

Series on Resource Management

Supply Chain Optimization through Segmentation and Analytics

Gerhard J. Plenert



CRC Press
Taylor & Francis Group

Supply Chain Optimization through Segmentation and Analytics

Supply Chain Optimization through Segmentation and Analytics

Gerhard J. Plenert



CRC Press

Taylor & Francis Group

Boca Raton London New York

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business

CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

© 2014 by Taylor & Francis Group, LLC
CRC Press is an imprint of Taylor & Francis Group, an Informa business

No claim to original U.S. Government works
Version Date: 20131106

International Standard Book Number-13: 978-1-4665-8477-8 (eBook - PDF)

This book contains information obtained from authentic and highly regarded sources. Reasonable efforts have been made to publish reliable data and information, but the author and publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The authors and publishers have attempted to trace the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission to publish in this form has not been obtained. If any copyright material has not been acknowledged please write and let us know so we may rectify in any future reprint.

Except as permitted under U.S. Copyright Law, no part of this book may be reprinted, reproduced, transmitted, or utilized in any form by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying, microfilming, and recording, or in any information storage or retrieval system, without written permission from the publishers.

For permission to photocopy or use material electronically from this work, please access www.copyright.com (<http://www.copyright.com/>) or contact the Copyright Clearance Center, Inc. (CCC), 222 Rosewood Drive, Danvers, MA 01923, 978-750-8400. CCC is a not-for-profit organization that provides licenses and registration for a variety of users. For organizations that have been granted a photocopy license by the CCC, a separate system of payment has been arranged.

Trademark Notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

Visit the Taylor & Francis Web site at
<http://www.taylorandfrancis.com>

and the CRC Press Web site at
<http://www.crcpress.com>

*To the love of my life—
Renee Sangray Plenert*

Who segments my life optimally!

And to my kids, their spouses, and of course the grandkids—

*Heidi, Dawn, Gregory and Debby, Gerick and Nicole,
Joshua and Amy, Natasha and Mark, Zackary and Karli,*

*Chelsey, Lucas, Boston, Evan, Lincoln, Livy,
Savannah, Boston (yes, there really are two with
that name), Beckham, Gerick, Jr., and Gage*

Who like to analyze my life!

Contents

Preface	xi
Acknowledgments.....	xiii
Introduction.....	xv

SECTION 1 Segmentation

Chapter 1: What Is Segmentation and How Does It Work?	1
--	----------

- What Is Segmentation?*
- Mail-Order Pharmacy*
- Aircraft Engine Manufacturer*
- Retail Segmentation*
- Analytics*
- Supply Chain Segmentation (SCS)*
- References*

Chapter 2: The Supply Chain.....	15
---	-----------

- Defining the Supply Chain*
- A Little History*
- What Is Supply Chain Management (SCM)?*
- A Model*
- Supply Chain Management Integration*
- Cycle Time and Response Time as the Key Strategic Metric*
- The Global Supply Chain*
- Information Integration*
- Risk Management*
- Logistics Management*
- Summary*
- References*

Chapter 3: Performance Measures.....	41
---	-----------

- The Role and Purpose of Measures*
- Some Examples of Supply Chain Improvements*
- The Role and Purpose of Control Systems*
- What Is the Best Measure for Your Organization?*
- Summary*
- References*

Chapter 4: Analytics and SCS.....51

Analytics Defined

Level of Analytics and Business Intelligence (BI)

How Analytics Is Used

Analytics Strategy

Analytics and BI Applications

Analytics and Supply Chain Segmentation (SCS)

Applied Analytics Case Example

Summary

References

SECTION 2 Segmentation Applied

Chapter 5: An Applied Example of SCS—

The Analysis Process..... 71

Why SCS?

