MANAGING THE COMPLEXITY PARADIGM

Stanley E. Griffis
Professor

David J. Closs
Department Chair,
John H. McConnell Chair in Business Administration

Department of Supply Chain Management
Michigan State University

APICS
SUPPLY CHAIN
COUNCIL

MICHIGAN STATE
UNIVERSITY

Broad College of Business

ABOUT THIS REPORT

As part of the ongoing collaboration between Michigan State University's Eli Broad College of Business and APICS Supply Chain Council, the Beyond the Horizon research project is investigating how the supply chain management discipline is evolving into the future. Key trends have emerged following in-depth interviews with more than 50 firms around the world. This whitepaper reviews the research findings surrounding the creation of value through procurement and sourcing efforts in integrated supply chains, including key practices and implementation recommendations.

INTRODUCTION

Supply chain executives cite supply chain and product complexity as two of the major challenges that keep them up at night. The top insomnia-inducing item in the Beyond the Horizons (BTH) research is "Understanding the End-To-End Supply Chain." This refers to the firm's ability to track product and information flows across the entire supply chain. With global multi-tiered supply chains, firms are increasingly challenged to be able to understand the complexity of these flows.

Omni-channel marketing has opened a number of new flows to the marketplace (direct from manufacturer, through distributors, and direct to home), and consumers are looking for more customized products, as well. This combination implies that supply chain executives are experiencing increased complexity. While such complexity provides the benefits of increased revenue by providing consumers with more customized products from the best sources, the increased complexity also generates increased supply chain cost and assets— because increased flows and stock-keeping units must be managed.

This paper offers insight into managing supply chain and product complexity by providing background into the complexity's sources, a framework for understanding its drivers, and methods to manage it.

MANAGING THE COMPLEXITY PARADIGM

TABLE OF CONTENTS

COMPLEXITY SOURCES

Supply chain and product complexity possess a number of sources that vex supply chain operations. During the BTH project, data was gathered from a number of interviews on what was creating complexity within the supply chain. The four primary sources of supply chain complexity are: 1) customer accommodation; 2) operations globalization; 3) supplier complexity; and 4) business/supply chain management-driven complexity. The rationale and implications for each are discussed below.

CUSTOMER ACCOMMODATION

Customer accommodation is the first source of complexity. Examples of specific customer requests include desire for more speed in the supply chain, visibility into operations, variety in products offered, customization of those products when necessary, and omni-channel flexibility. We outline some of these complications here.

Speed. It appears as though expectations of speed in customers' eyes are constantly increasing. While increased speed on its own doesn't create complexity, the desire for choices in time frames (e.g., one-day, three-day, five-day delivery service) does. The other dimension of speed—variation—definitely creates additional complexity. Meeting tight delivery windows is operationally more complex than merely "getting it there" faster, and requires the increased complexity of sequencing and accomplishing the variety of tasks necessary to deliver quickly and within tight time windows.

Visibility. In addition to desiring speed, customers are also demanding increased visibility. Like speed, this adds to the complexity of monitoring product location and status. Visibility doesn't simply require monitoring location and status; it implies that a firm can and should determine when a product is not going to meet the defined delivery expectations. Customers don't merely want to track where the shipment is—they want visibility and even advance notification when a shipment is not going to arrive on time.

Product/Service Assortment. It is well understood that product proliferation increases firm equipment and inventory assets, which compete with other potential investments. Not only does this increase supply chain production and inventory carrying cost, it also results in more demand disaggregation, which reduces overall economies of scale. The resulting work-to-forecast demand, reduced production economies, smaller shipments, and all the downstream supply chain tasks cause this form of complexity to propagate through the supply chain very quickly.

Product Customization. In addition to increasing the number of make-to-stock variations, allowing additional customer customization results in even more complexity. This complexity is felt less in inventory investments and more in internal process complexity. To offer product and service customization, systems need to be redesigned to respond to more variable, customer-controlled demand signals, rather than the aggregate customer demand that is typical of make-to-stock items.

