Information Technology in a Supply Chain

LEARNING OBJECTIVES

After reading this chapter, you will be able to

1. Understand the importance of information and information technology in a supply chain.
2. Know, at a high level, how each supply chain driver uses information.
3. Understand the major applications of supply chain information technology and the processes that they enable.

Information is crucial to the performance of a supply chain because it provides the basis on which supply chain managers make decisions. Information technology consists of the tools used to gain awareness of information, analyze this information, and execute on it to improve the performance of the supply chain. In this chapter, we explore the importance of information, its uses, and the technologies that enable supply chain managers to use information to make better decisions.

THE ROLE OF IT IN A SUPPLY CHAIN

Information is a key supply chain driver because it serves as the glue that allows the other supply chain drivers to work together with the goal of creating an integrated, coordinated supply chain. Information is crucial to supply chain performance because it provides the foundation on which supply chain processes execute transactions and managers make decisions. Without information, a manager cannot know what customers want, how much inventory is in stock, and when more product should be produced or shipped. In short, information provides supply chain visibility, allowing managers to make decisions to improve the supply chain's performance.

IT consists of the hardware, software, and people throughout a supply chain that gather, analyze, and execute upon information. IT serves as the eyes and ears (and sometimes a portion of the brain) of management in a supply chain, capturing and analyzing the information

necessary to make a good decision. For instance, an IT system at a manufacturer may show the finished goods inventory at different stages of the supply chain and also provide the optimal production plan and level of inventory based on demand and supply information.

Using IT systems to capture and analyze information can have a significant impact on a firm's performance. For example, a major manufacturer of computer workstations and servers found that most of its information on customer demand was not being used to set production schedules and inventory levels. The manufacturing group lacked this demand information, which essentially forced it to make inventory and production decisions blindly. By installing a supply chain software system, the company was able to gather and analyze demand data to produce recommended stocking levels. Using the IT system enabled the company to cut its inventory in half, because managers could now make decisions based on customer demand information rather than manufacturing's educated guesses. Large impacts such as this underscore the importance of IT as a driver of supply chain performance.

Availability and analysis of information to drive decision making is a key to the success of a supply chain. Companies that have built their success on the availability and analysis of information include Seven-Eleven Japan, Walmart, Amazon, UPS, and Netflix. To support effective supply chain decisions, information must have the following characteristics:

1. ***Information must be accurate.*** Without information that gives a true picture of the state of the supply chain, it is difficult to make good decisions. That is not to say that all information must be 100 percent correct, but rather that the available data paint a picture that is at least directionally correct.
2. ***Information must be accessible in a timely manner.*** Accurate information often exists, but by the time it becomes available, it is either out of date or it is not in an accessible form. To make good decisions, a manager needs to have up-to-date information that is easily accessible.
3. ***Information must be of the right kind.*** Decision makers need information that they can use. Often companies have large amounts of data that are not helpful in making a decision. Companies must think about what information should be recorded so that valuable resources are not wasted collecting meaningless data while important data go unrecorded.
4. ***Information must be shared.*** A supply chain can be effective only if all its stakeholders share a common view of the information that they use to make business decisions. Different information with different stakeholders results in misaligned action plans that hurt supply chain performance.

Information is used when making a wide variety of decisions about each supply chain driver, as discussed next.

1. ***Facility.*** Determining the location, capacity, and schedules of a facility requires information on the trade-offs among efficiency and flexibility, demand, exchange rates, taxes, and so on (see Chapters 4, 5, and 6). Walmart's suppliers, for instance, use the demand information from Walmart's stores to set their production schedules. Walmart uses demand information to determine where to place its new stores and cross-docking facilities.
2. ***Inventory.*** Setting optimal inventory policies requires information that includes demand patterns, cost of carrying inventory, costs of stocking out, and costs of ordering (see Chapters 11, 12, and 13). For example, Walmart collects detailed demand, cost, margin, and supplier information to make these inventory policy decisions.
3. ***Transportation.*** Deciding on transportation networks, routings, modes, shipments, and vendors requires information about costs, customer locations, and shipment sizes to make good decisions (see Chapter 14). Walmart uses information to tightly integrate its operations with those of its suppliers. This integration allows Walmart to implement cross-docking in its transportation network, saving on both inventory and transportation costs.

