Technology optimization and change management for successful digital supply chains

Chapter 4: Transformation framework for supply chain segmentation in digital business
Technology Optimization and Change Management for Successful Digital Supply Chains

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ABSTRACT
The purpose of this chapter is to explore the factors that influence digital supply chain segmentation and provide a best practice transformation approach to ensure a successful journey. The initial research is based on a review of supply chain segmentation literature and the application of relevant transformation steps to specific case studies, comprising of companies from different industries. Digital supply chain segmentation strategy presents huge opportunities that are being tapped by very few companies who achieved significant benefits and gained competitive advantage. The chapter provides a practical and proven digital supply chain segmentation framework for companies who are about to take the segmentation transformation journey.

INTRODUCTION
In response to the dramatic changes in the business landscape over the past few years, companies are assessing whether they have the right supply chains to support their dynamic and digital business, and exploring supply chain segmentation to reduce complexity and increase profit. Today’s supply chains have become increasingly complex due to globalization, outsourcing, complicated networks, logistics capacity uncertainty and volatility, and the rapid proliferation of stocking keeping units (SKUs) and product configurations. However, many manufacturers and retailers continue to use an outdated approach to supply chain segmentation which is more of a hindrance than a help towards reducing complexity and improving margin.

It is also critical to deliver the right level of service for each product/customer/channel segment, especially as consumer behavior pushes towards more product customization and better service leading to a more compressed supply cycle.

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Digital technology is transforming supply chain management and driving significant innovation. Machine learning as a concept has been around for some time, but has taken on new meaning as the industry sees massive advancements in computing power and memory. In addition, change is happening faster than ever as technology trends such as IoT, virtual reality, and big data are providing countless opportunities for manufacturers and retailers across the globe.

The tightening of budgetary constraints have driven more companies to explore ways to make the supply chain more agile, customer-focused, and profit-driven (i.e. to do more with less). This is another pressure driver for the increase in supply chain segmentation popularity.

Therefore, taking the journey of supply chain segmentation is no longer optional; it is a strategic mandate in order to stay relevant in the industry. The future belongs to companies who can profitably match their supply chains to the specific needs of their customer segments.

This chapter explains the concept of segmentation, its historical background, its importance for today’s business, and challenges to implementation. The chapter also provides an end-to-end supply chain practical segmentation framework. Companies can utilize this to ensure a smooth and successful implementation journey leveraging digital technologies. A number of existing frameworks are relevant but none are adequate or comprehensive by themselves. Several case studies will be discussed to illustrate the “fast track to success” framework.

BACKGROUND

Definition for Supply Chain Segmentation Concept

Sabri (2015) defined Supply Chain segmentation as managing profitably different virtual end-to-end supply chains defined by a combination of channel/customer requirements, product characteristics, business value considerations, and differentiated supply response strategies. IT research and advisory firm Gartner (http://www.gartner.com/it-glossary/supply-chain-segmentation) describes supply chain segmentation as “Designing and operating distinctly different end-to-end value chains (from customers to suppliers) optimized by a combination of unique customer value, product attribute, manufacturing and supply capabilities, and business value considerations. In essence, supply chain segmentation is the dynamic alignment of customer channel demands and supply response capabilities optimized for net profitability across each segment”.

The Segmentation Concept Is Not New

The concept of supply chain segmentation is not new in literature research. It started when Fisher (1997) mentioned that the root cause of the problems troubling many supply chains is a mismatch between the type of product and the type of supply chain response. For the past 20 years supply chain literature has introduced several methods for segmentation using different criteria such as product demand volume, product demand variability, product handling, production variability, selling channel type, and end customer behavior. Authors agree that a ‘one size-fits-all’ supply chain management is an outdated concept, yet, they use very different criteria (dimensions) and profiles for supply chain design selection.
Fisher (1997) used “Product characteristics”, in particular the volume of product demand and the variability of that demand, as the criteria for supply chain segmentation and created two profiles to define the product dimension: “functional” products and “innovative” products. “Functional” products, which have stable demand and long lifecycles, are necessitating an efficient supply chain model whilst ‘innovative’ products, with unpredictable demand and short lifecycles, are necessitating a responsive supply chain model. Fisher drew on examples from a diverse range of consumer products, including food, fashion apparel, and automobiles, to illustrate why different supply chain designs (models) were required depending upon whether products were “functional” or “innovative”.

Naylor et al. (1999) compared the lean and agile manufacturing paradigms and argued neither paradigm is better than the other. Rather, they complement one another. In addition, they developed a two-by-two matrix based on the product demand variability and production variability, and assigned lean and agile supply chain models to them. For example, low variability for demand and production requires a lean supply chain model, while high variability requires an agile supply chain model. They also highlighted that the way in which an agile supply chain differentiates its products from the lean supply chain is by concentrating on the service levels at the expense of reducing costs.

Similarly, Mason-Jones et al. (2000) suggested that the best approach is to design and implement a “leagile supply chain”. “Lean” can be achieved by eliminating waste (non-value added time), while “agility” usually requires technology advances. They demonstrated how the “lean” and “agile” paradigms may be combined. They introduced “order winners” as a segmentation criterion, and developed a two-by-two matrix that uses “order winners” criteria to determine the appropriate supply chain model. For example, if “cost” is the order winner then a “lean” supply chain model should be selected. When service level is the order winner then an “agile” solution should be recommended.

Lovell et al. (2005) also explored supply chain segmentation by examining product characteristics but used different criteria and profiles to define it. Two profiles (high value-density products such as microchips, and low value-density products such as packaging) were introduced and assigned two different supply chain models. Products with high value-density should be manufactured in a few centralized, large-scale plants while low value density items require production on a decentralized basis as close to the point of consumption as possible. The authors also mentioned that product handling characteristics should be considered in the supply chain model. Lovell et al. (2005) mentioned that perishable products are very different from fragile products, which are different from hazardous goods. This will influence the type of packaging, the mode of transport, and the type of storage.

Christopher et al. (2006) argued the importance of considering “supply lead time” as another segmentation criterion. This is very relevant to the globalization trend that started at that time. The authors developed a two-by-two matrix where demand variability and supply lead time are the segmentation criteria. The authors came up with four different profiles and assigned four supply chain designs to them:

1. When the profile is unpredictable demand and short supply lead time, an agile supply chain model should be assigned to provide flexibility and responsiveness
2. When demand is predictable and supply lead time is long, a lean supply chain model should be used to reduce supply chain costs
3. When demand is predictable and supply lead time is short, a “continuous replenishment” model should be recommended
4. When demand is unpredictable and supply lead time is long, a “postponement” (leagility) model should be proposed
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Christopher et al. (2006) highlighted that global sourcing and offshore manufacturing have dramatically altered the landscape of today’s business and added to the importance of agility and responsiveness as competitive success factors. The challenge to today’s global business is first to identify the appropriate supply chain models to meet the different needs of the different product/channel characteristics and then to manage virtual multiple supply chains.

Gattorna (2006) was the first to consider consumer behavior as a supply chain segmentation criterion and argued that segmentation criteria should go beyond just product characteristics, demand/supply attributes, and order winners. The author explained that companies should segment their customers along buying behavior lines sharing a specific value proposition and then assign the right supply chain design. The author identified four different profiles for buying behaviors segmentation criterion and recommended a specific supply chain design for each one of them:

1. ‘Understand Me’ requires a “continuous replenishment” design that handles stable demand perfectly and allows certain degree of collaboration
2. ‘Be Consistent’ requires a “lean” supply chain design to ensure an efficient response for fairly stable demand
3. ‘Respond’ is often associated with innovative or new products with typical surge in demand and requires an “agile” supply chain design
4. ‘Surprise’ is associated with unpredictable products and a “fully flexible” supply chain design

Gattorna (2006) also introduced the “dynamic alignment’ concepts which allow the supplier to switch between the four supply chain models as the needs of the customer or consumer behavior change.

Christopher et al. (2009) explored more segmentation criteria and suggested five dimensions: stage of product lifecycle, delivery lead time window, volume based on Pareto classification, product form and variability of demand.