The Structure of SCS

Creating an Example of SCS

The Companies

Goals

Building Out the SCS Approach

Returning to Our Three Case Example Companies

Driving toward SCS Execution

Cleanse and Analyze Data

Summary

Chapter 6: An Applied Example of SCS—

The Build Process113

Designing the Segmentation Logic Map

Define and Map Planning and Scheduling

Strategies for Each Segment

Build/Run/Test/Validate the Developed Segmentation Structure

Summary

Chapter 7: SCS Execution.....145

Chapter 8: SCS in Your Organization151

Analyze

Build

Execute

Summary

Chapter 9: SCS Key Concepts167

SCS Planning and Scheduling Key Concepts

Touch

ERP Integration

<i>Life of a Product</i>	
<i>Forecast Analysis</i>	
<i>Statistical Safety Stock (SSS)</i>	
<i>Optimal Service Level (OSL)</i>	
<i>Coefficient of Variation (CoV)</i>	
<i>Reorder Point Cycle (ROP)</i>	
<i>Economic Order Quantity (EOQ)</i>	
<i>Optimal Inventory Level (OIL)</i>	
<i>Min/Max (MM) Planning</i>	
<i>Build to Order (BTO)/Manufacture to Order (MTO) Planning</i>	
<i>End of Life (EOL) Planning</i>	
<i>Summary</i>	

SECTION 3 Segmentation Effects

Chapter 10: Change Management.....	189
<i>Quality Functional Deployment (QFD)</i>	
<i>Total Quality Management (TQM)</i>	
<i>Process Re-Engineering</i>	
<i>Concept Management</i>	
<i>Lean</i>	
<i>Six Sigma</i>	
<i>Summary</i>	
<i>Reference</i>	
Chapter 11: SCS Is Wonderful.....	215
<i>Summary</i>	

Preface

In a meeting with a COO (Chief Operating Officer) the author was told, “We have had dozens of consulting companies through here, each telling us that they know the best way to solve our productivity and logistics problems. But every one of them only solves a small part of the problem. Are you going to come in here and give me another solution that fixes a part of our problem but leaves us missing the mark in other areas of our business? In your opinion, which solution is best?”

The author was quick to jump at the opportunity and stated, “All of them are best.”

“What do you mean?” asked the general.

“You’ve already identified the problem,” the author continued. “Each solution fixes part of your planning and scheduling problems. But none of them fixes all the problems. What I would recommend is a segmented approach. Your facility does not need a ‘one size fits all’ solution. It needs a segmented solution. Within each segment, a different planning and scheduling tool is optimal. We need to define the segments, select the appropriate tool for that segment, and execute using that tool. Then you will finally achieve optimality.”

With that, the author and the COO proceeded to discuss the details of a segmented planning and scheduling approach for his extremely complex supply chain. That is what this book will teach the reader how to do.

First let us take a look at how good you, the reader, are at segmentation. I have included a planning and scheduling test created by Einstein. It is called the Albert Einstein Riddle. Albert Einstein wrote this riddle and claimed that if you could solve this “pure logic” problem you must be in the top 2% of the intelligent people in the world. He starts with these rules

1. On a street there are five houses painted five different colors.
2. In each house lives a person of a different nationality.

3. These five homeowners each drink a different kind of beverage, smoke different brands of cigars, and keep different pets.

The question you are trying to answer is: Who owns the fish?
He offers the following clues:

1. The Brit lives in the red house.
2. The Swede keeps dogs as pets.
3. The Dane drinks tea.
4. The green house is on the left of the white house.
5. The owner of the green house drinks coffee.
6. The person who smokes Pall Mall rears birds.
7. The owner of the yellow house smokes Dunhill.
8. The man living in the center house drinks milk.
9. The Norwegian lives in the first house.
10. The man who smokes Blends lives next to the one who keeps cats.
11. The man who keeps horses lives next to the man who smokes Dunhill.
12. The man who smokes Blue Master drinks beer.
13. The German smokes Prince.
14. The Norwegian lives next to the blue house.
15. The man who smokes Blends has a neighbor who drinks water.

The answer to the riddle is found later in this book, but I won't tell you where because that would just be too easy.