Omni-channel. The last complexity consideration resulting from customer accommodation is derived from the push for omni-channel supply chains. Anyone who interacts with the end customer has seen this issue develop over the last few years. Consumers desire unlimited flexibility in how they receive goods and services, as well as where they return the goods and services if they don't meet expectations. Years ago, firms kept their brick-and-mortar and online inventories separate—with SKUs of differing formats or sizes to keep the inventory of one channel designee from the other—but those days appear to be gone for modern supply chains. While saleable inventory returned to a store should be a benefit, there is an impact on the ordering process when "unexpected" inventory appears from the returns channel after an order has already been placed. Problematic issues like this further amplify ordering variation, and if not accounted for, are huge challenges for managing the complexity of a supply chain.

OPERATIONAL GLOBALIZATION

While customer accommodation is one source of supply chain and product complexity, the BTH research also identified supply chain operations itself—especially supply chain globalization—as a persistent source of complexity. The following discussion describes those sources of complexity related to customer-facing issues (localized variety, locational complexity, legal and regulatory factors) as well as supplier-facing globalization issues (localized sourcing, cultural, and infrastructure and process complexity in globalized operations).

As supply chains globalize, another set of complicating factors arises, including: 1) localized variety; 2) locational complexity; and 3) legal and regulatory complexity. Each is discussed below.

Localized Variety. As supply chains expand into new, more varied customer markets, the need to stock different goods and services becomes apparent. Most are familiar with the product customization McDonald's engages in when it tailors its menu to localities around the globe. The same is true of all supply chains, particularly retailers, as they globalize. As new markets are accessed, all kinds of localized tastes, preferences, technical requirements, and customer expectations have an increasing impact on local product requirements. As this occurs, substantial variation and adaptation in existing supply chain processes must occur to meet specific customer product and process requirements.

Locational Complexity. As supply chains extend past their home geographies, they must develop systems and processes to get to where their growing customer base expects them to deliver. As access to products opens up with the Internet's abilities to tap an ever-expanding marketplace, the breadth of supply chain operations must expand to meet the needs of new customers. As operations expand, the logistical tail obviously also grows—requiring new supply chain partners with the associated relationships, contracts, and complexity that each creates. An excellent example is the anticipated growth of the African markets in coming years, where customers' ability to connect to retailers electronically significantly exceeds the retailers' ability to physically access those same customers, and presents a supply chain challenge for the future.

Legal and Regulatory Complexity. Globalization also results in an ever-changing legal and regulatory environment. As a result, global supply chains face a major source of complexity in supply chain operations. As seen with the UK's recent Brexit vote, the "package" of rules, regulations, and requirements for operating globally are far-reaching, complex, and at times turbulent for a supply chain to manage. Another characteristic of the legal and regulatory environment is that it can change very quickly, either through a change in government policy or even through the interpretation of a revenue or customs agent. For example, some firms are finding it increasingly difficult to classify product for customs and duty purposes, which results in processing and border delays.

SUPPLIER COMPLEXITY

In addition to supply chain complexity resulting from variations in customer-facing operations, complexity also results from expanding supplier networks. These factors include: 1) local sourcing complexity; 2) cultural complexity; and 3) globalized operations. Each is discussed below.

Local Sourcing Complexity. For either regulatory or simple economic efficiency reasons, going global typically means more than just shipping around the world from a firm's home market. In the course of the BTH project, firms discussed the complexity and seriousness of the issues associated with local sourcing. Developing suppliers outside the home market and bringing them into their supply chains, all while dealing with differences in quality (be it material quality or process quality), was an issue challenging many firms. Creating the systems to accommodate this sourcing strategy was the main complicating factor. Due to the differences in each market, developing and maintaining a supply chain structure and relationships was a cause of serious complexity concerns.

Cultural Complexity. Above and beyond the mere increased span of a globalized supply chain, firms also were sensitive to the fact that there are many differences in business practices by country. Business norms, interaction with the community, or any other location-specific factor can make globalized operations more sensitive. Firms need to work to understand the cultural uniqueness of each market they operate in so they can position themselves for success. As an example, merely understanding the ethical norms (e.g., the expectation of disdain for monetary exchanges) of a new market, even before deciding whether one's firm will engage in such activity, is a challenge whenever operating outside home markets.

Globalized Operations. Global supply chains must operate over much longer distances, thereby reducing firms' ability to meet tight time windows and perform a host of other basic supply chain activities. Global operations require significant extra work in the design, development, and operation of processes and infrastructure that allow global supply chains to operate effectively.