Roscoe and Parker (2013) combined Fisher’s (1997) product attributes, Mason-Jones et al.’s (2000) value proposition and order winning criteria, Christopher et al.’s (2006) demand predictability and lead times, and Gattorna’s (2006) behavioral segmentation and concept of dynamic alignment. The authors came up with four supply chain models for the sporting goods industry based on the combined criteria tailored for a sporting goods manufacturer:

1. Agile – Customization
2. Agile Quick – Response
3. Lean
4. Continuous Replenishment

In summary, Table 1 shows the links between segmentation criteria (dimensions), profiles, and supply chain models for the previous work done in this area. It is clear that the concept of segmentation is not new in academia (Sabri, 2015).

Table 1 demonstrates how a number of existing segmentation methods may be relevant to a specific company or industry but none are adequate by themselves for every company or across industries. The literature conceptualizes the theory of supply chain segmentation but, when it comes to reality, there are more factors in play. It is possible that pre-defined, scripted supply chain models based on certain segmentation profiles might not even be relevant to the company’s customers or products (Sabri, 2015).
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**Table 1. Summary of segmentation dimensions, profiles, and related SC model**

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Segmentation Dimensions</th>
<th>Profiles</th>
<th>Supply Chain (SC) Models</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Functional Products</td>
<td>Responsive SC process</td>
</tr>
<tr>
<td>Naylor, Naim, and Berry</td>
<td>Product &amp; Production</td>
<td>High variability of products and related production</td>
<td>Lean SC</td>
</tr>
<tr>
<td>(1999)</td>
<td></td>
<td>High variability of products and related production</td>
<td>Agile SC</td>
</tr>
<tr>
<td>Mason-Jones, Naylor, and</td>
<td>Order Winner</td>
<td>Cost</td>
<td>Lean SC</td>
</tr>
<tr>
<td>Towill (2000)</td>
<td></td>
<td>Service Level</td>
<td>Agile SC</td>
</tr>
<tr>
<td>Lovell, Saw, and Stimson</td>
<td>Product</td>
<td>High product-value density</td>
<td>Centralized large-scale plants</td>
</tr>
<tr>
<td>(2005)</td>
<td></td>
<td>Low product-value density</td>
<td>Decentralized close to customer plants</td>
</tr>
<tr>
<td>Christopher, Peck, and</td>
<td>Demand &amp; Lead Time</td>
<td>Unpredictable demand and short lead time</td>
<td>Agile SC</td>
</tr>
<tr>
<td>Towill (2006)</td>
<td></td>
<td>Unpredictable demand and long lead time</td>
<td>Leagile (postponement)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Predictable demand and long lead times</td>
<td>Lean SC</td>
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<tr>
<td></td>
<td></td>
<td>Predictable demand and short lead times</td>
<td>Lean (continuous replenishment)</td>
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<tr>
<td></td>
<td></td>
<td>‘Be Consistent’ – efficient response</td>
<td>Lean SC</td>
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<tr>
<td></td>
<td></td>
<td>‘Demanding’ – respond approach</td>
<td>Agile SC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>‘Surprise Me’ – innovative solutions</td>
<td>Fully flexible SC</td>
</tr>
<tr>
<td>Roscoe and Parker (2013)</td>
<td>Product Demand</td>
<td>Innovative, unpredictable &amp; Online</td>
<td>Agile – Customization</td>
</tr>
<tr>
<td>– Case Study for Sport</td>
<td>Channel &amp; Order Winner</td>
<td>Innovative, hi quality, unstable demand &amp;</td>
<td>Agile Quick – Response</td>
</tr>
<tr>
<td>Goods</td>
<td></td>
<td>specialist stores</td>
<td>Lean</td>
</tr>
<tr>
<td></td>
<td>Value Proposition</td>
<td>Price sensitive, predictable &amp; sports</td>
<td>Continuous Replenishment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>brand, stable demand &amp; lifestyle generalist</td>
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As previously stated, the concept of supply chain segmentation is not new. The author observed several manufacturing, fashion and retail companies which have multiple supply chain models, but the majority of them were developed out of necessity (reactive mode) with manual and inconsistent business practices. Therefore, there is an urgent need for a comprehensive and practical framework for supply chain segmentation. This should not only provide best practices in profiling and identifying different supply chain models, but also provide an end-to-end approach for implementing and sustaining segmentation and successfully leveraging digital technologies.
The Benefits of Supply Chain Segmentation

Addressing Today’s Business Challenges

Executives and supply chain leaders face many challenges today in every aspect of their operations and enterprise integration. The following are considered to be the top ten challenges:

- The need to be more customer oriented while managing the supply chain cost (bottom-line) more efficiently. Companies have long known the importance of designing offerings to serve the needs of different markets and consumers, but accomplishing this can be difficult given how quickly customers’ behaviors and expectations change. Also, more business to business (B2B) customers are expecting a business to consumer (B2C) experience when interacting with other businesses.
- Information delay or latency, which creates the need for companies to design business processes that realize the information flow between business partners.
- Globalization which intensifies the competition and makes the competitive advantage crucial.
- The increased complexity of supply chains including the need for tighter control, the growing complexity of managing information flows, SKU proliferation, channel complexity, and the increasing trends of 3rd party logistics.
- Long and unpredictable product life cycles. Rapid product innovation forces the product introduction cycle to be faster to react to the market needs and gain competitive advantage.
- The shift from vertical integration to horizontal supply chains which calls for more efficient and effective collaboration with suppliers and customers. The new trend is for companies to buy out competitors in the same business or merge with them instead of buying their suppliers (i.e. to expand vertically instead of horizontally).
- Expensive operating cost structures, especially when companies are facing intensified competition. Related to that is the increase in transportation cost due to outsourcing.
- The disruption to the supply chain from demand and supply mainly caused by supply chain uncertainty and variability.
- Supporting the redesigned processes with leading edge technology that is easy to integrate, cheap to maintain, and fast to achieve results.
- Outsourcing and having suppliers across the world. Companies continue to outsource assembly work, information systems management, call centers, and product engineering to contractors. The challenge is to decide what to outsource, and how to make sure that customer satisfaction, delivery service, and quality are not compromised.
- The need to explore insourcing for certain clusters to improve responsiveness rate. More than a decade ago, many companies started moving their production operations to lower-cost countries. The industry is again on the brink of a major global shift. Various of the offshore cost advantages that once existed are beginning to erode. Wage inflation, tariff taxes, rising oil prices — even natural disasters — are among the factors affecting outsourcing supply chain profitability, agility, and risk. Several companies underestimated the offshore impacts of long lead times and high inventory carrying costs. They are discovering that maintaining service levels, in addition to the inventory and logistics buffering costs necessary to support the long-distance supply chain, far outweigh any labor cost advantages. In addition, outsourcing production introduces a latency lag in bringing new products to market and responding to market trends (Johnston, 2012).
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In order to address the challenges mentioned above, companies should look for certain key enablers to implement in their operations (Sabri, 2015). Supply chain segmentation is one of these key enablers. Other enablers can be grouped as follows:

1. **Cross organizational collaboration**: Cross organizational collaboration can improve efficiency, reduce quality risk, and streamline processes.

2. **Customer-centricity & Agility**: This includes building flexibility into product designs and manufacturing processes to become more “customer-oriented” and to mitigate the challenge of supply and demand uncertainty by providing the ability to change plans quickly. Flexibility in manufacturing is measured based on the ability to shift production load, change production volumes and product mix, and modify products to meet new market needs. It is important to note that cost reduction initiatives usually inversely impact flexibility.

3. **Visibility**: Real time visibility reduces uncertainty and enables the reduction of safety stock. This in turn drives down operational costs. Visibility also improves customer satisfaction, which increases revenue by presenting the real picture and providing the ability to proactively address potential problems. Finally, visibility reduces the impact of disruption to the supply chain caused by demand and supply variability and uncertainty.

4. **Process innovation**: This addresses the following questions: How can companies reengineer their processes to increase speed of delivery when introducing new products? What supply chain process improvements and digital technologies should companies invest in to gain competitive advantage? How can companies restructure their supply chains to reduce cost and increase profitability across their total global network? How can companies reduce their supplier base? How can companies leverage best in class technology to enable best practice processes?