4. ***Sourcing.*** Information on product margins, prices, quality, delivery lead times, and so on are all important in making sourcing decisions. Given sourcing deals with inter-enterprise transactions, a wide range of transactional information must be recorded to execute operations, even once sourcing decisions have been made.
5. ***Pricing and revenue management.*** To set pricing policies, one needs information on demand, both its volume and various customer segments' willingness to pay, and on many supply issues, such as the product margin, lead time, and availability. Using this information, firms can make intelligent pricing decisions to improve their supply chain profitability.

In summary, information is crucial to making good supply chain decisions at all three levels of decision making (strategy, planning, and operations) and in each of the other supply chain drivers (facilities, inventory, transportation, sourcing, and pricing). IT enables not only the gathering of these data to create supply chain visibility, but also the analysis of these data so that the supply chain decisions made will maximize profitability.

THE SUPPLY CHAIN IT FRAMEWORK

We develop a framework that managers can use to understand the role of IT within the supply chain. At its core, IT provides access and reporting of supply chain transaction data. More advanced IT systems then layer on a level of analytics that uses transaction data to proactively improve supply chain performance. For example, as a baseline, good IT systems will record and report demand, inventory, and fulfillment information for Amazon. IT systems that provide analytics then allow Amazon to decide whether to open new distribution centers and how to stock them.

Given that both reporting and analysis require the availability of accurate transaction data, enterprise software forms the foundation of a supply chain IT system. This is a space that has matured from the early 1990s to the early 2000s, with SAP and Oracle as the two major players. During this period, enterprise software providers such as SAP and Oracle worked to extend their analytics capabilities, while best-of-breed analytics providers such as i2 and Manugistics attempted to provide transaction level capability. The winners were the enterprise software providers, and the first decade of the twenty-first century saw significant consolidation across the industry. We propose that further evolution of supply chain IT can be viewed in the context of the supply chain macro processes discussed in Chapter 1.

The Supply Chain Macro Processes

The emergence of supply chain management has broadened the scope across which companies make decisions. This scope has expanded from trying to optimize performance across the division, to the enterprise, and now to the entire supply chain. This broadening of scope emphasizes the importance of including processes all along the supply chain when making decisions. From an enterprise's perspective, all processes within its supply chain can be categorized into three main areas: processes focused downstream, processes focused internally, and processes focused upstream. We use this classification to define the three macro supply chain processes (see Chapter 1) as follows:

- ***Customer relationship management (CRM).*** Processes that focus on downstream interactions between the enterprise and its customers.
- ***Internal supply chain management (ISCM).*** Processes that focus on internal operations within the enterprise. Note that the software industry commonly calls this *supply chain management* (without the word *internal*), even though the focus is entirely within the enterprise. In our definition, supply chain management includes all three macro processes—CRM, ISCM, and SRM.
- ***Supplier relationship management (SRM).*** Processes that focus on upstream interactions between the enterprise and its suppliers.

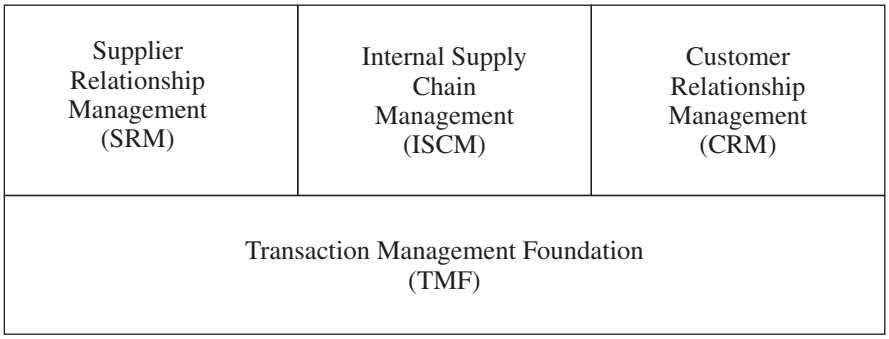

FIGURE 1 The Macro Processes in a Supply Chain

All operation and analytics related to the macro processes rest on the *transaction management foundation* (TMF), which includes basic enterprise resource planning (ERP) systems (and its components, such as financials and human resources), infrastructure software, and integration software. TMF software is necessary for the three macro processes to function and to communicate with one another. The relationship between the three macro processes and the transaction management foundation can be seen in Figure 1.

Why Focus on the Macro Processes?

