practitioner	Maintaining leading-edge business processes and best practices and ensuring consistent and efficient execution to extend competitive advantage over time

Quantitatively, four levels of adoption assessment, as shown in Figure 3, are distinguishable for discerning organisational readiness in SCM. The four levels are: (1) substantial improvement opportunities, (2) early-stage adopter, (3) emerging leader and (4) best practitioner, in ascending order of adoption (Level 1 is the lowest adoption and Level 4 is the highest adoption). Two up to four key steps are ranked on a scale of 1 to 4 to estimate the level of adoption for the five components, namely: plan, source, make, deliver and return. To evaluate SCM adoption, an assessment methodology is developed based on a ranking protocol; and the overall average rank of SCM adoption can be calculated systematically. The ranking protocol, as illustrated in Figure 4, provides the methodological approach for evaluating SCM adoption by assessing the steps involved for each component. If new steps need to be incorporated in the ranking protocol, the assessment methodology can be re-designed to include these steps.

**Figure 4:** Ranking Protocol for SCM Evaluation



## An Evaluative Sample

As the assessment methodology carries an element of subjectivity, loading factors may be incorporated for each key step to further improve the reliability of the evaluation process. However, this would require a sufficiently sizeable historical database of companies to be built first whose evaluation results and the level of SCM adoption are known and available. Nevertheless, it must be acknowledged that SCM adoption is dynamic in nature and would progress over time as SCM capabilities are strengthened. For this reason, SCM should not be viewed as a one-off static solution, but as an on-going commitment to improving business processes in a supply chain. To provide a typical example for reference, an evaluative sample of the company, ACE Logistics Associates, as assessed by Mr Paul J. Snyder, is shown in Figure 5. From the evaluation results, it was demonstrated that the company is an emerging SCM leader, with potential of being a best practitioner, particularly for the three components: plan, source and make.

**Figure 5:** An Evaluative Sample

<b>ORGANISATION:</b> LOGISTICS ASSOCIATES		<b>ACE</b>	<b>ASSESSOR:</b> PAUL J. SNIDER		<b>DATE:</b> 15 February 2005				Average Rank
Component	Key Step	Ranking							
		1	2	3	4				
Plan	Have a deliberate organisational strategy for managing resources required for meeting customer demands.			X					
	Have a set of metrics to monitor the supply chain to ensure efficiency and cost-effectiveness.				X			3.5	
Source	Have a set of pricing, delivery and payment processes with suppliers and create metrics for monitoring and improving relationships.				X				
	Implement processes for managing inventory of goods and services received from suppliers, including shipments etc.			X				3.5	
Make	Schedule the activities for production, testing, packaging and preparation for delivery.				X				
	Measure the quality levels, production output and worker productivity of the supply chain.			X				3.5	
Deliver	Co-ordinate the receipt of orders from customers		X						
	Develop a network of warehouses				X				
	Select carriers to deliver products to customers.			X					
	Set up an invoicing system to receive payments.			X				3.0	
Return	creates a network for receiving defective and excess products back from customers		X						
	supports customers who have problems with delivered products				X			3.0	
		<b>Number of scores for each rank</b>				0	2	5	5
		<b>Overall Average Rank</b>				3.25			
		<b>Adoption Description</b>				Emerging Leader			

## Conclusion

In summary, this article has highlighted the knowledge management (KM) aspects of a supply chain that merit focused attention for effective SCM adoption. It has developed an assessment methodology for evaluating SCM adoption based on five components: plan, source, make, deliver and return. Using a ranking protocol, the level of SCM adoption can be systematically evaluated and ranked. The methodology not only provides a strategic tool for managers to understand the extent of SCM adoption as part organisation-wide efforts towards, say, a cross-functional enterprise resource planning system, but also enhances the company's effectiveness in embracing best knowledge management (KM) practices. The evaluation process also offers an opportunity to learn about a company's strengths and weaknesses in SCM adoption and to navigate its SCM strategies on how to advance its journey to eventual SCM excellence. Thus, further attempts should be made to improve its supply chain through efforts such as shortening process lead-time or via flow model economics and the like. One example is to reform an existing supply chain or combine multiple supply chains into one to improve a company's competitive position in SCM adoption. Given that businesses are trying their utmost to leverage from SCM solutions, relying blindly on technological KM tools alone to manage supply chains is clearly inadequate. In all certainty, installing a SCM solution is not a "magic bullet" for inefficient supply chains. True supply chain excellence comes only from understanding SCM adoption and then exploiting what technology has to offer for a SCM solution. In conclusion, the best bet for SCM success is to first evaluate a company's SCM adoption, identify suitable SCM tools, and then design an appropriate SCM solution to deliver the best value for customers.

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