Acknowledgments

In order to give credit where credit is due, I would need to create a long list of individuals, companies, universities, and countries that I have worked with. In my most recent academic past, I have had the pleasure of working with the following universities:

- University of San Diego in its Supply Chain Management Institute
- Brigham Young University
- California State University, Chico
- Numerous international universities

Professionally, I have had the pleasure of working with the following organizations:

- Wipro Consulting as a Practice Partner in Supply Chain Management
- MainStream Management as a Senior Strategy and Lean Consultant
- Infosys as a Senior Principal heading the Lean/Six Sigma/Change Management Practice
- American Management Systems (AMS) as a Senior Principal in their Corporate Technology Group
- Precision Printers as Executive Director of Quality, Engineering, R&D, Customer Service, Production Scheduling and Planning, and Facilities Management

Other organizations that I have worked for include:

- Air Force and DOD
- The State of California
- The State of Texas
- United Nations and others

I have lived and worked in factories in Latin America, Asia, and Europe. I have co-authored articles and books and have

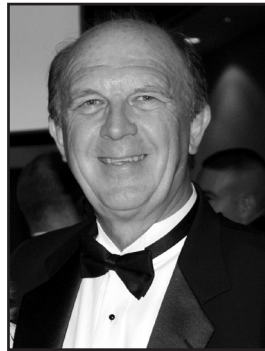
worked with academics and professionals from as far away as Europe, Japan, and Australia. My broad exposure to a variety of manufacturing and service facilities all over the world has given me the background I needed to write this book.

Introduction

Too many organizations are failing to be competitive, not because they cannot solve problems, but because they cannot identify the best solution. They haven't realized that there is not a "one size fits all" solution that will solve every problem.

Gerhard Plenert

We live in a world filled with consultants who have the perfect answer to any problem. The problem is that in order for that approach to work, every problem would have to be structurally the same. And they simply are not all the same. In this book, we address the issues of planning and scheduling and ask the question, "Is there a 'one size fits all' solution for planning and scheduling?" The answer is a resounding, "No!" For example, historically we started with EOQ (Economic Order Quantity) as the one size fits all solution. Eventually computer power allowed us the luxury of using the more complicated MRP (Material Requirements Planning) systems. MRP allowed us to schedule materials based on work schedules or routings, but it had the flaw of assuming infinite worker capacity and therefore was plagued with scheduling shortages. Next, we had JIT (Just In Time), which focused on optimizing the scheduling of materials movement. This was followed by TOC (Theory of Constraints), which optimized machine bottlenecks. Each of these systems looked at the facility as if it had one focused problem: optimizing work schedules, optimizing materials movement, or optimizing machine utilization. But what if you have two, or possibly even all three of these problems? Then what system do you use? Or what if your critical resource is not labor, materials, or machinery? What if it is energy, as in the case of aluminum, or logistics as in the case of apparel or bottling? Then which planning and scheduling solution do you utilize?



This book introduces the concept of segmentation as the planning and scheduling tool that facilitates the optimization of the supply chain. If you have one type of problem in a part of your supply chain, you use the solution that appropriately focuses on that problem. If you have a different problem in a different part of your supply chain, then you use a different and appropriate tool for that part of the supply chain, and so forth.

That is what segmentation does. It applies the appropriate tool to the appropriate part of the supply chain. It breaks us free from “one size fits all” thinking.

The purpose of this book is to provide private companies and government agencies with the tools to:

- Understand the power of segmentation
- Develop a systematic plan for the implementation of segmentation in the supply chain
- Understand the components of an integrated segmentation policy
- Understand the analytics elements of Supply Chain Segmentation (SCS)
- Understand the measures that define segmentation success
- Develop a strategy and methodology to introduce segmentation principles

The book will discuss how to integrate planning and scheduling tools using a segmentation approach resulting in a world-class environment. This book will provide professional, objective, and valuable information to solve many of the major planning and scheduling challenges. It will demonstrate solutions to these challenges by using stories and examples of how segmentation management improvements have successfully made a difference in both the private and government sectors. To do this, the book will give detailed examples of several organizations that solved different problems using a segmented planning and scheduling structure.

Let us now move forward and see how segmentation, when augmented by analytics and when applied to the supply chain, can have a dramatic effect on the performance of your organization.

S E C T I O N 1

Segmentation

1

What Is Segmentation and How Does It Work?

If you want to live a happy life,
Tie it to a Goal.

Albert Einstein

What Is Segmentation?