As the performance of an enterprise becomes more closely linked to the performance of its supply chain, it is crucial that firms focus on these macro processes. As we have emphasized in this book, good supply chain management is not a zero-sum game in which one stage of the supply chain increases profits at the expense of another. Good supply chain management instead attempts to grow the supply chain surplus, which requires each firm to expand the scope beyond internal processes and look at the entire supply chain in terms of the three macro processes to achieve breakthrough performance. A good supply chain coordinates all the macro processes across all stages. Apple is an example of a company that has coordinated all macro processes to introduce and sell blockbuster products such as the iPhone. Apple has been very successful in its interactions with customers not only in designing products that meet their needs but also in operating Apple retail as a successful and profitable endeavor. All its products are designed in-house but manufactured by a third party. Despite this, Apple has managed the release of new products to effectively meet huge demand. Strong coordination across all the macro processes has been fundamental for the level of success achieved by Apple.

We now discuss each of the macro processes and the role played by IT.

CUSTOMER RELATIONSHIP MANAGEMENT

The CRM macro process consists of processes that take place between an enterprise and its customers downstream in the supply chain. The goal of the CRM macro process is to generate customer demand and facilitate transmission and tracking of orders. Weakness in this process results in demand being lost and a poor customer experience because orders are not processed and executed effectively. The key processes under CRM are as follows:

- ***Marketing.*** Marketing processes involve decisions regarding which customers to target, how to target customers, what products to offer, how to price products, and how to manage the actual campaigns that target customers. Good IT systems in the marketing area within CRM provide analytics that improve the marketing decisions on pricing, product profitability, and customer profitability, among other functions.

- ***Sell.*** The sell process focuses on making an actual sale to a customer (compared to marketing, in which processes are more focused on planning whom to sell to and what to sell). The sell process includes providing the sales force with the information it needs to make a sale and then execute the actual sale. Executing the sale may require the salesperson (or the customer) to build and configure orders by choosing among a variety of options and features. The sell process also requires such functionality as the ability to quote due dates and access information related to a customer order. Good IT systems support sales force automation, configuration, and personalization to improve the sell process.
- ***Order management.*** The process of managing customer orders as they flow through an enterprise is important for the customer to track an order and for the enterprise to plan and execute order fulfillment. This process ties together demand from the customer with supply from the enterprise. Good IT systems enable visibility of orders across the various stages that an order flows through before reaching the customer.
- ***Call/service center.*** A call/service center is often the primary point of contact between a company and its customers. A call/service center helps customers place orders, suggests products, solves problems, and provides information on order status. Good IT systems have helped improve call/service center operations by facilitating and reducing work done by customer service representatives and by routing customers to representatives who are best suited to service their request.

Amazon has done an excellent job of using IT to enhance its CRM process. The company customizes the products presented to suit the individual customer (based on an analysis of customer preferences from past history and current clicks). Quick ordering is facilitated by systems that allow one-click orders. The order is then visible to the customer until it is delivered. In the rare instances that a customer uses the call center, systems are in place to support a positive experience, including offering a callback if the call center is heavily loaded.

The five largest CRM software providers in 2012 (as reported by Gartner) were Salesforce.com (14.0 percent), SAP (12.9 percent), Oracle (11.1 percent), Microsoft (6.3 percent), and IBM (3.6 percent).[1]

INTERNAL SUPPLY CHAIN MANAGEMENT

ISCM, as we discussed earlier, is focused on operations *internal* to the enterprise. ISCM includes all processes involved in planning for and fulfilling a customer order. The various processes included in ISCM are as follows:

- ***Strategic planning.*** This process focuses on the network design of the supply chain. Key decisions include location and capacity planning of facilities. For more details on strategic planning decisions, see Chapters 5 and 6.
- ***Demand planning.*** Demand planning consists of forecasting demand and analyzing the impact on demand of demand management tools such as pricing and promotions. For more discussion of this process, see Chapter 7 on demand forecasting as well as Chapters 9 and 15 on pricing.
- ***Supply planning.*** The supply planning process takes as an input the demand forecasts produced by demand planning and the resources made available by strategic planning, and then produces an optimal plan to meet this demand. Factory planning and inventory planning capabilities are typically provided by supply planning software. For more discussion of this process, see Chapters 8 and 9 on sales and operations planning and Chapters 11 and 12 on inventory management.

[1]www.forbes.com/sites/louiscolumbus/2013/04/26/2013-crm-market-share-update-40-of-crm-systems-sold-are-saas-based, accessed July 25, 2014.