5. **Risk Management**: This addresses the risks related to product quality and service delivery that arise from a global supply chain and the rushing of new product introductions.

**Impacting the Company’s Bottom Line**

Any manufacturer or retailer knows, no two customers are the same. Each customer’s perception on the value of a product or service and how much they are willing to pay for it is different. This is true for almost every product category available in the market from cars to snack bars.

That said, many retail and manufacturing companies are still using ‘one size fits all’ supply chain processes; over-serving some channel/product combinations and under-serving others. For example, research of one industry showed that around 50% of a company’s customer and product portfolio was unprofitable which would require different supply chain response to reduce cost.

Through in depth understanding of the profit profiles of their customers, channels, and/or products, companies can tailor a more profitable supply chain strategy to each of them and thus increase the overall margin of their portfolios. It can also increase inventory turnover through optimal inventory positioning and aligning fulfillment, logistics, demand planning, manufacturing, and procurement strategies. For example, an apparel retailer can satisfy the demand for their basic products through an efficient (less costly) supply chain model and deliver their fashion products through a highly responsive supply chain model. This creates one model for standard (predictable) products and another for fashion (unpredictable) products. Each model will have different demand planning, stocking, and fulfillment policies.
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In addition, supply chain segmentation would improve customer service which would improve sales by increasing the reliability of delivering on promises and improving forecast accuracy.

Companies that successfully deploy a segmentation strategy will improve the reliability of their customer service while increasing profitability across their product portfolio through better alignment of supply chain strategies/policies to customer/product value propositions. These companies will also increase inventory turnover through inventory positioning and aligning supply chain assets to customer value propositions and profitability (Thomas, 2012).

FRAMEWORK FOR SUPPLY CHAIN SEGMENTATION TRANSFORMATION

The recipe for success in managing the journey of supply chain (SC) segmentation transformation is mastering the change transformation cycle, leveraging digital technologies, and ensuring effective change management. Figure 1 introduces a practical and comprehensive SC segmentation transformation framework to help with implementation. This figure shows the 10-step transformation journey which typically lasts two to three years and consists of three phases: “plan” (five blue steps), “implement” (two yellow steps), and “sustain” (three green steps).

Planning starts by defining the vision and objectives and aligning them to corporate goals and needs. This is followed by profiling and clustering. Process analysis and associating clusters to supply chain models is next followed by identifying the changes in process, technology, and people required to support the new supply chain models and the new end state. The final step of the planning phase is building the business case (estimating benefits and costs) and defining the program implementation roadmap.

The “implement” phase starts by configuring the segmented supply chain networks and is followed by conducting training on the new processes and monitoring progress and adoption.

Figure 1. Supply chain segmentation transformation framework
The “sustain” phase consists of three steps starting with transition and structured rollout. This is followed by ensuring organizational, metrics, and incentives alignment and concluded by the “refining” step. The next planned transformation cycle can kick in after months of refining, corrective actions, and incremental improvement of the first cycle. Supply chain segmentation is not a one-time exercise or sprint; it is a journey. Five success factors are also emphasized in this framework to ensure the required support for the segmentation transformation program:

1. The right transformation team
2. Culture support & executive commitment
3. Leveraging digital technologies
4. Proven change management methodology
5. An effective performance measurement system (PMS) which includes data availability, metrics, and KPIs

These success factors, in addition to the discussed 10-steps, will be detailed out in the coming section highlighting several best practices.

The 10-Step Supply Chain Segmentation Framework

Step 1: Segmentation Vision Alignment to Corporate Goals

This step helps in establishing clearly how the supply chain segmentation transformation program is a crucial strategy to achieving corporate goals. It includes developing the vision and objectives of the segmentation transformation initiative.

The key to supply chain segmentation is finding the right balance between agility and efficiency (lean) for each product/customer/channel combination. A one-size-fits-all strategy will not allow a company to compete on a global scale in today’s business. Segmentation allows companies to get the right product/service with the right value to the right customer while optimizing the supply chain. Once the linkage is established and transformation program objectives are defined, communicating this to upper management and all stakeholders is important.

Step 2: Profiling and Clustering

This step determines segmentation criteria, profiling, identifying customer value propositions, and clustering.

Segmentation Criteria

Companies need to determine the segmentation criteria that will fit their needs. The author would argue against a pre-defined segmentation criteria based on general literature or a specific case study. Existing literature and case studies are an excellent starting point, but they should not be the ultimate reference. Comprehensive segmentation criteria are presented in Figure 2 under each of the segmentation dimensions. Selected criteria were underlined to highlight examples that will be detailed later in this chapter.
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- **Product Characteristics:**
  - Product lifecycle stage
  - Shelf life
  - Functional or innovative
  - Handling characteristics
  - Product value density
  - Supply lead time
  - Product variety

- **Customer Characteristics:**
  - Demand volume
  - Margin
  - Demand variability
  - Large customers vs. small customers
  - Buying behavior (such as seasonal, planned or spontaneous)
  - Customer lead time
  - Strategic importance
  - Service-level agreements (SLAs)

- **Channels**
  - Online (website)
  - Retailers
  - Warehouses
  - End consumers: business-to-consumers (B2C)
  - Business-to-business (B2B)
  - Geography

**Profiling**

Once the segmentation criteria are determined, the company needs to document a portfolio of products, customers, channels, and related profiles based on detailed analysis. This analysis is typically more extensive than the analysis most companies would have carried out previously because in this step they are trying to predict the market conditions and customer (consumer or B2B customer) behavior that will prevail in the next three to five years, rather than examining how best to compete in the present time. Such forward-looking thinking requires extensive customer research and detailed marketing analysis. The aim is to understand the company’s average customer, and get a solid appreciation for each existing and potential customer type. It is not just customer profiling, it is product/customer/channel profiling.

**Customer Value Proposition**

Companies need to identify the customer value proposition by conducting customer satisfaction surveys, and using business intelligence, market analysis reports, etc. This can also be accomplished by identifying the complexities that are present and identifying whether they are good complexities or bad complexities. Good complexities are those that improve the product or service and, most importantly, customers are willing to pay for. Bad complexities add no value and come at a price like increased inventory or expediting.
Figure 2 provides a list of seven typical customer value propositions listed below:

1. Brand name
2. Lead time or speed
3. Cost (price)
4. Availability
5. Flexibility
6. Delivery performance (DP)
7. After-sales service

The company can select from the list based on the previously discussed analysis.

Clustering
The key for most companies who are interested in segmentation is to identify and better align to the natural tradeoffs that exist within their business. A simple but effective way to model this is by identifying the key customer value propositions that the customers apply to the company’s business offering. These value propositions have natural trade-offs between them that allow the company to develop a differentiated supply chain response.
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For example, university students often prioritize price. However, growing up with Amazon.com has made short lead time (speed) another deciding factor. To get that speed and low price, they are willing to forego other value propositions such as after-sales service. Segmentation allows companies to specialize and compete for all customers on their terms, rather than an average that appeases, but never delights (Mellins-Cohen, 2012).

In this activity, companies need to identify sets of clusters that best represent their business profiles and value propositions. Figure 3 provides a hypothetical example of profiling and clustering. In this example a company selected ‘Functional vs Innovative’ as a profile parameter for the product characteristics segmentation dimension. ‘Demand volume’, ‘margin’, and “demand variability” were selected under the customer characteristics dimension. In addition, B2B and B2C are the selected channels and four customer value propositions (lead time, cost, flexibility, and delivery performance) are considered.

The next activity is to determine the clusters that best represent the selected profile parameters and value propositions. It is recommended to think big when creating this initial version and create clusters for as many profiles as possible that are relevant to the company. However once the profile types are exhausted, it is critical to reduce them to the key few and bear in mind that each cluster probably represents a new supply chain design (model).

In the example in Figure 3, Cluster 1 represents the innovative products and customers with low volume, high margin, and high demand variability (i.e. low forecast accuracy). Furthermore, this cluster represents B2C channel only. The value proposition for this cluster is reduced lead time (fast delivery), high degree of flexibility, and high delivery performance (on time delivery). Cost is not a decision making factor as shown in the figure.