Segmentation is about differentiating. As we can see in Chart 1.1, there are differences. Segmentation is about realizing that not all customers and products are the same. At the same time, there are still some common characteristics that allow a certain level of process standardization. In the rare case where we have one product with one supplier and one

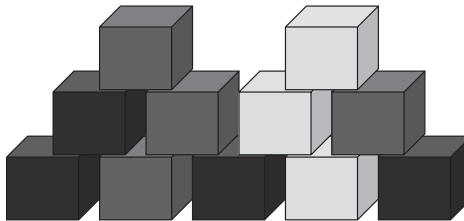


Chart 1.1 Without Segmentation

customer, segmentation is meaningless. But as soon as we add a second customer to the mix, we find that the two customers expect to be supported differently. The difference could be a location difference, where one is further away than the other is. Or, it could be a timing difference, where the delivery to one customer is more critical than the other. Or, possibly a quality requirement difference. Or, it could be a personality difference making us more compatible with one customer than the other. And the potential differences go on and on. The result is that we manage our two customers differently. We treat them differently. We respond differently to their requests.

Now let us grow our business to where we have dozens of customers. Some customers buy more than others do and therefore they become a preferred customer. Some customers complain more, and therefore get more attention. And the list of differentiators goes on and on. In the end, we treat customers differently.

Now let us grow our customer base to hundreds or even thousands of customers. Suddenly our customers lose their individuality. We still respond to the complainers differently than the non-complainers, and we respond to the large customers differently. But, our customers start losing their individual identity. They start becoming a number that is part of a list or group of customers of one type or another. In the belief that we are increasing our efficiency and that we are setting a policy of treating our customers fairly, we start treating all customers the same. We implement policies, systems, and procedures that become rigid in an attempt to be consistent. We believe consistency generates efficiency and stability through standardization. This is true, but there is an even better way to manage these customers and still take advantage of the ability to standardize.

Becoming even more realistic, we next complicate our organization even more by increasing the number of products produced, and then by increasing the number of suppliers that provide input into the process. We can quickly see how the complexity of this process can become overwhelming. Let us look at a real-life example of exactly what I am describing.

Mail-Order Pharmacy

In the pharmaceutical industry, we have both neighborhood pharmacies and mail-order pharmacies. In one specific example of a rather large mail-order pharmacy, we find that this organization has grown so fast that it no longer distinguishes between the various types of customers that it has. Its customers include hospitals, clinics, and individual households or patients. However, the pharmacy no longer knows which prescription deliveries are critical and which ones are not. The result is that the lack of information and customer differentiation has forced this pharmacy to treat all prescription deliveries as critical. They overnight ship all prescriptions, regardless of their importance. Often the shipment is not critical because the customer may have an existing supply on hand, but again, the pharmacy has lost the ability to track individual information. It has never created any way of identifying or distinguishing the difference in its customers. And the result is that its shipping costs have become enormous.

If you look at this example, in the way I presented it, the solution becomes obvious. However, the pharmacy that I am describing was so caught up in growth and in customer service, that it never took the time to step back and say, “This doesn’t make sense. There must be a better way.” It was too busy fighting fires to realize how much money it was losing on shipping costs. It felt that customer service was the most important. But it didn’t realize that through a segmented approach it could not only reduce shipping cost, but also simultaneously increase customer service.

Let us take a closer look at the pharmacy’s process. The pharmacy purchases drugs from suppliers all over the world. Depending on the supplier, some level of certification and testing is required. All of this occurs before the drugs arrive at the pharmacy. However, all of these steps have an impact on delivery time. Once they have arrived, the drugs are placed into bins. But, there is an added complication. This pharmacy not only manages the drugs for itself, but also provides a drug distribution service for other pharmacies. So, the drugs of any one

specific type may be deposited into the bins of any one of the three companies that it services. Therefore, pills ABC arrive at the pharmacy for distribution under company X and are placed in the ABC bin for company X. Similarly, ABC also arrives for company Y and is in turn stored in the ABC bin for company Y.

Fortunately, the pill picking process is automated. As long as the pills are put into the correct bins, the prescription bottles are filled and labeled with the appropriate pills, given the appropriate pharmacy name and label, and sent down the line for shipping. At the shipping location, the pill bottles are put in an envelope and labeled for shipping. However, at this point another complication may occur. What if the same patient is getting multiple prescriptions? Wouldn't it make sense to ship all these together and consolidate the shipping costs? Sometimes that happens, but often it does not.