- ***Fulfillment.*** Once a plan is in place to supply the demand, it must be executed. The fulfillment process links each order to a specific supply source and means of transportation. The software applications that typically fall into the fulfillment segment are transportation and warehousing management applications. For more discussion of transportation, see Chapter 14 on transportation.
- ***Field service.*** Finally, after the product has been delivered to the customer, it eventually must be serviced. Service processes focus on setting inventory levels for spare parts as well as scheduling service calls. Some of the scheduling issues here are handled in a similar manner to aggregate planning, and the inventory issues are the typical inventory management problems.

Given that the ISCM macro process aims to fulfill demand that is generated by CRM processes, strong integration is needed between the ISCM and CRM macro processes. When forecasting demand, interaction with CRM is essential, as the CRM applications are touching the customer and have the most data and insight on customer behavior. Similarly, the ISCM processes should have strong integration with the SRM macro process. Supply planning, fulfillment, and field service are all dependent on suppliers and therefore on the SRM processes. It is of little use for your factory to have the production capacity to meet demand if your supplier cannot supply the parts to make your product. Order management, which we discussed under CRM, must integrate closely with fulfillment and be an input for effective demand planning. Again, extended supply chain management requires that we integrate across the macro processes.

Successful ISCM software providers have helped improve decision making within ISCM processes. Good integration with CRM and SRM, however, is still largely inadequate at both the organizational and software levels. Future opportunities are likely to arise partly in improving each ISCM process, but even more so in improving integration with CRM and SRM.

The top five ISCM vendors in 2012 (as reported by Gartner) were SAP, Oracle, JDA, Manhattan Associates, and Epicor. SAP ($1.721 billion) and Oracle ($1.453 billion) had significantly higher revenues than the other three ($0.724 billion combined).[2]

SUPPLIER RELATIONSHIP MANAGEMENT

SRM includes those processes focused on the interaction between the enterprise and suppliers that are upstream in the supply chain. There is a natural fit between SRM processes and the ISCM processes, as integrating supplier constraints is crucial when creating internal plans. The major SRM processes are as follows:

- ***Design collaboration.*** This software aims to improve the design of products through collaboration between manufacturers and suppliers. The software facilitates the joint selection (with suppliers) of components that have positive supply chain characteristics such as ease of manufacturability or commonality across several end products. Other design collaboration activities include the sharing of engineering change orders between a manufacturer and its suppliers. This eliminates the costly delays that occur when several suppliers are designing components for the manufacturer's product concurrently.
- ***Source.*** Sourcing software assists in the qualification of suppliers and helps in supplier selection, contract management, and supplier evaluation. An important objective is to analyze the amount that an enterprise spends with each supplier, often revealing valuable trends or areas for improvement. Suppliers are evaluated along several key criteria, including lead time, reliability, quality, and price. This evaluation helps improve supplier performance and aids in supplier selection. Contract management is also an important part of sourcing, as many supplier contracts have complex details that must be tracked (such as volume-related price reductions). Successful software in this area helps analyze supplier performance and manage contracts.

[2]www.mmh.com/article/top_20_scm_software_suppliers_2013, accessed July 25, 2014.

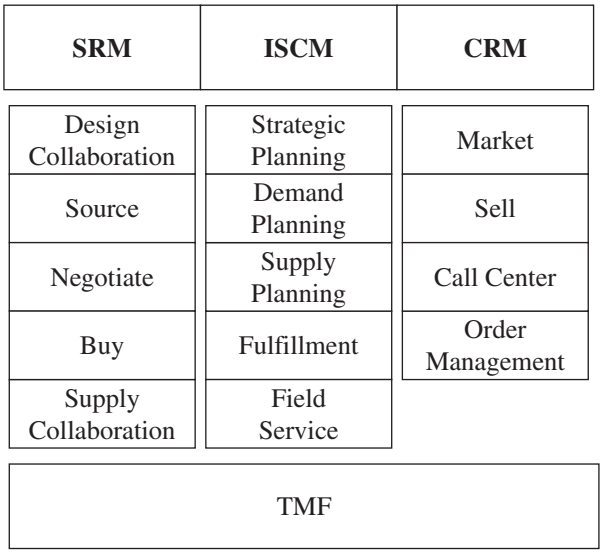

FIGURE 2 The Macro Processes and Their Associated Processes

- ***Negotiate.*** Negotiations with suppliers involve many steps, starting with a request for quote (RFQ). The negotiation process may also include the design and execution of auctions. The goal of this process is to negotiate an effective contract that specifies price and delivery parameters for a supplier in a way that best matches the enterprise's needs. Successful software automates the RFQ process and the execution of auctions.
- ***Buy.*** "Buy" software executes the actual procurement of material from suppliers. This includes the creation, management, and approval of purchase orders. Successful software in this area automates the procurement process and helps decrease processing cost and time.
- ***Supply collaboration.*** Once an agreement for supply is established between the enterprise and a supplier, supply chain performance can be improved by collaborating on forecasts, production plans, and inventory levels. The goal of collaboration is to ensure a common plan across the supply chain. Good software in this area should be able to facilitate collaborative forecasting and planning in a supply chain.

