



MIT SCALE RESEARCH REPORT

The MIT Global Supply Chain and Logistics Excellence (SCALE) Network is an international alliance of leading-edge research and education centers, dedicated to the development and dissemination of global innovation in supply chain and logistics.

The Global SCALE Network allows faculty, researchers, students, and affiliated companies from all six centers around the world to pool their expertise and collaborate on projects that will create supply chain and logistics innovations with global applications.

This reprint is intended to communicate research results of innovative supply chain research completed by faculty, researchers, and students of the Global SCALE Network, thereby contributing to the greater public knowledge about supply chains.

For more information, contact
MIT Global SCALE Network

Postal Address:

Massachusetts Institute of Technology 77
Massachusetts Avenue, Cambridge, MA 02139 (USA)

Location:

Building E40, Room 267
1 Amherst St.

Access:

Tel: +1 617-253-5320
Fax: +1 617-253-4560

Email: scale@mit.edu
Website: scale.mit.edu

Research Report: ZLC-2013-6
Segmentation Strategies in Supply Chain
Zoltan Ejiiofoh and Ana Novillo

For Full Thesis Version Please Contact:

Marta Romero

ZLOG Director

Zaragoza Logistics Center (ZLC) Edificio

Náyade 5, C/Bari 55 – PLAZA 50197

Zaragoza, SPAIN

Email: mromero@zlc.edu.es

Telephone: +34 976 077 605

Segmentation Strategies in Supply Chain

By: Zoltan Ejiofoh and Ana Novillo

Thesis Advisor: Prof. Mustafa Çağrı Gürbüz

Summary:

This thesis focuses on the various segmentation strategies that could be adopted by companies and develops a model that demonstrates how the supply chain could be tailored to offer differentiated service to different customer and product segments. The proposed differentiation model is one that is cost effective and could be easily implemented across all business units.



M.Eng. in Logistics and Supply Chain Management, MIT-Zaragoza International Logistics Program

B.A. Business Studies International Business School Budapest, Hungary



M.Eng. in Logistics and Supply Chain Management, MIT-Zaragoza International Logistics Program

B.Sc in Industrial Engineering Universidad Politecnica de Madrid, Spain

KEY INSIGHTS

Current situation:

1. All customer segments are offered the same standard service level.
2. Inadequate link between current segmentation policy and service level.

Proposed system:

3. Prioritization of service delivery based on customer segment results in higher service levels to the most important customer classes.

Introduction

A leading company for specialty chemicals has already adopted a model to segment its customers and products, and it now wants to determine if this segmentation is rational and how the supply chain can be tailored and differentiated for each segment. The overall goal of this project is to see how the supply chain can be coordinated in order to improve

the service offered to its different classes of customers in such a way that its most important customer segments are better off from a service delivery stand point.

The company understands that a one size fits all strategy (offering all customers same level of service and supply chain solutions) isn't good enough to compete effectively. Attempting to give all clients equal service usually results in a decline of overall service, a dramatic increase in costs, and most importantly, allows for the possibility of a lower priority customer preempting a higher priority one (Byrnes 2010).

The chemical company has 11 broadly segmented business units segmented based on the different markets the products within these units serve. The scope of this project was to narrow down to one business unit serving consumer and industrial needs. Then it was further narrowed to two business lines dealing with paints and agricultural chemicals.

The company had specifically requested that the segmentation and differentiation strategies proposed in this project be practical and general enough to be

replicated across all business units. In adherence to this requirement, we focused on two differentiation strategies: - (1) Prioritization of service delivery based on customer class, and, (2) Inventory rationalization as a tool for differentiated service. These two strategies are general enough to be adopted in any business unit and also prove to be very cost efficient, as they simply re-organize the service delivery process and inventory allocation method based on customer classification.

It's important to mention at this point that "service" within the context of this thesis will be predominantly viewed from an order fulfillment point of view (the time that elapses between order entry and order delivery). The primary measurement of this service is ON TIME IN FULL (OTIF). This measurement checks if an order line was delivered to customers on time and that the full quantity requested by the customer was delivered.

Literature Review

Several works performed by other researchers in the field of segmentation and supply chain differentiation were reviewed. The segmentation of products and customers into ABC categories based on volume and variability of demand was researched by Vitasek et al (2003). A hybrid of this kind of segmentation was adopted by the chemical company, and production strategies like MTF, PTO and MTO are driven by this segmentation. Mentzer et al (2001) demonstrated that timeliness (i.e., the time that elapses between the dates an order is placed to when it is received) impacts perception of service; their prioritization of service level based on service time was selected as this project's model for supply chain differentiation.

Methodology

Primary Research

Surveys and interviews were performed with customers, customer service representatives, and functional business leaders in order to get an idea about current service performance and also understand which areas within the supply chain need to be improved. This project found that customers highly valued Quality and Reliability of delivery, as seen in Figure 1.