Let us complicate the process even more. What if we have multiple patients at the same hospital, each getting his or her own prescription filled? Currently, the hospital receives multiple shipments, one for each patient. This becomes expensive in shipping costs for the pharmacy, and it is a nuisance for the hospital because it needs to open several shipping envelopes when all the different orders could have come together as one shipment. Moreover, wouldn't it be more convenient if somehow the critical or urgent shipments were identified differently than the ones that were not as urgent? Right now, the pharmacy and the hospital are forced to treat all shipments as urgent because there is no way to distinguish the difference.

So what would segmentation do differently in this example? How would it help? The first and most important step in segmentation is the identification of the goal. What are we trying to accomplish? Are we trying to reduce shipping cost? Are we trying to improve customer service by putting more focus on the urgent shipments and less importance on the non-urgent shipments? Are we trying to reduce inventory by improving the planning process? Knowing what it is that we are trying to accomplish shifts our priorities and therefore changes the criteria used in segmentation, as we will see in later chapters.

Let us continue with our pharmacy example. In this case, the goal is customer service—"getting the right product to the

correct customer on time.” If that was its only goal, then what it is doing now—shipping everything overnight express—is good enough because it achieves that goal. The pharmacy should just go ahead and overnight FedEx everything to its customers. It gets the pharmacy what it needs when it needs it. Unfortunately, it may go bankrupt in the process, so there has to be a secondary goal, which in this case is “being competitive.”

Defining what it means to be competitive requires not just revenue and profit, but also requires us to look at what would differentiate our service from our competitors’ service. In the pharmacy example, the organization is a mail-order pharmacy. It does not have the convenience of just being in a retail outlet down the street where its customers can stop in and quickly pick up their pills. So what differentiates this organization? The key benefit it offers is that it can provide the drugs to your door without you having to leave the house. This becomes important for patients who have disabilities, or who are getting older in years thereby making a trip to the local pharmacy challenging. Therefore, the mail-order pharmacy needs to get the drugs to the customer as quickly as possible and have them delivered to the patient’s door so the patient does not have to venture out of the house.

The mail-order process is also convenient for hospitals and clinics. They don’t have to stock up on all drugs. They can have the correct prescription delivered through the mail system ahead of when the patient needs them.

Let us get back to the concept of segmentation. How would it help our mail-order pharmacy? It turns out that there are several different specific areas where segmentation can simultaneously reduce cost and improve customer service. Segmentation can provide a basis for the following:

1. Differentiating urgent from non-urgent deliveries based on the product being delivered. For example, refrigerated products require overnight turn-around. Alternatively, prescriptions that are renewals are not as urgent as new prescriptions.
2. Customers can be segmented by type. For example, hospitals tend to have more urgent needs than a clinic because hospitals handle emergencies whereas clinics handle

more repetitive customers. In the case of clinics, they tend to distribute the medicine when the patient comes in for treatment, and the schedules are fixed and regular.

3. Receipt of drugs can be managed by priority. For example, is this particular drug running low on supply at this customer location?

At this point, we have discussed some of the reasoning behind segmentation, but we have kept our example extremely simplistic. Identification of the best and most meaningful segmentation structure requires analytics and data analysis. For example, factors like service level, demand variability, forecast reliability, inventory stocking rules, shelf life, etc., all come into play when creating the optimal segmentation structure. We will see how all of this works in the next chapters.

Moving away from our example, let us look at retail segmentation. Segmentation for a retail organization or a distributor would focus on the customer. It would have only one set of SKUs. The same SKU numbers that are used on the procurement side are also used on the delivery side. That makes the segmentation criteria different then in manufacturing. In manufacturing you typically have an entirely different set of SKUs for the procurement side (or supply side) than you do for the delivery side (or demand side) of the process. In this case, two entirely different segmentation exercises are often required. The process will be explained in more detail in future chapters, but for now I just want to increase your awareness that segmentation is not executed the same way for all organizations and for all processes.

Aircraft Engine Manufacturer

Let us look at a second real-life example. In this case, we are looking at an aircraft engine manufacturing facility. This organization has hundreds of suppliers from all over the world shipping materials through a series of warehouses. Initially the materials are staged and consolidated in an overseas