During this activity, it is often recommended to conduct a cost-to-serve analysis. The objective of this exercise is to understand which customer/product/channel combinations are winners and losers, and then to structure the clusters so that some or all of the losers are turned into winners. For example, a large consumer goods company, with a significant portion of business coming from Wal-Mart, would likely have an assigned team and a set of strategies dedicated to that account. The high value of the Wal-Mart

*Figure 3. Profiling and clustering approach with an example*
business warrants this level of premium service. However, the cost-benefit ratio (cost to serve) would not be positive if the same strategy is applied to every mom-and-pop store that also buys the same products. The company would need a different supply chain design for those customers.

In another example, the cost to serve a customer in the US for a US company will be different than the cost to serve a customer overseas. Estimating the cost to serve across extended supply chains requires visibility into many cost data elements. These can be enabled by the digital technologies which are one of the key success factors for supply chain segmentation that will be discussed. This may require changing the replenishment model and service-level agreements for a specific customer/product combination. The author worked with a tire manufacturer to adjust its replenishment model to store products for customers (similar to cluster 1) in the centralized and factory distribution centers (DCs) instead of storing it closer to customers in regional DCs. This moves the inventory buffer point upstream in the supply chain, reducing overall inventory. The upstream DCs hold a larger pool of inventory, increasing the odds that downstream demand will be filled with the required product.

**Step 3: Associating Clusters to Supply Chain Models**

When the clusters have been finalized, the next step is to decide what needs to be done to deliver each of them top value. It is time to design the supply chain models and Step 3 is conducting process analysis and associating clusters to supply chain designs (models). The supply chain models will be driven by the unique value propositions of the clusters from the previous step. It is important to remember that the number of supply chain designs (models) should be manageable. Most literature reviews suggest two or four models. The author typically recommends the number to be based on the business requirements and the company’s capabilities in managing different supply chain models.

In Figure 4, five supply chain models are selected against five clusters. Column 3 covers the value propositions which put emphasis on lead time (responsiveness), cost, flexibility, and delivery performance (reliability). Let’s assume that the key processes for supply chain management are supply planning, demand planning, procurement, and order fulfillment. For every key process, key strategies will be implemented to support certain value propositions.

For example, for Cluster 1, under supply planning, postponement (keeping inventory upstream in factories or central DCs) and flexible capacity strategies are selected since one emphasis (customer value proposition) of this cluster is flexibility. In this highly innovative, product-driven, and highly variable environment with a ‘premium’ type of customer, a “postponement” manufacturing strategy is required. Under order fulfillment, air is selected as the main transportation mode since the other emphasis is on lead time reduction. The customer is given the benefit of choice and a fast and more flexible-focused supply chain is required to fulfill their requirements. In addition, working closer with customers when generating the forecast is a best practice strategy to control demand variability.

A multi-sourcing procurement strategy will be needed to provide flexibility in case of supply shortages for nonproprietary parts. Also, capacity contracts with key suppliers will need to have flexibility built in and delivery routes will need to be more agile and faster. As a result, the lower volumes of these innovative products will command higher price due to higher cost and differentiated service. This should not be a customer barrier since this supply chain is designed around the customers who are willing to pay for it.
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Cluster 5 targets purely cost-driven customers. The route to address ‘lowest-cost’ emphasis is often an efficient supply chain. This supply chain uses ‘lean’ concepts to streamline and eliminate waste from the process, implements a build to stock manufacturing supply strategy since demand variability is low for this cluster, and positions inventory closer to the customers due to high volume. In addition, advanced planning like forecasting enables high forecast accuracy which allows things to be booked much in advance and for suppliers and logistics companies to plan ahead for optimization. Offshore manufacturing capacity and slower, cheaper routes — such as ocean — can be also used, allowing the company to reduce cost and provide the best price for the customer in this cluster.

By working with various clusters — combinations of customer types, channels, products, and value propositions — to identify their requirements and tailor their supply chain, companies can optimize their capabilities and improve the bottom line.

Step 4: Identifying Process, Technology and Governance Changes

The segmented supply chain strategy requires process, technology, and governance changes to demand planning, supply planning, procurement, and order fulfillment processes. In doing so, even though physical supply chain resources could remain the same, the supply chain response operates differently from one supply chain model to another and from one cluster (segment) to another.

It is important to complete a detailed, future-state process map after supply chain models are approved by key stakeholders. A value stream mapping method can be leveraged to understand the cost drivers and come up with a more granular design of the future state. It is crucial to capture process, technology, and governance (organizational structure, metrics, and policies) changes and capabilities for every supply chain process that enables implementing the proposed strategies for every supply chain model in the previous step.

Figure 4. Associating clusters to supply chain models approach with an example
Companies have long struggled to deploy segmented supply chains because underlying decision support (planning) technologies have not been readily available for end-to-end supply chains. This has changed recently which will make it easier for companies to go through the segmentation journey.

To summarize, the segmented supply chain strategy requires process, technology, and governance changes to demand planning, supply planning, procurement, and order fulfillment processes. In doing so, even though physical supply chain resources could remain the same, supply chain response operates differently from one supply chain model to another and from one cluster (segment) to another.

Figure 5 reflects an example from a real manufacturer. These are the changes that were required to support a supply chain design similar to Supply Chain A from Figure 4 (Responsive & Flexible Supply Chain).

Under demand planning, the manufacturer needed to implement a customer collaboration strategy which would require a process change of modifying the forecasting process to include the customer input, a technology change to enable a collaboration workbench leveraging digital technologies, and two people-related changes. The first people-related change was an organizational structure change which formed a decentralized Demand Planning Group to be closer to the customer and corresponding sales person. The second people-related change was adding customer forecast accuracy to the set of existing metrics to establish accountability to the customer forecast.

The manufacturing company can no longer forecast demand based on past sales history alone. The segmented strategy will require market intelligence on similar products and markets along with close collaboration with marketing and sales personnel to get customers’ input. The cluster (product/customer/channel) under this supply chain design (model) would need to be tracked differently to monitor market acceptance and utilize more frequent feedback cycles relative to other clusters in the company’s portfolio.

Under the supply planning process, demand prioritization needed to be adjusted to increase the planning priority associated with this cluster since margin was high and supply lead time was a competitive differentiator (customer value proposition). Profiling the expected lead time by customers is important to decide if a replenishment postponement strategy (such as build-to-forecast to a semi-finished stage and assemble-to-order thereafter) could be enabled for this cluster.

Figure 5. Example for identifying process, technology and governance changes
Under order fulfillment, a substantial emphasis was put on allocation planning and order promising sub processes. As the company strove for margin growth, finished goods supply needed to be allocated more heavily toward this cluster. The company needed to adjust its allocation policies. Additionally, higher service levels for this supply chain model required faster replenishment. This often meant smaller, more frequent shipments which raised transportation costs. Careful planning of shipments associated with this cluster, including load consolidation, mode selection, routing, and carrier selection, could significantly reduce transportation costs while ensuring high service levels. Establishing a long term agreement with carriers was recommended to handle expedited high value products effectively in this cluster.

Finally, under the procurement process, establishing a process and criteria to split the sourcing demand by vendors was necessary to provide flexibility and address the risk of shortage in raw material and components. Investment in technology to provide real time visibility for in-transit inbound material was required to reduce lead time variability and enable the company to react faster to delays.

Segmentation-based supply chain processes have helped this manufacturer balance value to the business against service levels required to support corporate goals for their strategic products (Cluster 1).

Step 5: Estimating Benefits and Defining the Roadmap

Cost-to-Serve Analysis

The first activity of this step is to validate “cost-to-serve” analysis against the new supply chain designs. “Cost to serve” analysis is very similar to Activity Based Costing (ABC). However it must be much more granular because in virtual supply chain there will be shared assets that necessitate allocating costs differently since each virtual supply chain (supply chain design) must be managed differently. Various resources such as power, overheads, equipment, and technology costs, must be allocated differently for each line according to usage. For example, premium freight service is used heavily for the Responsive & Flexible Supply Chain model which requires speed in delivery (short lead time) but not used the Efficient Supply Chain. Therefore, no premium freight cost should be allocated to the Efficient Supply Chain. Currently, many companies assign all these resources to one area labeled as ‘overheads,’ but to execute the supply chain segmentation strategy effectively, they need to be separated. They also need to be analyzed more granularly in order to accurately estimate cost and price profitability. Based on the author’s experience, getting finance involved early on during this step is crucial.