GENERAL BUSINESS AND SUPPLY CHAIN TRENDS

The last category of sources of supply chain complexity revealed in the BTH research relates to the complexity derived from general business and supply chain forces. These are "trends" in the business and supply chain community in general, and include: 1) process customization; 2) technology turnover; 3) supply chain management scope; 4) mergers and acquisitions; and 5) collateral complexity.

Process Customization. The BTH research suggested that the need to customize processes often leads to specialized suppliers, which in turn restricts options in the future and leads to complexity. From one perspective, process customization can be viewed as a complexity reducer, since less searching for suppliers is necessary. However, at the same time, the challenge shifts to maintaining the ability to be flexible and responsive—despite having fewer options for sources—which, again, complicates things.

Technology Turnover. Moore's Law and its impact upon any number of technological issues is familiar to most. When considering supply chain applications, the break-even on information technology (IT) investments typically extends well beyond the next Moore's Law cycle, which means supply chains are almost always operating with technology of varying vintages. Getting these systems to operate together, whether they are owned or shared across the supply chain between suppliers and customers, is a complicating factor.

Increasing Supply Chain Management Scope. Supply chain responsibilities are also increasing. Long ago, getting the product to the customer was enough. Now supply chains must continue to deliver products and services while also establishing and maintaining efficient approaches for the accommodation of customer returns, be they retail-based or end-of-life, closed-loop, supply chain-based reverse flows.

Mergers and Acquisitions (M&A). M&A activity also drives supply chain complexity. Many supply chains that have experienced mergers and acquisitions have reached the point where they have dozens of distinct ERP and planning system implementations. One of the major challenges faced by these firms is to figure out how to work with these disparate systems, even as more business units are being added over time. An analogy was made during the BTH interviews to changing the tires on a truck, at speed while going down the highway, all while still making deliveries and picking up more freight.

Collateral Complexity. A final source of complexity results from the business decisions made elsewhere in the firm that unfortunately make things more difficult for the supply chain. This has not been an uncommon complaint of supply chain managers over time, but the push to omni-channel supply chains appears to be bringing increased collateral complications with it. Supply chain is often requested to "make it happen" following decisions that were focused on optimizing other business functions. While the customer is delighted by the flexibility to do things like order online and return in person, organizing the supply chain to allow this to happen is less straightforward than it used to be, as previously mentioned. Omni-channel may be the most recent push creating this collateral complexity, but it is an issue with which supply chain managers perennially struggle.

APPROACHES TO MANAGING COMPLEXITY

In addition to asking research participants what issues related to complexity they were facing, the research team also focused on how respondents were managing this supply chain complexity. The solutions have ranged across: 1) avoidance; 2) relationship collaboration; 3) information technology; 4) flexible workforces; 5) supplier collaboration; 6) access to leadership: and 7) supplier/customer understanding. Specific examples of each are discussed below.

AVOIDANCE

The leading approach to addressing complexity was, not surprisingly, to avoid it in the first place! While the respondents do not believe that such an approach is easy, they did provide some ideas regarding how to avoid complexity. One such idea was to increase understanding of how the supply chain creates either internal or external value propositions. Once this is accomplished, effort can focus on insulating those value propositions from the negative effects of unnecessary complexity—or worse yet, from the erosion of these value propositions on the way to reducing complexity elsewhere. In one unfortunate situation, the executives described how the firm was working to reduce complexity in marketing and as a result, the supply chain value stream was negatively impacted—making things worse rather than better.

Broadly speaking, it's important for supply chain management to discuss the potential modification of business-level strategy, objectives, and processes to make sure the firm is still able to deliver value to both internal and external customers throughout the change and under the new approach.

GOOD PARTNERS

The BTH research participants offered many comments regarding the relationship of their supply chain partners to the degree of complexity. Again, while this is possibly an obvious recommendation on the surface, respondents found that the better the partners in the relationship were, the easier it was either to limit or to address supply chain complexity issues. Specifically, they discussed ways good partners helped them address complexity by enhancing product and process innovation.