Significant improvement in supply chain performance can be achieved if SRM processes are well integrated with appropriate CRM and ISCM processes. For instance, when designing a product, incorporating input from customers is a natural way to improve the design. This requires inputs from processes within CRM. Sourcing, negotiating, buying, and collaborating tie primarily into ISCM, as the supplier inputs are needed to produce and execute an optimal plan. However, even these segments need to interface with CRM processes such as order management. Again, the theme of integrating the three macro processes is crucial for improved supply chain performance.

The SRM space is highly fragmented in terms of software providers and not as well defined as CRM and ISCM. Among the larger players, SAP and Oracle have SRM functionality in their software. There are many niche players, however, that focus on different aspects of SRM.

All three macro processes and their associated processes can be seen in Figure 2.

THE TRANSACTION MANAGEMENT FOUNDATION

The transaction management foundation is the historical home of the largest enterprise software players. In the early 1990s, when much of the thinking in supply chain management was just getting off the ground and ERP systems were rapidly gaining popularity, there was little focus on

the three macro processes we discussed earlier. In fact, there was little emphasis on software applications focused on improving decisions through analysis. Instead, the focus at that time was on building transaction management and process automation systems that proved to be the foundation for future decision support applications. These systems excelled at the automation of simple transactions and processes and the creation of an integrated way to store and view data across the division (and sometimes the enterprise).

The huge demand for these systems during the 1990s drove the ERP players to become the largest enterprise software companies. According to Gartner, the top five ERP software vendors in 2012 were SAP, Oracle, Sage Group, Infor Global Solutions, and Microsoft.[3]

The real value of the transaction management foundation can be extracted only if decision making within the supply chain is improved. Thus, most recent growth in enterprise software has come from companies focused on improving decision making in the three macro processes. This has set the stage for what we are seeing today and will continue to see in the future—the realignment of the ERP companies into CRM, ISCM, and SRM companies. Already, the majority of ERP players' revenue comes from applications in the three macro processes. A major advantage that ERP players have relative to best-of-breed providers is the inherent ability to integrate across the three macro process, often through the transaction management foundation. ERP players that focus on integrating across the macro processes along with developing good functionality in one or more macro process will continue to occupy a position of strength. The goal of a successful IT system is ultimately to help coordinate decisions and actions across the supply chain. This can happen only if IT supports the macro processes to coordinate and run as one rather than as disparate silos, as shown in Figure 3.

THE FUTURE OF IT IN THE SUPPLY CHAIN

At the highest level, we believe that the three SCM macro processes will continue to drive the evolution of supply chain IT. Although there is still plenty of room to improve the visibility and reporting of supply chain information, the relative focus on improved analysis to support decision making will continue to grow. The following important trends will affect IT in the supply chain:

1. The growth in cloud and software as a service (SaaS)
2. Increased availability of real-time data

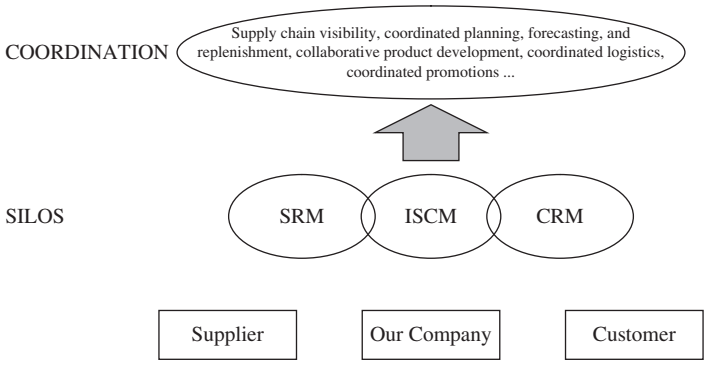

FIGURE 3 The Goal of Supply Chain IT: From Silos to Coordination

[3]www.forbes.com/sites/louiscolumbus/2013/05/12/2013-erp-market-share-update-sap-solidifies-market-leadership, accessed on July 25, 2014.