Capturing the Expected Benefits

The next activity is to estimate the benefits for every supply chain model and highlight the impact on key performance indicators’ (KPIs) targets. During this phase, there is a need to: 1) identify the critical supply chain KPIs to grow the business and improve profitability, 2) capture an accurate baseline for each of these KPIs, and 3) explain how the new/updated supply chain models will impact the KPIs - positively (green color), negatively (red), or neutral (empty box) as shown in Figure 6. For example, supply chain A will get a hit from supply chain cost perspective due to the use of Air as the main transportation mode, but this strategy will improve other KPIs like order cycle time.

It is important to mention that KPIs should be the same (applicable) for all supply chain designs; it is only the targets that change. Once these KPIs (such as SCM cost, cycle time, etc) are established, average targets across all supply chain designs must also be agreed on. These targets can be internal-based, industry–based, or competition-based. Then KPIs targets are defined for each supply chain design based
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on strategies that are being implemented with a goal of achieving the average targets across all of the supply chain designs. For example, the target for “Order Cycle Time” for an Efficient & Reliable Supply Chain will be lower than the average target while it is higher in Responsive Supply Chain. On the other hand, Responsive Supply Chain is higher than the average target when it comes to supply chain cost KPI. To re-iterate: positively impacting one KPI might inversely affect others.

Building the Business Case

The next activity is to build the business case and significant ROI (benefits – costs) for executives to secure their buy-in on pursuing the supply chain segmentation journey.

To be able to conduct this activity successfully, the defined KPIs (as in figure 6) should be aligned to corporate goals like increased margin, cost reduction, improvement in customer service, etc.

Building the Roadmap

The final phase of this step is to build the roadmap for the transformation program which should be broken into multiple phases (projects) with definitive outcomes for each to ensure manageable change. The idea here is to ‘think big’, ‘start small’, ‘act quick’, and ‘win fast’. No matter what your situation is, the journey to supply chain segmentation success is a radical ongoing overhaul of culture, process, organizational structures, technology, measurement framework, and operating models.

Senior management must approach supply chain segmentation as more than a single project. It must be approached as a transformation program and must become the new way of doing business.

Step 6: Configuring the Segmented Supply Chain Network

This step is the starting point for execution and implementing the supply chain segmentation strategy (‘Implement Change’ phase). It includes conducting detailed design and new process/technology deployment. As a best practice, it is recommended to use several pilots and implementation waves to “turn

Figure 6. Different supply chain models impact KPI targets differently
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on” capabilities and strategies piece by piece to reduce risk and allow enough time for stakeholders to adopt the change. Advanced supply chain planning software applications should be in place as a prerequisite to support different virtual supply chains from a planning perspective. It is important to note that although a technology investment is not necessarily a requirement for supply chain segmentation, inadequate technology frequently surfaces as a concern in the segmentation process. Also, leveraging digital technologies will make segmentation much easier and scalable.

While a company’s physical supply chain assets — raw materials, factory resources, warehouses, distribution centers, retail centers, and channels — are typically the same across all supply chain designs (models), its processes and governance (organizational structure, metrics, and policies) for predicting customer demand, positioning supply, procurement, and fulfilling orders can be different. In executing these differentiated processes and enforcing governance, supply chain professionals help drive competitive advantage and profitable growth across all clusters.

After configuration is complete, a formal readiness assessment to ‘go live’ with the new supply segmentation networks should be conducted.

It is important to re-iterate that the transformation program should be broken into multiple stages with definitive outcomes for each to implement manageable change and achieve quick wins (Sabri, 2015). One example would be that a company might decide to enable two supply chain models in the first stage (which might take a year) and leave the last 3 to the second stage. Another example is to stack the stages based on the supply chain processes like implementing the process, technology, and governance for the demand planning process in the first stage, followed by supply planning in the second stage, etc. This depends on the maturity of these processes and the size of changes. A third example would be to divide the process, technology, and governance changes into three groups: 1) ‘crawl’, 2) ‘walk’, and 3) ‘run’ and then stack the stages to implement “crawl” changes first, followed by ‘walk’ and implement the remaining changes in the third stage. Some of the stages can overlap from a timing perspective and a coordinated timeline that highlights critical stop-gate dependencies can improve the efficiency of managing these initiatives (stages).

Step 7: Training and Monitoring

A structured and comprehensive education plan — starting with the transformation team and end users and ending with engaging key stakeholders and leaders — should be developed early and executed effectively as changes move through the organization. The plan should cover planning, implementing, and sustaining the segmentation transformation. This step is critical to ensure the effectiveness of the execution.

Additionally, the education plan for end users should be tailored based on which segment they work on. For example, enabling “efficient supply chain” model requires strong knowledge in lean principles.

Monitoring is another phase of this step to ensure employee adoption to the new process of the segmented supply chain. It is important to proactively monitor the experience of the employees, suppliers, and customers to identify performance issues and provide additional training when needed to sustain positive behavior by all stakeholders including supply chain leaders, managers, and planners.

Step 8: Transition and Structured Repeated Rollout

This step is the starting point for sustaining the new state of doing business (“Sustain Change” phase). During this step, the transformation team typically transitions to a different team (business team) to take
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over the transformation initiative. The transformation team is responsible for planning and implementing the process, technology, and governance changes needed to support segmented supply chain strategy. The business teams (demand planning, supply planning, procurement, and order fulfillment teams), with the help of IT customer support, would take over to lead this step and the next two steps of making the changes part of running the business environment.

During this step, a repeated rollout to other business units might occur based on the previously pre-defined roadmap for the segmentation transformation. Segmentation must be a living thing, with the ability to assign new products easily to existing clusters and eventually to existing supply chain designs (models).

Step 9: Organizational structure, KPIs, and Incentives Alignments

Organizational Realignment
The first activity of this step is to ensure that organizational alignment (part of the governance changes defined earlier) is happening. Human resources department might need to update job descriptions and bonus structure to reflect the changes. This might require creating a pipeline of candidates for hiring with a mix of demand, supply, and product expertise. Also, incentives for the company’s talent should be aligned with the skill requirements for the new process.

Incentive Alignment
The second activity is to ensure KPIs and incentives are aligned so each supply chain model can drive the right business decisions and behavior effectively. This requires a clear set of goals (targets for the KPIs) and incentives to be defined earlier during Step 5. Incentives, including bonuses, should always be based on the KPIs; getting the KPIs right allows the incentives to be altered to match, which will in turn stimulate behavioral change where it is required. For example, if sales people are to provide input in the forecasting process, they will need an incentive (such as a 20% percentage of their bonus) to ensure that this is done in a way to which the supply chain organization can respond accordingly (i.e. no overestimating or underestimating). Equally, in terms of supply, the procurement team must be incentivized to work in line with the supply chain strategy like total landed cost rather than simply focusing on lowest-cost scenarios.

Cost and Benefits Data Gathering
During Step 2, cost allocation is determined for every supply chain model. This is needed to break down the shared overhead charges that have traditionally been spread equally across all products. This is important in order to validate the cost to serve analysis and to estimate the cost and saving of a certain supply chain model. During this step (Step 9), the actual costs are captured and should be compared with the previous estimate. Also, the actual benefits would start to be realized and the expected business case (ROI) can be confirmed in this step.
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Step 10: Refining

Fine-tuning profiles, clusters, and cost allocations are necessary as products move through their life cycles and demand shifts. Technology can be leveraged to move a product/customer/channel combination automatically from one cluster to another as the underlying attributes change. Revisiting and adjusting KPIs targets is also needed to ensure a continuous improvement culture. A cross-functional governance monthly review cadence should exist such as a monthly meeting like Sales and Operational Planning (S&OP) review. This will also allow the company to continually align with customer value.

