Supply Chain Metrics That Matter:
A Focus on the Pharmaceutical Industry

Using Financial Data from Corporate Annual Reports to Better Understand the Pharmaceutical Industry

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Research

*Supply Chain Metrics That Matter* is a series of publications issued monthly by Supply Chain Insights LLC. They are a deep focus on a specific industry.

Within the world of Supply Chain Management (SCM), each industry is unique. To help companies understand the differences and similarities between industries, we share deep analysis in each report.

While we find it useful to understand the evolution of supply chain excellence by comparing industries, we feel the true stories of supply chain excellence can only be really understood by comparing what happened within a period by peer group. The goal of this series is to share these insights.

Disclosure

This independent research is 100% funded by Supply Chain Insights. Your trust is important to us. As such, we are open and transparent about our financial relationships and our research process.

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Research Methodology

The basis of this report is publicly available information from corporate annual reports from the period of 2000-2011 for pharmaceutical manufacturers. We use this financial data to help readers learn from past trends, better understand current operating environments, and provide recommendations for the future. We augment the financial data analysis with information from our quantitative and qualitative research studies as well as our work with clients operating within the pharmaceutical industry.
Executive Overview

In the face of declining growth, the pharmaceutical industry has consolidated. Over the past five years, few pharmaceutical companies have not completed a major merger or acquisition activity. This has created a sense of instability within the industry. In addition, the pharmaceutical industry lags other process industries on supply chain maturity. With high gross margins and the ability to fund large inventory stockpiles, there has been little need to balance costs, inventory and customer service. However, this picture is now changing. There are four primary drivers of the changing pharmaceutical operating environment.

- **Channel Redefinition.** The first decade of the pharmaceutical supply chain was based on molecule discovery. The historic focus of the pharmaceutical supply chain was building a strong personalized relationship with the doctor and improving time to market for new drugs. Over the last decade, the requirements and restrictions for the pharmaceutical supply chain have become a more complex system of hospital, provider and physician networks. As a result, the channel through which pharmaceutical sales occur has become more complex with an increasing need to develop improved supply chain capabilities.

- **Globalization.** The evolution of the global supply chain, with distinctly different regional regulation and compliance rules, also increases the need for more advanced supply chain capabilities. Globalization is increasing the need for more well-defined governance structures as well as the need for technology to streamline the order-to-cash process from manufacturer to consumer.

- **Commoditization.** With fewer new products successfully navigating the drug approval process, and more drugs leaving “patent protection,” the pharmaceutical companies’ market is becoming more competitive. There is a greater need for supply chain practices to help companies become more competitive against generic drugs. As a result, there is no question that supply chain is becoming more and more important in the pharmaceutical industry.

- **New Requirements.** Supply chain excellence is also needed to deliver against the new functionality requirements for product delivery. This is twofold. Pharmaceutical supply chain systems need to be rethought and redesigned to enable traceability. This system-level thinking and redesign will enable drug serialization and the management of new
drugs requiring specialized handling in cold-chain conditions. Serialization and cold-chain requirements are driving the need for redesign of physical distribution systems.

State of the Industry

While other companies in other supply chains have struggled with low gross margin values as a result of their operating environment, and thus focused on improving efficiency and driving improvements in supply chain excellence, the large/high gross margin values in the pharmaceutical industry have enabled more of a laissez faire attitude towards supply chain improvements. Table 1 illustrates recent four-year averages for five companies operating within the pharmaceutical industry.

Table 1: Pharmaceutical Gross Margin Averages

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<tbody>
<tr>
<td>Abbott Laboratories</td>
<td>0.54</td>
<td>0.55</td>
<td>0.58</td>
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<tr>
<td>Amgen Inc.</td>
<td>0.87</td>
<td>0.84</td>
<td>0.84</td>
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<tr>
<td>Eli Lilly &amp; Co.</td>
<td>0.80</td>
<td>0.77</td>
<td>0.80</td>
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<tr>
<td>Merck &amp; Co., Inc.</td>
<td>0.72</td>
<td>0.76</td>
<td>0.67</td>
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<tr>
<td>Pfizer, Inc.</td>
<td>0.85</td>
<td>0.83</td>
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The gross margin values are much higher than in other process industries including consumer packaged goods (CPG), the chemical industry, and retail. However, faced with a changing operating environment fueled by globalization, commoditization and increasing complexity, there is a need to think more seriously about improving supply chain capabilities.