3. Increased use of mobile technology
4. Increased use of social media

SaaS is defined as software that is owned, delivered, and managed remotely through the cloud. Salesforce.com is one of the best-known pure SaaS supply chain software providers (in CRM). Gartner has predicted that SaaS (which made up about 10 percent of the enterprise software market in 2009) will grow from $13.5 billion in 2011 to $32.8 billion in 2016. CRM will continue to be the largest sector within SaaS, forecast to grow at a rate of over 16 percent annually to $9 billion in 2016. Another example is transportation management systems, for which roughly a quarter of the revenues are from SaaS applications. This shift is likely to occur because SaaS provides lower startup and maintenance costs compared with applications that are deployed onsite. These factors are particularly important for small and mid-sized companies. Traditional enterprise software vendors, such as SAP, Oracle, and Microsoft, are increasing the availability of their software using the SaaS model. Cloud-based solutions fit naturally with supply chain management because they allow geographically dispersed entities to view common information and make decisions.

The availability of real-time information has exploded in most supply chains. Whereas current supply chain software is focused primarily on improving strategy and planning decisions (often at the corporate level) that are revisited infrequently, significant opportunity exists to devise software that will use real-time information to help frontline supply chain staff (such as that in transportation and warehousing) make smarter and faster decisions that are revisited frequently. The opportunity is to design systems that enable rapid insight based on real-time data. There is significant opportunity in flagging exceptions as well as the use of predictive analytics to improve the utilization of supply chain assets.

The increased use of mobile technology coupled with real-time information offers some supply chains an opportunity to better match demand to supply using differential pricing. An example is an initiative by Groupon called Groupon Now, which offers mobile users deals that are time and location specific. Businesses can improve profitability by offering deals when business is slow at specific locations. Consumers benefit from getting a deal when and where they want it. Such an approach is likely to be applicable in many supply chain settings.

Mobile technology, along with real-time information, has also allowed improved use of existing supply chain assets, often at a person-to-person level. The increased use of social media coupled with mobile technology has the potential to alter supply chains, especially around the last mile. In Stockholm, Sweden, the DHL supply chain has worked on MyWays, a new model for last-mile delivery. Through an app available on mobile devices, customers sign up for this delivery option. MyWays members are notified of the need for delivery and sign up for the delivery if it is close to a route they normally take—to their college, for example. Once delivery is made, the member gets credits that can be exchanged for cash. Airbnb and Uber are two examples of companies that have used social media and mobile devices to link individuals to rooms or transportation. There is a real opportunity in the future to use existing assets (such as a person traveling a route for MyWays or an idle car for Uber) to make supply chains more effective, as mobile technology and social media are used to connect the existing asset to the supply chain task at hand.

RISK MANAGEMENT IN IT

Several risks are associated with the use of IT in the supply chain, and the process of adding new supply chain capabilities with IT can be fraught with danger. The larger the change in the IT system, the greater is the risk of a negative impact on operations. The more ingrained IT becomes in companies, the greater is the risk that the firm will not be able to function properly if IT suffers a major failure. Here we discuss some of the major risks posed by using IT in the supply chain and some ideas for mitigating these risks.

The major areas of risk in IT can be divided into two broad categories. The first, and potentially the greater, is the risk involved with installing new IT systems. During the process of

getting new IT systems running, a firm is forced to transition from the old processes it used in its operations to the new processes in its IT system. Here, trouble can be found in both business processes and in technical issues. On the business process side, new IT systems often require employees to operate according to new processes. These may be difficult to learn, take training to execute correctly, or may even be resisted outright by employees who prefer the old way of doing business. Getting the entire organization on board with the changes brought about by a new IT system is particularly difficult because top management is often not actively involved in making this transition. In addition to business process adjustments, tremendous technical hurdles must be overcome in getting new IT systems operational. The amount of integration that must take place between disparate systems is often overwhelming. When a firm switches to a new system without proper integration, the new system is often unable to perform all that was promised and sometimes even performs worse than the system it replaced. Even when the employees are bought into the new process and all the technical hurdles are overcome, it is often a delicate balance to actually make the transition over to the new system.

The second category of risk is that the more a firm relies on IT to make decisions and execute processes, the higher is the risk that any sort of IT problem, ranging from software glitches to power outages to viruses, can completely shut down a firm's operations. These are serious risks that a firm must plan to face. IT also poses a risk in that it tends to set processes in stone. Perhaps a system allows a process to be executed only one way; then the firm settles into a pattern of always doing this process that way. Obviously, there are great efficiency benefits to this, but the firm also runs the risk that the process is not up to the performance level of its competitors and that its systems make it difficult to change to newer, more effective processes.