The transformation journey is ongoing and not a one-time exercise; it is a multi-year journey which requires multiple cycles. Each cycle might take between two and five years. Refining is the last step in the cycle during which incremental improvements and fine-tuning are done. Once the success criteria, expected benefits, and KPIs targets are achieved, a new transformation cycle should be considered. This is when the company goes from Step 10 back to Step 1 to repeat the cycle to achieve additional improvements and benefits. Changes in the business and new opportunities such as an emerging market should also trigger another transformation cycle.

The 5 Success Factors for Supply Chain Segmentation

There are five key success factors required to ensure the successful implementation of supply chain segmentation as shown earlier in Figure 1.

Success Factor # 1: Having the Right Transformation Team

Having the right transformation team is crucial for the supply chain segmentation journey. Special skills should be considered in selecting the transformation team such as process design and automation, lean principles knowledge, Six Sigma expertise, data analytics, systems optimization, program management, organizational influence, and communication.

Success Factor # 2: Executive Commitment and Culture Support

Supply Chain segmentation is not just a business initiative, it is a change to the culture. Executive commitment and visible support are key to the success. For example, executives need to enforce the culture of customer-driven and differentiation, the culture of promising what you can deliver and delivering on every promise, the culture of commitment to continuous improvement as a way of life for the organization, and the culture of praising and promoting the managers who avoid fires (being proactive) versus promoting the fire fighters (being reactive).

Establishing a clear segmentation vision strategy enabled by digital technologies is so fundamental to a firm’s future success that the CEO must inspire employees to pursue a vision of the company. However, many CEOs feel that segmentation is somewhat beyond their grasp. The CEO must step up and collaborate with the CMO, COO, and CIO to jointly create a vision that the CEO can sponsor.

Establish “a differentiated supply chain response” culture, collaboration, agility, and digital innovation are second nature to employees in today’s businesses. Therefore, its crucial fuel the differentiated response mindset by educating, training, and inspiring employees with roadshows and education programs,
Success Factor # 3: Leveraging Digital Technologies

Technology management teams must play a pivotal role in enabling digital transformation for supply chain segmentation. CIOs must champion a business technology agenda — investments in digital technologies to facilitate financial governance capture KPIs, conduct cost-to-serve analysis, and collaborate with sales leveraging social media and research data to find out the value propositions for customers in order to win, serve, and retain them.

Let’s give one use case as an example. Customers’ perceptions on the value of a product or service and how much they are willing to pay for it is difficult to predict. On one end of the extreme, you have value-conscious customers who always looking for a deal. On the other end, you have customers that will only buy premium goods and services. The other issue is that customers’ behaviors and expectation change. Therefore, many firms struggle to segment their customers and markets intelligently and provide tailored products and services to those segments on an ongoing basis. Using digital technologies like “machine learning” and predictive analytics can be leveraged to analyze customers by collecting data from thousands or even millions of customers. Mining the collected data and combining it with external data like social media will help to keep pace with the analysis required to identify new correlations at all times. This will help in identifying the segmentation criteria and making it dynamic.

Also, machine learning will enable firms to support different supply chain strategies/responses for each segment like higher visibility, simplifications, etc. Machine learning can support creating intelligent customer-product-channel segments and then developing supply chain strategies to deliver differentiated offerings to these segments (all while balancing the cost to serve each segment against the value that segment brings to the business).

Success Factor # 4: Proven Change Management Methodology

Having a structured and proven methodology to show the way in the change transformation journey is a must. Any supply chain transformation program creates uncertainty and resistance. New leaders emerge, job descriptions are changed, and new skills and capabilities need to be developed. Dealing with these change management issues on a reactive, case-by-case basis puts timeline, morale, and results all at risk. A structured plan for managing change—beginning with the transformation team and then engaging key stakeholders and leaders—should be developed early and executed effectively as changes move through the organization. The plan should be comprehensive to cover planning, implementing, and sustaining the transformation changes (Sabri, 2013).

For transformation programs to work, there must be convergence between the new process, new technology capabilities, people readiness with the required new skills, and organization structure alignment changes.

Success Factor # 5: Effective Performance Measurement System (PMS) – Data, Metrics, and KPIs

Comprehensive end-to-end measures of supply chain performance, such as total cost, inventory, forecast accuracy, and perfect order, must be established to show the trade-offs required. Supply chain performance results should be communicated to all layers. Operational and financial data will be needed at both aggregated and granular levels to analyze performance and conduct corrective actions.
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The author has not come across many firms that could claim that they have mastered performance measurement across all of their processes and levels. The widespread feeling among supply chain managers is that they measure too much, too little, or measure the wrong metrics. For the supply chain segmentation strategy to work, the culture of measurement should be anchored within the organization while leveraging some best practices such as: 1) focus on a handful of key KPIs and related metrics, 2) sustain KPI tracking, 3) conduct root cause analysis on a regular basis, and 4) align incentives to achieving KPIs targets. Finally, the list of the KPIs should be comprehensive enough to include related KPIs necessary to measure achieving the customer value propositions such as delivery performance and flexibility (Sabri, 2012).

In addition, data availability and accessibility is very important. It is considered a pre-requisite for supply chain segmentation because visibility to data such as customer requirements, demand, cost, materials, forecasts, product life cycle, revenue, and margin is required to drive the right decisions regarding segmentation during planning and implementing phases.

Most supply chain leaders and executives understand the difference between “lean” and “agile” supply chain models. The first one seeks operational efficiency and cutting waste while the other one focuses on responsiveness, flexibility, speed, and targeting higher service levels. The challenge for these leaders is when to apply each supply chain model and how. Here is how Dell and Caterpillar addressed that challenge in the context of the above framework.

CASE STUDY FROM DELL

Dell faced a challenge with its supply chain in 2008 when it realized that the highly responsive ‘configure-to-order direct-to consumer’ supply chain that had made its online store the world’s largest channel for personal computers sales no longer fit the needs of its new physical retail channel, its enterprise sales, or even its high-volume consumer products. Facing increasing pressure from emerging and revitalized competitors, Dell found its supply chain model was no longer right for all aspects of its business, especially the emerging ones. For example, when Dell entered the retail channel, the company tried to use the same supply chain model as its online configure-to-order business. Because competition in conventional retail can be fiercer than its online channel and Dell’s supply chain was not designed for lower cost, it was determined that Dell’s 2008 supply chain model would not work well at the store level. Most retail orders are large and focused on fewer configurations compared to online orders.

Adding to this challenge, the company faced corporate and public sector customers who were looking for a complete and customized package for their IT needs. This required a different supply chain model than one used for online customers (Simchi-Levi, Clayton, & Raven, 2012).

The company had been in the top five of the Gartner Supply Chain Top 25 every year since it started in 2004, but demand for commoditized products, changes in customer channel preferences, emerging market growth, a more capable supply base and globalization had challenged the one-size-fits-all supply chain model (Davis, 2010). Clearly, Dell needed to segment its supply chain and implement new supply chain models to serve new customers in new channels with new product types.

For the past several years, the company has been transforming its supply chain into a multichannel, segmented model, with different policies for serving consumers, corporate customers, distributors, and retailers. Through this transformation, Dell has moved up to the number two spot on Gartner’s “Top
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25 Supply Chains” list (Thomas, 2012). Dell’s supply chain segmentation journey is summarized in the following section in the context of the segmentation framework explained in the previous section.

Segmentation Vision Alignment to Corporate Goals

Dell decided to create multiple supply chain models, each dedicated to a different segment of the PC industry and configured differently from a demand planning, inventory planning, production planning, and distribution planning perspective. But, they would be designed in such a way that the company could take advantage of synergies to reduce complexity and benefit from economies of scale (i.e. virtual supply chains with one physical supply chain).

Dell embarked on a three-year segmentation journey to achieve two of the corporate goals: improving margin and gaining market share in retail business.