The large gross margins shown in table 1 have provided an environment in which profits were nearly guaranteed and operations were not scrutinized and streamlined like they were in other industries. While the pharmaceutical industry has a low level of supply chain maturity currently when compared to other industries, there is an opportunity to catch up and improve capabilities based on the successes and mistakes of other industries.
Resiliency Levels

Through our analysis of different industries, we have discovered that supply chain leaders in those industries demonstrate different patterns of performance and levels of maturity. For example, CPG companies including Colgate-Palmolive and Procter & Gamble demonstrate a level of resiliency in their supply chains that most other companies, both within and outside of CPG, have not yet achieved.

We find this comparison of the cash-to-cash cycle (C2C) and gross margin especially interesting because most supply chain professionals would agree that both metrics matter. However, it is important to understand the comparison between the two metrics and prioritizing one or the other can lead to an unbalanced supply chain. Here we see that Colgate and Procter & Gamble have demonstrated the highest level of resiliency in regards to these metrics over the past decade. This resiliency is demonstrated below in figure 1 with a tight pattern indicating year-over-year stability in both measures.

Figure 1. Supply Chain Leaders (2000-2011)

Compare the trajectory of Colgate (purple) or Procter & Gamble (dark green) versus Merck (blue) in the figure above and it becomes evident that there are a variety of maturity levels among different supply chain leaders. The ideal supply chain in the graphic above would demonstrate low C2C values and high gross margin, while remaining consolidated and consistent with small year-over-year gains. No company is perfect, but some are better than others. Merck’s pattern is the worst. Merck has weathered large fluctuations in both gross
margin and the cash-to-cash cycle over the preceding decade and saw especially large swings during the years of the Great Recession. While Merck is a leader within the pharmaceutical industry, they do not demonstrate a comparable level of consistency and resiliency when compared to consumer products leaders. In general, the pharmaceutical companies are less resilient and struggle to deliver consistent year-over-year results in C2C and gross margin.

**Effectiveness of R&D Spending**

A major factor in the pharmaceutical supply chain is the upcoming drug patent cliff. More drugs are expiring from patent protection than are gaining regulatory approval. While the absolute value of the cliff is debated, all parties realize that it is a significant event.

PricewaterhouseCoopers and Evaluate Pharma estimate that from 2012 to 2018, nearly $150 billion of profit will be lost to generic drugs.¹ With this impending loss of revenue, pharmaceutical companies face a challenge. Not only must supply chain leaders make their supply chains more effective, they must also improve the effectiveness of research & development (R&D) spending. Improved effectiveness of R&D spending has the power to act as a differentiator in a commoditized market.

Effective R&D spending has always been a critical part of a successful pharmaceutical company, but the cost to bring a new drug to market is very high. Recent commentators have suggested that the cost of a new molecule ranges between $75 million to $4 billion according to the same PricewaterhouseCoopers report. As a result, effectiveness in R&D spending is paramount. Figure 2 illustrates pharmaceutical companies’ performance on the R&D margin, a measure of R&D effectiveness over the preceding decade.

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¹ PricewaterhouseCoopers.  From Vision to Decision: Pharma 2020  
Figure 2. Pharmaceutical R&D Margin (2000-2011)

R&D Margin is defined as:

\[
R&D \text{ Margin} = 1 - \left( \frac{R & D \text{ Budget}}{\text{Revenue}} \right)
\]

The winner is clearly Abbott Laboratories. Merck’s declining performance was a major factor in its decision to merge with Schering Plough. While Eli Lilly shows consistency in past performance, the future looks bleak with Eli Lilly losing patent protection on 66% of its 2010 pharmaceutical sales by 2013.\(^2\) Other pharmaceutical companies face similarly steep patent cliffs.

The development of a more effective supply chain plays an important role in reducing the severity of the situation. The design of the clinical trial supply chain, to ensure effective deployment of drugs and trials, is critical. In addition, effective commercialization of supply chains early in the new drug stage-gate processes is vital. Due to the fact that pharmaceutical companies are closely regulated and manufacturing sites are not interchangeable, it is very important for companies to design the whole supply chain early in the process of a new product launch. This issue is of more importance to pharmaceutical companies than any other industry due to the level of regulation.