Each of the major risk categories has its own mitigation strategies. With regard to implementing IT systems, keep three ideas in mind. The first is to install new IT systems in an incremental fashion rather than changing all processes at the same time (often referred to as a "big bang" approach). This allows a firm to limit the damage should things go wrong and to pinpoint problem areas during the installation process. Second, firms can run duplicate systems to make sure the new system is performing well. By this, we mean that the firm can keep its old system running at the same time the new one is running. If the new system runs into trouble or if the results seem too far off from the old one, the old system can be used, as it still exists. In fact, even before the new system is actually executing, it can be simulating (in parallel with the existing system) all the actions it would take. These proposed actions can be monitored to test how the new system will perform when it is actually activated. Finally, implement only the level of complexity that is needed. If certain capabilities or added complexities are unnecessary, they should be left out, as they can often increase the risk of the project without increasing the potential benefits. In essence, we want to tailor our IT systems to our supply chain needs, with risk reduction being one of those needs.

On the operational side, mitigation strategies include data backup systems, systems running in parallel in case one should suffer a problem, and a range of security software products that can help keep a company's systems safe. In addition, picking systems that have the flexibility to change if necessary can be important.

SUPPLY CHAIN IT IN PRACTICE

In addition to the sets of practical suggestions for each supply chain macro process discussed earlier, managers need to keep in mind several general ideas when they are making a decision regarding supply chain IT.

1. ***Select an IT system that addresses the company's key success factors.*** Every industry, and even companies within an industry, can have different key success factors. By key success factors, we mean the two or three elements that really determine whether a company is going to be successful. It is important to select supply chain IT systems that are able to give a company an advantage in the areas most crucial to its success. For instance, the ability to set inventory levels optimally is crucial in the consumer electronics business, in which product life

cycles are short and inventory becomes obsolete quickly. However, inventory levels are not nearly as crucial for a chemical company, for which demand is fairly stable and the product has a long life cycle. For the chemical company, the key to success depends more on utilization of the production facility. Given these success factors, a consumer electronics company might pick a package that is strong in setting inventory levels even if it is weak in maximizing utilization of production capacity. However, the chemical company should choose a different product—one that excels at maximizing utilization even if its inventory components are not especially strong.

2. ***Take incremental steps and measure value.*** Some of the worst IT disasters result when companies try to implement IT systems in a wide variety of processes at the same time and end up with their projects being failures. The impact of these failures is amplified by the fact that many of a company's processes are tied up in the same debugging cycle all at once, causing productivity to come to a standstill. One way to help ensure the success of IT projects is to design them so they have incremental steps. For instance, instead of installing a complete supply chain system across your company all at once, start first by getting your demand planning up and running and then move on to supply planning. Along the way, make sure each step is adding value through increases in the performance of the three macro processes. This incremental approach does not mean that one should not take a big-picture perspective (in fact, one *must* take a big-picture perspective), but rather that the big-picture perspective should be implemented in digestible pieces.

3. ***Align the level of sophistication with the need for sophistication.*** Management must consider the depth to which an IT system deals with the firm's key success factors. There is a trade-off between the ease of implementing a system and the system's level of complexity. Therefore, it is important to consider just how much sophistication a company needs to achieve its goals and then to ensure that the system chosen matches that level. Erring on the less sophisticated side leaves the firm with a competitive weakness, whereas trying to be too sophisticated leads to a higher possibility of the entire system failing.

4. ***Use IT systems to support decision making, not to make decisions.*** Although the software available today can make many supply chain decisions for management, this does not mean that IT applications can make *all* the decisions. A mistake companies can make is installing a supply chain system and then reducing the amount of managerial effort it spends on supply chain issues. Management must keep its focus on the supply chain because as the competitive and customer landscapes change, there must be corresponding changes in the supply chain.

5. ***Think about the future.*** Although it is more difficult to make a decision about an IT system with the future rather than the present in mind, managers need to include the future state of the business in the decision process. If trends in a company's industry indicate that insignificant characteristics will become crucial in the future, managers must make sure that their IT choices take these trends into account. As IT systems often last for many more years than originally planned, managers need to spend time exploring how flexible the systems will be if—or rather, when—changes are required in the future. This exploration can go so far as to include the viability of the supply chain software developer itself. If it is unclear whether a company will be able to get support from a software company in the future, management needs to be sure that the other advantages of this product outweigh this disadvantage. The key here is to ensure not only that the software fits a company's current needs, but also, and even more important, that it will meet the company's future needs.