INFORMATION TECHNOLOGY

Our research partner firms definitely viewed technology as a way forward in complexity reduction, specifically in using technology to simplify processes. They cautioned that, as we well know, adopting technology for technology's sake often ends badly. However, when the technology and the firm's processes are fit to each other, it is possible to achieve significant positive results.

FLEXIBLE WORKFORCES

Many of the firms described how they reduced complexity using more flexible workforces. The application of flextime, contingent labor, and part-time staff allowed the firms to simplify their operations, which reduced complexity. Another approach used by the firms was to develop multi-skilled talent to reduce the handoffs between workers that create opportunities for breakdowns to occur. This was accomplished through the use of formal training processes that rotate employees through multiple tasks. The formal rotation also helps identify situations where complexity occurs as the result of siloed staff not understanding the entire process.

SUPPLIER COLLABORATION

One of the research participants told us, "It sounds hokey, but...work with good people." In this case, the respondents were specifically talking about their suppliers—how they strove to build integrity across their supplier relationships, promote transparency (as much as they could) across the partnerships, and foster trust between themselves and their partners. They conceded that it isn't easy and the "almighty dollar" has its say, but that long term, without these qualities trouble will ensue. They pointed out that transparent collaboration between a firm and its partners opens up opportunities to reduce the processing exceptions that introduce complexity.

ACCESS TO LEADERSHIP

The respondents also indicated that having the right people in the room, at the right time, is critical. There are times in a relationship—certainly early on, and possibly at other waypoints—when the CEO must be there to make it happen. CEOs can't be hanging around all the time, nor do they want to be, but at certain points they need to be present to set the tone and lead the organization. Similarly, director-level staff may need to touch base at the right points in either a process or a relationship when the day-to-day working-level managers need them in the room.

SUPPLIER/CUSTOMER UNDERSTANDING

Further related to supplier collaboration, the firms we interviewed indicated that complexity is reduced through possessing a better understanding of how a firm's processes impact its suppliers. Research participants related how, as suppliers, they often felt their trading partners were unaware of or unreceptive to how customer demands affected the complexity of their operations. Conversely, respondents also indicated that suppliers needed to better understand how their output—their particular product or service—was integrated into the overall value proposition of the final good or service. If suppliers better understood the role their output created, they'd be better positioned both to help deliver the best possible product and to do it in a manner that smoothed the flow and reduced complexity along the way.

SUMMARY

Product and market complexity have challenged firms for years. Firms have searched repeatedly for ways to reduce complexity. While one obvious answer is to reduce the number of products or markets, the desire for revenue growth has limited that as an option. The result is that firms are experiencing increasing complexity through a growing number of products, customers, channels, and geographies. The BTH respondent firms are no exception to this trend.

While they acknowledge that reducing complexity through the traditional means of reducing products and markets is not likely to happen, their insight does provide some additional direction regarding how to change process complexity. A deeper understanding of value propositions and the application of collaborative partnerships, information technology, and more flexible operations have demonstrated opportunities to reduce process complexity. Reducing process exceptions will help firms achieve better performance.

ABOUT ELI BROAD COLLEGE OF BUSINESS

Michigan State University's Eli Broad College of Business prepares students to make business happen through an innovative curriculum and collaborative culture, guided by a distinguished faculty. The hardworking, team-oriented students of Eli Broad College acquire deep knowledge of their chosen disciplines and a broad understanding of how global businesses work, enhanced by study abroad and real-world projects in research centers and experiential labs. The college, consistently ranked among the top business schools, offers undergraduate, graduate, and executive development programs. Broad graduates are ready to tackle business challenges around the world, part of an unparalleled peer and alumni network.

ABOUT APICS SUPPLY CHAIN COUNCIL

APICS SCC is a nonprofit organization that advances supply chains through unbiased research, benchmarking and publications. APICS SCC maintains the Supply Chain Operations Reference (SCOR) model, the supply chain management community's most widely accepted framework for evaluating and comparing supply chain activities and performance. APICS SCC enables corporations, academic institutions and public sector organizations to address the ever-changing challenges of managing a global supply chain to elevate supply chain performance. APICS SCC is part of APICS, the premier professional association for supply chain and operations management. Visit apicsscc.org to learn more.

APICS
SUPPLY CHAIN
COUNCIL