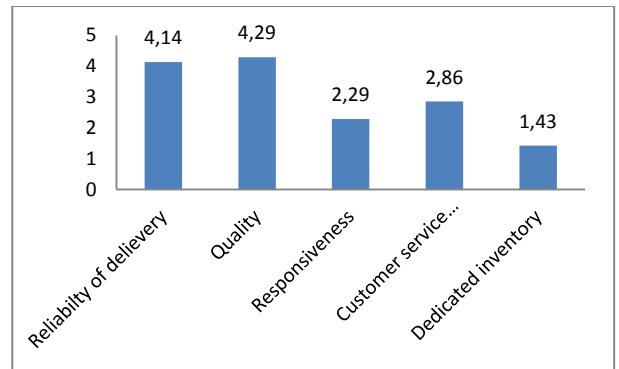


Figure 1: Response to the statement "On scale of 1 to 5 (1 = least important and 5 = most important) rank the following components of a Premium service offering".

The differentiation model proposed in this project will help the chemical company provide more reliable delivery lead times to each customer segment. It was also observed that 67% of customers surveyed did not regularly measure service performance of the chemical company.

Historical Data Analysis

Two Year historical data on all orders fulfilled was analyzed to understand the calculated service performance of the company. OTIF is the main KPI for measuring service at the company. A key finding was that the chemical companies' most important customer segments are experiencing the lowest OTIF performance, which clearly shows the impact of having non-differentiated service levels, as seen in Figure 2. In order to reverse this trend, we adopted service prioritization.

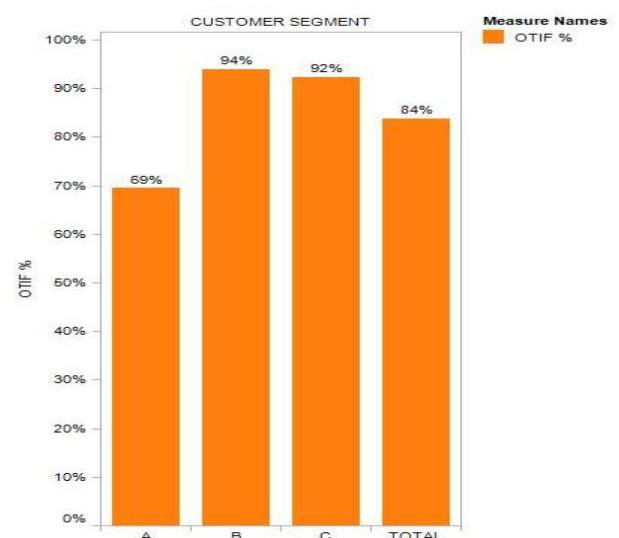


Figure 2: OTIF % for each customer segment.

Differentiation Application

Two segmented based supply chain differentiation strategies were adopted: (1) Prioritization of service delivery based on customer class, and (2) Inventory rationalization as a tool for differentiated service. These two strategies were selected due to their broad applicability and cost effective qualities. These strategies also provide a clear bridge between the current product-based segmentation models already in place and the customer segmentation model.

In order to prioritize service time Queuing theory was used as a method to offer different service times to different customer segments based on their priority classes, A, B, and C. This project analyzed the current service times in the company (without any prioritization: - can be seen as the horizontal lines in in the Figure 3 for each scenario. This line is reflects the W value) and compared the results with our proposed model (i.e. with prioritization: - can also be seen in the Figure 3 as the vertical bar values W_i for each customer segment) under multiple scenarios in the both business lines. For the agricultural chemical business line, three scenarios were analyzed: (1) stable demand; (2) demand decrease by 30% to reflect off peak seasonality; and (3) demand increase by 30% to reflect peak season, as seen in Figure 3.

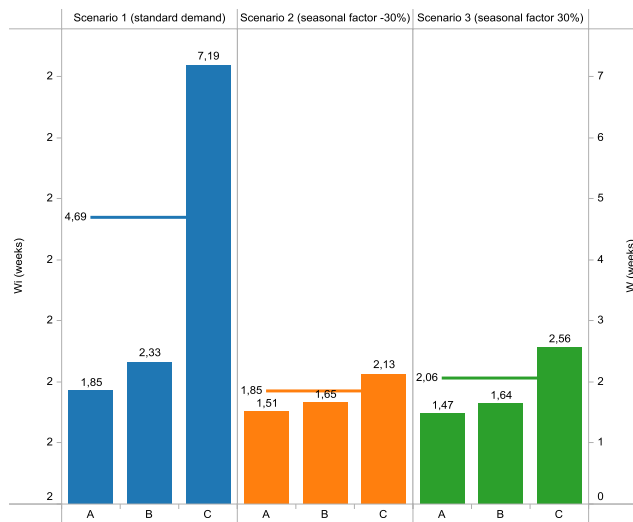


Figure 3: Summary of results with the Agricultural chemical business line.

For the Paints business line, four scenarios were analyzed :- (1) Equal percentage of orders from all customers, or 33% from A customers; 33% from B customers, and finally 33% from C Customers; (2) A scenario when the highest priority segment, A customers, have majority of the orders or 80% for A customers: - 15% for B and 5% for C customers; (3) C customers with the majority of the orders, or 5%

for A customers, 15% for B, 80% for C; in a fourth scenario, conditions were identical to the third scenario, but then we analyzed what happened when the normal prioritization rule of serving A customers first is changed. Figure 4- shows a summary of all four scenarios, and by comparing scenarios 3 and 4, the impact of changing the prioritization order can clearly be seen.