SUMMARY OF LEARNING OBJECTIVES

1. ***Understand the importance of information and information technology in a supply chain.*** Information is essential to making good supply chain decisions because it provides the broad view needed to make optimal decisions. IT provides the tools to gather this information and analyze it to make the best supply chain decisions.

2. ***Know, at a high level, how each supply chain driver uses information.*** Each of the supply chain drivers that we have discussed in previous chapters (facilities, inventory, transportation, sourcing, and pricing) requires information for decisions to be made. Information is the factual component on which decisions about each of the other drivers are based. In essence, information is the glue that holds the entire supply chain together and allows it to function, making information the most important supply chain driver.

3. ***Understand the major applications of supply chain information technology and the processes that they enable.*** A company's supply chain processes can be grouped into three main macro processes. CRM includes processes that enable interaction between an enterprise and its customers. ISCM includes processes focused on the internal operations of an enterprise. SRM includes processes that enable interaction between an enterprise and its suppliers. IT enables these processes, as well as the integration across these processes. Good IT systems allow not only the collection of data across the supply chain, but also the analysis of decisions that maximize supply chain profitability.

Discussion Questions

1. Which processes within each macro process are best suited to being enabled by IT? Which processes are least suited?
2. What are some advantages of the software as a service (SaaS) model? Why has it been successful in the CRM space?
3. Why is supply chain management software dominated by the ERP players, such as SAP and Oracle?
4. Identify a few examples of the availability of real-time information being used to improve supply chain performance.
5. Discuss why the high-tech industry has been the leader in adopting supply chain IT systems.

Bibliography

Chopra, Sunil, and Peter Meindl. "What Will Drive the Enterprise Software Shakeout?" *Supply Chain Management Review* (January–February 2003): 50–56.

Chopra, Sunil, and ManMohan Sodhi. "Managing Supply Chain Risk." *Sloan Management Review* (Fall 2004): 53–61.

Davenport, Thomas H., and Jeanne G. Harris. *Competing on Analytics*. Boston: Harvard Business School Press, 2007.

Drayer, Ralph, and Robert Wright. "Getting the Most from Your ERP System." *Supply Chain Management Review* (May–June 2002): 44–52.

Escalle, Cedric X., Mark Cotteleer, and Robert D. Austin. *Enterprise Resource Planning, Technology Note.* Harvard Business School Note 9–699–020, 1999.

Fawcett, Stanley E., Paul Osterhaus, Gregory M. Magnan, and Amydee M. Fawcett. "Mastering the Slippery Slope of Technology." *Supply Chain Management Review* (October 2008): 16–25.

Fontanella, John, and Eric Klein. "Supply Chain Technology Spending Outlook." *Supply Chain Management Review* (April 2008): 14–20.

Gartner, Inc. "Gartner Says Worldwide CRM Market Grew 12.5 Percent in 2008." Press release, July 15, 2009.

Hofman, Debra. "Supply Chain Management: Turning Data into Action." *Supply Chain Management Review* (November 2007): 20–26.

Meyer, Michelle M. "Why IBM Is Linking Logistics and Information." *Supply Chain Management Review* (September–October 2001): 56–62.

O'Dwyer, Jerry, and Ryan Renner. "The Promise of Advanced Supply Chain Analytics." *Supply Chain Management Review* (January 2011): 32–37.

Rutner, Stephen M., Brian J. Gibson, Kate L. Vitasek, and Craig M. Gustin. "Is Technology Filling the Information Gap?" *Supply Chain Management Review* (March–April 2001): 58–64.

Shankar, Venkatesh, and Tony O'Driscoll. "How Wireless Networks Are Reshaping the Supply Chain." *Supply Chain Management Review* (July–August 2002): 44–51.

Soni, Ashok, M. A. Venkataramanan, and Vincent A. Mabert. "Enterprise Resource Planning: Common Myths vs. Evolving Reality." *Business Horizons* (2001): 44(3), 69–76.

Ward, Thomas, and Vasanthi Gopal. "Moving IBM's Smarter Supply Chain to the Cloud." *Supply Chain Management Review* (March–April 2014): 26–31.

White, Andrew. "Want to Be Agile? Master Your Data." *CSCMP's Supply Chain Quarterly* (Q2, 2007): 67–71.