Profiling and Segmentation

Dell started the profiling and segmentation step by determining how different groups of customers derive value from its products and services. The business-to-business (B2B) market demands predictability, speed, customization, services, and precision delivery. While business-to-consumer (B2C) market wants multiple channel options, the ability to personalize for niche products, low-price options, and devices that deliver content. Historically, Dell was organized by products and/or region (Davis, 2010). As part of globalization, Dell aligned organizations to customer value consistently across regions. Dell moved to the following segmentation dimensions to come up with the segmentation criteria: product characteristics, customer characteristics, and channel. Figure 7 shows the profiles that were selected to represent the majority of the business. During this step, customer value propositions were analyzed. Dell used historical customer data from contracts, survey results, and business intelligence (BI) data to begin its exercise. To provide a robust, outside-in perspective, Dell invested in several resources to complete the detailed configuration profitability analysis, targeted surveys, and external marketing insights from multiple industries (Davis, 2010). Three customer value propositions were selected: 1) lead time, 2) cost, and 3) flexibility in configuration. Based on the segmentation criteria, four clusters were selected as shown in Figure 7.

Associating Clusters to Supply Chain Models

With a good understanding of selected clusters and the direction of the market, Dell began to design the new supply chain models by balancing the supply chain extremes of agility and efficiency. Dell used the ‘voice of the customer approach to identify the range of strategies it would require in different functions. The combination of these strategies created the unique supply chain models. The company originally defined eighteen potential supply chain models simplified to six supply chain models. This resulted in models based on a mix of configurations predetermined by Dell and products configurable by customers (Davis, 2010). The six supply models were further consolidated into four supply chain models which have been referred to as Build-to-Order, Build-to-Plan, Build-to-Stock, and Build-to-Spec (Simchi-Levi et al., 2012). Since Dell is not using this exact naming convention for the supply chain models, the author refers to them as follows:
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Figure 7. Selected profiles and clusters for Dell

In the first cluster shown in Figure 8, the interaction with online consumers and volume by configuration is low. As Dell offers to satisfy customers’ value propositions of flexibility in defining the configuration and having short lead time for delivery, the focus of Dell is on higher margins and the cost of a lost sale is high. The supply planning strategy should be based on realized demand (sales order) or a pull strategy. This is the strategy that Dell uses in its traditional business. Dell employs a pull replenishment strategy where component inventory is managed based on forecast while sales order determines the final configuration. So, assembly is driven by the individual customer order and the production batch size is one. Direct ship to consumer and using ‘air’ as the main transportation mode are needed order fulfillment strategies to achieve a short lead time (high degree of responsiveness).

In 2008, as part of globalization, Dell began to heavily leverage its partner network of suppliers to perform assembly (outsourcing its assembly lines), which put more emphasis on strengthening relationship with suppliers to ensure high level of quality and delivery performance with tracking capability. For this cluster, there is need for assembly suppliers to master the production batch size of one.

The second cluster targets retailers and is associated with higher forecast accuracy, less product variability (configuration), and lower margin, since retailers demand low prices to make money. This makes the traditional push-based replenishment strategy better because managing the supply chain based on long-term forecast lowers cost through economies of scale (high volume) and high forecast accuracy. In this supply chain model, procurement, assembly, and shipment decisions are all based on forecast. Extensive collaboration on the configuration and related forecast is expected between Dell and retailers. Ocean transportation mode is typically used to reduce cost.
Cluster 3 is defined for online end consumers who select popular configurations sold online. This cluster has limited configuration options (product variety) which increase forecast accuracy, and call for a push-based replenishment strategy. In this supply chain model, popular product configurations are prepositioned in the supply chain network based on long-term forecasts, to provide a high response time (which is a customer value proposition). In this model, procurement, assembly, and ocean shipping to stocking points are all based on forecast, while shipment to consumers is based on sales orders using air for high response delivery.

Finally, a fourth cluster is defined for enterprise clients (corporates) where forecast accuracy is high and product variety is customized for individual corporations. The menu of available options offered to corporate clients has a longer product lifecycle with more overlap across generations of technology. This enables corporate clients to order the same configuration over a long period of time and lower their total cost of ownership. Because Dell has a close relationship with its corporate clients, forecast accuracy and volume are high (Simchi-Levi et al., 2012). Therefore, Dell uses the flexible supply chain model for this cluster. This model does not keep a finished goods inventory and products are assembled to sales order using components ordered well ahead of time, based on forecast.

In addition to adopting different strategies across different supply chain models, Dell adopted some best practice strategies to be the same across all supply chain models. The idea here is that one physical supply chain should be able to support several virtual supply chains. Some of the key common strategies are:

1. Procurement strategy to reduce purchasing cost by leveraging volume across the various supply chain models
2. Procurement/manufacturing strategy to outsource and consolidate manufacturing infrastructure
3. Product design strategy to standardize the components on the bill of material (BOM) across all supply chain models and reduce product portfolio
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4. Order fulfillment strategy to use one physical infrastructure to support all supply chain models

Simchi-Levi et al. (2012) referenced an example where Dell took advantage of synergies in order fulfillment for the North American supply chain by using one infrastructure for all four supply chain models. Dell has U.S. fulfillment nodes in Atlanta, Chicago, Los Angeles, and New York and employs some of them in more than one supply chain model. In the online business, where speed is critical, items are air shipped from manufacturing in Asia to the four locations in the U.S, and from there by parcel to customer locations. Retail is different. Because cost is the customer value proposition, products are shipped by ocean to Los Angeles and Chicago, and from there by truck to the retailers. However, for online consumers interested in popular products, items are shipped by ocean to North America and then trucked to two key locations (Los Angeles and Nashville) for shipping to individual consumers. This results in a simple logistics network that still meets the needs of a complex business.

Process, Technology, and Governance Changes for Dell

It is important to mention that one of the biggest challenges of segmentation is to coordinate the required changes across several supply chain processes to support different virtual supply chains.

Dell created a standard process to introduce new processes, technologies, and governance changes to enable the large range of supply chain strategies that were defined in the previous step. It has a dedicated center of excellence (COE) that collects requirements from sales, marketing, and operations, then evaluates the customer benefit and business strategy, and finally recommends the right changes within product development and supply chain design.

Critical factors to this effort were continuous improvement that utilizes lean methodologies to maintain a focus on customers’ value and conducts benchmarking to provide an outside-in perspective (Davis, 2010). Organizational realignment was a critical governance change to the new supply chain models. Dell went through this realignment in every aspect of their business, including product design, manufacturing, transportation, customer care, warranty, and technical support. Dell also simplified internal interactions by centralizing global operations and aligning to customer verticals.

Dell undertook a comprehensive transformation of the legacy technology that had only supported Dell’s configure-to-order strategy. With the implementation of different supply chain models to support different customer segments, there was a need for technology to support large lot sizes and imply the existence of a finished goods inventory, something Dell had never considered before. As a result, the company needed to rethink its IT infrastructure so it could support multiple supply chain models.

Segmentation creates the need to develop a single process to allocate manufacturing capacity to different supply chain models and related clusters. This is sales and operations planning (S&OP) — one process applied across all supply chain clusters to align demand, supply, and inventory, and to allocate production capacity to the various supply chains based on actual and forecast demand.

Another process change benefiting mainly the “efficient & flexible” supply chain model was to simplify its product lines and market the most popular configurations. This simplification reduced costs and improved responsiveness through improved forecast accuracy. It also enabled the company to identify popular products which are good candidates to be produced in advance, prepositioned in the network, and offered online to consumers, thus enabling Dell to respond quickly to consumer demand (Simchi-Levi et al., 2012).
Implementation Roadmap for Dell Segmentation Transformation

Dell recognized that the scope of this transformation change would require a multiyear roadmap. The company set short-term project goals with specific benefits to show traction against the overall plan. Another key component of the implementation approach was to pilot segmentation capabilities manually, while designing the automated, scalable solution in parallel. Both of these strategies allowed quick wins to build momentum and mitigated risk during the transformation (Davis, 2010).

Refining and Evolving Journey

The result of Dell’s supply chain segmentation was the creation of end-to-end supply chain models in which multiple capabilities can be arranged in unique designs to satisfy specific customer requirements. These models were rolled out to different regions. There is a need to sustain it and refine it to achieve the expected benefits. The key for Dell is that end-to-end supply chain segmentation is an ongoing, evolving journey. Improvement is never done, but rather continuously realigned to changing customer values.