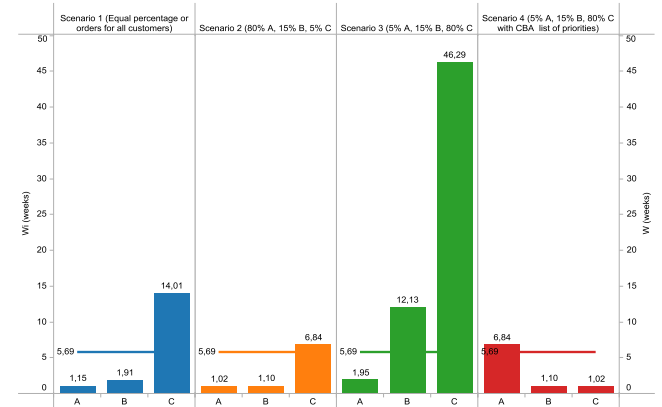


Figure 4: Summary of results with the Paint business line.

Inventory rationalization as a tool for differentiated service was the second differentiation strategy summarized. Deshpande & Cohen (2003) was the source for all insights presented, and all values, results and figures were obtained from their work.

Inventory rationalization is a process of allocating inventory to some customer classes while delaying fulfillment to other customer classes that have lower priority. This model assumes inventory is managed continuously using a (Q, r, K) policy where K represents the threshold at which we stop serving all customer classes and only serve customers with highest priority. Q simply means the fixed quantity that will need to be ordered when inventory drops below r , which is the re-order point. Figure 5 visualizes the model.

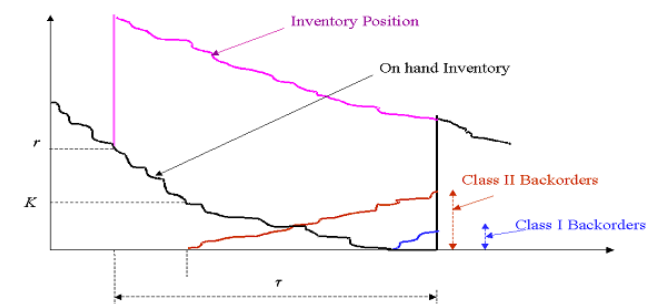


Figure 5: Typical Cycle for a (Q, r, K) Policy. Source: article of Vinayak Deshpande.

The case analyzed compared inventory rationalization models with two typical models that companies usually adopt: (1) Round up model,

meaning rounding up over all inventory levels to be able to meet the highest fill rate demanding customer, and (2) keeping separate pools of stock to meet each customer's fill rate demands independently. Rationalization policies offer the most benefits when there is a significant difference in the cost of stocking out among customer classes and also when the fraction of demand from priority class customers is small when compared to the total.

Recommendations

- Standardization of the OTIF measurement needs to be done, because customers measure OTIF based on their request delivery dates while the company measures OTIF based on their first confirmed delivery date.
- The two suggested supply chain segmentation strategies should be adopted, and the opportunity to charge each customer segment for better service could be explored.
- Customer segmentations must be clearly communicated to all functional departments from customer service to operations. Any manual override of the prioritization driven by segments should be discouraged to ensure adherence.
- Since most customers indicated that they do not track OTIF performance regularly, the chemical company should make their own monthly OTIF metrics visible and transparent. This could be a value adding service.

Conclusions

This thesis was born out of the desire of the chemical company to move away from the current one *size-fits-all*, *first-come*, *first-serve* supply chain model and move towards a differentiated supply chain that services customer segments in a differentiated way. This was achieved by first mapping requirements, and then, analyzing historical OTIF performance on various segmentation criteria. Two major differentiation strategies were proposed: 1) Prioritization of service delivery based on customer class, and 2) Inventory rationalization as a tool for differentiated service.

These two strategies were proposed due to their practical nature and cost effective qualities. Priority queuing theory was applied to order fulfillment process and resulted in very significant service improvements for high priority customers when compared to the current general *first-come first-serve* model. This priority queuing model, if applied to the order confirmation process, ensures better reliability of delivery dates, which primary research shows was highly valued by customers and also enables customer segmented order confirmations to be possible.

Cited Sources

Byrnes, J.L.S. (2010). *Islands of Profit in a Sea of Red Ink*. Penguin Group. New York. USA.

Vitasek, K.I., Manrodt, K.B., Kelly, M. (2003). Solving the supply – Demand mismatch. *Supply Chain Management Review (September/October)* pp 58-64.

Mentzer, J.T., Flint, D.J., Hult, G.T.M. (2001) Logistics Service Quality as a Segment-Customized Process. *Journal Of Marketing*. Vol. 65 pp. 82-104.

Deshpande, V., Cohen, M.A., Donohue, K. (2003) A Threshold Inventory Rationing Policy for Service-Differentiated Demand Classes. *Management Science* Vol 49 No 6, pp 683-703.