Impact of Mergers & Acquisitions

Just as in the chemical industry, mergers and acquisitions (M&A) have played a large role within the pharmaceutical industry over the past decade. Although there is the potential for M&A activity to create a lot of instability and shifting conditions, the pharmaceutical industry has done a remarkable job of weathering the storm. Pfizer’s acquisition of Wyeth and Merck’s acquisition of Schering-Plough are two examples of the level of consolidation and activity occurring within the industry. This turbulence creates a difficult environment to drive year-over-year improvements, yet the pharmaceutical industry as a whole has demonstrated a level of stability in regards to M&A activity that signifies a higher level of maturity than we had expected.

The cash-to-cash cycle is a popular supply chain metric that enables a holistic look at the operations of the supply chain through the lens of cash flow. It includes the popular metrics: days of inventory (DOI), days of receivables (DOR) and days of payables (DOP). The corresponding equations follow:

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For instance, one of the compounds we’d licensed ran into a problem in Phase II clinical trials. We thought we could formulate around the issue, so we continued working on the compound. I looked at the situation and asked, “Science aside, what are the odds that this drug is ever going to reach the market?” It turned out they were low. I pushed for a decision, and we shut it down and took a write-off of more than $100 million. I try to emphasize this message to our employees: If you’re afraid to admit you made a mistake, you’re not going to be successful in pharmaceuticals, because things don’t always turn out the way you expect in science.

• Joseph Jimenez, CEO Novartis AG

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Cash-to-Cash Cycle = Days of Inventory + Days of Receivables − Days of Payables

\[
\text{Days of Inventory} = \frac{\text{Average Inventory}}{\text{Cost of Goods Sold}} \times 365
\]

\[
\text{Days of Receivables} = \frac{\text{Accounts Receivable}}{\text{Revenue}} \times 365
\]

\[
\text{Days of Payables} = \frac{\text{Accounts Payable}}{\text{Cost of Goods Sold}} \times 365
\]

To illustrate the positive cash flow within the organization, DOI and DOR are added to the metric while DOP which represents cash owed to suppliers is subtracted. An optimal C2C cycle value (which depends greatly on the operating environment and maturity of the company and industry) will be low and/or even negative indicating a rapid and streamlined flow of cash through the organization. Figure 3 illustrates the C2C performance of five pharmaceutical companies over the preceding decade.

Figure 3. Pharmaceutical C2C Values (2000-2011)

This graphic tells multiple stories, only two of which we will examine. The first story is the remarkable level of consistency in C2C in light of the M&A activity within the industry. Although, once again, pharmaceutical companies do not display the stability of CPG companies, given the operating environment, the large spikes have been confined to only years affected by the Great
Recession. Even then, Abbott Laboratories and Eli Lilly were both able to hold C2C results fairly stable.

The second story is the overall stagnancy in the metric. What we would like to see is companies gradually decreasing C2C through improved management of inventory, receivables and payables. It may seem contradictory, but we see the most mature companies hold their metrics from large swings while also making small but sustainable year-over-year improvements. Here the majority of the pharmaceutical companies end the decade with equal or even increased C2C values, as compared to 2000. While this is certainly understandable, ongoing success and corporate profitability will require pharmaceutical companies to take a closer look at the inputs to the C2C cycle and manage with a hands-on approach to improve cash flow as top line revenues become more susceptible to decline.

**Managing the Cash-to-Cash Cycle**

As displayed in figure 3, pharmaceutical companies have historically high cash-to-cash values. Despite large investments in Enterprise Resource Planning (ERP) and Advanced Planning Systems (ARP), cash-to-cash values have gone up, not down, over the past 12 years. Table 2 below illustrates the trend of C2C across 11 separate industries. Pharmaceutical is one of the few industries to show an increasing trend.

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<thead>
<tr>
<th>Cash-to-Cash Cycle Averages Across Industries (2000-2011)</th>
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<tr>
<td>Athletic Apparel</td>
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<td>Pharmaceutical</td>
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<td>Semiconductors</td>
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Source: Supply Chain Insights LLC, Corporate Annual Reports 2000-2011