Key Success Factors for Dell

Dell identified four critical success factors (Davis, 2010):

1. **The Right Transformation Team**: Dell identified 12 key work tracks (teams). Each had a VP sponsor, with small teams coordinating and program-managing the change. Certain skills for certain roles were required. For example, during the first part of the planning phase, the skills required were an outside-in perspective focused on customers, knowledge of market and other industries, end-to-end supply chain design. Then, for the second part of the planning phase, the skills required were process design, lean/Six Sigma expertise, data analytics, systems optimization, and process automation. Now, for the change management work stream, the following skills were required: program management, organizational influence and communication.

2. **Executive Sponsorship**: The supply chain segmentation strategy and potential benefits were shared with the entire executive leadership team to drive cross-functional buy in. Dell’s Vice Chairman was the sponsor of the effort throughout the transformation program.

3. **Unified, End-to-End Business Strategy for Culture Support**: The key to this was the ability to clearly articulate and communicate the need for change, the vision, and the role of different organizations in the end state. To support this communication, several leaders started an internal blog to keep people up to date and engaged.

4. **Start With Customer Value**: Historically, customers were segmented by verticals (e.g., consumer, corporate, government, and small business) as well as regions. Dell had to look across an aggregated view of these existing groupings to identify shared values relating to product features and supply chain capabilities. A global view for customer value and KPIs was critical to this process. Dell wanted to balance customer metrics with operational metrics and achieve a Balanced Scorecard with clear accountability. In addition, data was essential. Visibility to customer requirements, demand, cost, materials, forecasts, product road maps, revenue mix, and multiple views to margin were required to drive the right decisions.
Achieved Benefits

Three years after starting the transformation program, Dell started to gain some significant benefits. Product availability has improved 37%, and order-to-delivery times are 33% shorter. Dell now offers significantly fewer configurations resulting in a dramatic improvement in forecast accuracy by a factor of three. The tailored matching of transportation mode with supply model led to a 30% reduction in freight cost for laptops and slashed manufacturing cost by 30% (Simchi-Levi et al., 2012). Dell also realized approximately $1.5 billion in operational cost reductions between 2008 and 2010. This transformation was a critical factor in that reduction (Davis, 2010). Key operational drivers in this improvement were:

- Leveraging supplier capability and scale
- Addressing customers’ value propositions,
- Simplified design and reductions in complexity
- Improved internal collaboration through collaboration across product design, supply chain, marketing, sales, and finance
- Improved forecast accuracy due to reduction in complexity and better connection to demand which resulted in a significant increase in forecast accuracy at the product, platform, and configuration levels

To summarize, Dell, which revolutionized both the computer industry and supply chain management with its direct-to-consumer business model in the 1990s, is one of a number of companies that are transforming their supply chains by leveraging supply chain segmentation and achieving significant benefits. Instead of using a one-size-fits-all approach to supply chain processes and policies, segmentation is helping these companies determine specific channels and customers that should be sourced from specific locations within their supply chains — and how these supply chains should be managed to profitably service all of those clusters (Johnston, 2012).

Lessons Learned

Dell’s situation is not unique. Many global companies underperform because of a mismatch between business needs and supply chain designs (models). Supply chain segmentation is increasingly necessary to compete in today’s business and reverse poor/declining performance.

Supply chain segmentation strategies often result in manufacturers taking different value propositions to market to meet the needs of different customers while supporting corporate objectives. For instance, when pursuing market share growth for certain product-customer-channel combinations, manufacturers may need to adopt one supply chain model: aggressive and dynamic pricing, high-product availability and superior lead times. When looking to retain market share for other product-customer-channel combinations, the supply chain posture may be different: fixed pricing and competitive lead times.

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FUTURE TRENDS

More companies are realizing that gaining competitive advantage is no longer feasible by only optimizing their own resources without considering customers’ needs and suppliers’ capabilities. They need to get involved in the management of all upstream organizations that are responsible for the supply, as well as the downstream network that is responsible for delivery and after sales market. The challenge for companies is synchronizing supply chain processes (from product design and procurement to marketing and customer service management) in order to be more responsive to customer needs. The trend of mergers and acquisitions will continue to rise, and the complexity of supply chains will increase. This will intensify the need for supply chain segmentation to streamline the process of collaboration between different entities and satisfy the value propositions for customers.

The author predicts the explosion of supply chain segmentation strategy implementation in the next few years. As companies redefine supply chain processes that span across suppliers and customers, there will be a need for segmentation that will result in a significant improvement in efficiency and help them achieve competitive advantage. Companies that do not come on board will realize soon that they are losing ground and customers soon.

The widespread use of supply chain segmentation strategy will lead to new options for improving business-to-business and business-to-consumer collaborations, in addition to supply chain performance, monitoring, and controlling. Intelligent performance measurement systems that can capture negative performance trends and select the correct resolutions are expected to come into widespread use in the next few years. This will open new methods of integration between supply chain partners like system-to-system integration using web services (e.g. integrating one firm’s inventory control system and another’s logistics scheduling environment), the use of wireless devices, and the tight integration of front-end web-site with the back-end systems of supply chain partners.

In the coming years, more and more companies will need to take the supply chain segmentation journey to deliver customer value propositions and gain competitive advantage and market share. Digital technologies will make the journey smoother and more effective. The future belongs to companies who can match their supply chains to the specific customers’ needs, and therefore supply chain segmentation remains one of the key interests of supply chain leaders.

Segmentation criteria will be able to use structured and unstructured data (SNEW – social, news, events, and weather) and process large amounts of data. Leveraging ML / AI it would be possible for ML to leveraging self-clustering algorithms and create the segments dynamically in an automated fashion.

Also, where as in the past, companies were limited to a few segments, supply chain designs would be increased beyond 2 or 4 segments. Digital technology would do the heavy lifting ultimately leading to significant number of segments to satisfy customers’ expectations and requirements.

CONCLUSION

Segmentation is gaining ground in manufacturing as well as in retail and the questions around it have evolved from “what is it?” to “how can we do it?” Supply chain segmentation is not a one-time exercise; it is a multi-quarter journey, but it does get easier after your first venture through the ten steps discussed as part of the proposed segmentation framework. Also, structured assessment of the five success factors
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should be executed early on. Segmentation must be living and ongoing, with the ability to repeat the exercise. Segmentation is a continuous journey to keep your supply chain(s) relevant to your customer(s).

The supply chain segmentation is not just a business initiative; it’s a change in the organization’s culture. Therefore, executive commitment and visible support is mandatory to the success.

Technology is typically needed for the implementation since segmentation often uncovers issues and gaps with current tools. Leveraging digital technology makes the supply chain segmentation journey smoother and more effective. In absence of the right decision-support tools, segmentation strategies will not yield the expected benefits.

Supply chain segmentation strategy presents huge opportunities that are already being tapped by a few companies and supply chains who achieved significant benefits. Implementing supply chain segmentation strategy is key to gain competitive advantage, streamline processes, reduce waste, and eventually achieve business agility which is significantly needed in the new age of globalization and intensive competition.

REFERENCES


Transformation Framework for Supply Chain Segmentation in Digital Business


**KEY TERMS AND DEFINITIONS**

**Clustering:** The process of associating and grouping very similar (but not identical) profiles that reveals patterns, trends, requirements, characteristics, relationships, and structures.

**End-to-End Supply Chain:** The philosophy of considering all value-added processes from supplier to customer and embracing the concept of eliminating middle steps and barriers to optimize the performance of supply chain.

**Governance:** Encompasses the establishment of organizational structure, metrics, policies, and monitoring of their effectiveness.

**Profiling:** The process of learning information about behavior patterns, business characteristics, trends, requirements, relationships, and structures.

**Supply Chain Segmentation:** Is managing profitably different virtual end-to-end supply chains defined by a combination of channel/customer requirements, product characteristics, business value considerations, and differentiated supply response strategies.

**Transformation:** Is the journey of taking an organization in a new direction and reaching an entirely different level of effectiveness. It is a change to processes, systems, structure, and culture.

**Value Proposition:** A concise statement to why a customer should buy a product or service or how it will add value. It should be appealing to the customers’ decision makers.