**Athletic Apparel:** Adidas, Matuo, Nike, Puma SE

**Automotive:** Ford, Honda, Toyota, Volkswagen AG

**Chemical:** BASF, Dow, DuPont

**Consumer Products:** Colgate, Kimberly-Clark, P&G, Unilever

**Food & Beverage:** Campbell, General Mills, Kellogg, Kraft

**Hard-Disk Drives:** Seagate, Sony, Western Digital

**High-Tech & Electronics:** Apple, LG, Motorola, Samsung

**Medical Devices:** Boston Scientific, Medtronic, St. Jude Medical, Zimmer Holdings

**Retail:** Amazon.com, CVS Caremark, Safeway, Target, Walmart

**Pharmaceutical:** Abbott Laboratories, Amgen, Eli Lilly, Merck, Pfizer

**Semiconductors:** Analog Devices, Intel Corp., Maxim Integrated Products, Texas Instruments, TriQuint Semiconductor
The pharmaceutical industry has long been a laggard in the use of new techniques and technologies to manage inventories. In the world of high gross margins and global expansions, it has just not mattered as much. Although, inventory is only one of the three components of C2C; along with Payables and Receivables, each of the three levers plays a large role in the overall movement of the C2C value.

In the period from 2000 to 2003, it is possible to examine the C2C averages of the five pharmaceutical companies to better understand what drove the increasing values.

Figure 4. Pharmaceutical C2C Averages (2000-2003)

The beginning of the decade sees large C2C values for all companies driven mainly through inventory values. Due to the requirement of holding greater inventory stores than other industries, this result is not surprising. However, there is a very large spread of Payables values from 64 (Abbott Laboratories) to 157 (Merck & Co., Inc.). In contrast, Receivables values are relatively comparable and do not show such a wide variance. When evaluating the C2C cycle, we hope to see small sustained year-over-year improvements. However, as seen in figure 5 below, for the pharmaceutical industry this was, unfortunately, not the reality.
In this snapshot, Abbott again returns the best performance but overall the C2C value is stagnant, stuck at 117 days. Days of Inventory has been reduced through improved inventory management, while the remaining four companies are still struggling with high inventory. Amgen Inc., for example, has seen an increase of DOI of over 100 days. DOP is still displaying widely different terms from 38 days for Abbott to 243 for Amgen. Clearly, the pharmaceutical industry does not demonstrate the level of maturity in managing their C2C cycle as other companies and industries. However, the vast room for improvement empowers the pharmaceutical companies to make strides in their own right by understanding the components of the C2C cycle and acting accordingly to improve supply chain performance. Each of the three components represents fertile ground for improvement initiatives.

The Future

The future of the pharmaceutical industry will be tightly woven with stories of improving supply chain excellence. It will be a story of globalization and declining margins, increased regulation and delivery requirements for drug safety.

- **Globalization.** The pharmaceutical industry may use the term “global supply chain” to define their operations, but the design has, up to this point, been primarily regional. Opportunity exists in the design of regional and global governance to enable companies
to maximize economies of scale while obeying increasing regulations. The key is to build strong horizontal companies and processes (revenue management, sales and operations planning (S&OP), supplier development) to ensure organizational visibility. This is a balancing act of service, margin and working capital. For the average pharmaceutical company, this will be a long, slow and difficult journey; but, there is a lot to learn from companies both within and outside the industry who have gone before.

“People here are new to the concept of supply chain as an overall process. For many supply chain management is synonymous with inventory management and logistics. However, because of the economic crisis, supply chain management is becoming more and more important. Margins are falling everywhere and no one can hide their old practice behind the walls of the local market walls any longer. Managers are increasingly looking for innovative ways to run their companies”.

• From a pharmaceutical supply chain leader in Croatia

• **Regulation.** Regulations and compliance requirements will drastically change the pharmaceutical operating environment. In the U.S., standardized countrywide regulations (the RxTEC Act, for example) will offer a much more streamlined set of guidelines in the domestic channel than current patchwork state-by-state directives. Furthermore, they offer visibility throughout the supply chain, enabling its owners to truly see the supply chain and tackle problems and issues in a much more proactive manner than is currently possible.

• **Changing Distribution Requirements.** The changes in product mix and regulations will dramatically change the nature of physical distribution. Serialization and cold-chain requirements for temperature-controlled products with short life cycles are growing in popularity. These products, and others with strict handling and distribution requirements, will force pharmaceutical supply chain leaders to redesign the archaic inventory practices currently in use in the pharmaceutical space.

**Steps to Take**

There are certainly substantial issues to be resolved within the pharmaceutical supply chain; however, in part because of the historical lack of focus on supply chain operations, there is great room for opportunity. While other industries have already optimized inventory management and struggle with low gross margin values, the pharmaceutical industry has several advantages and the ability to learn from other industries. Here are our recommendations:
• **Use Metrics and Invest in Your Supply Chain.** The pharmaceutical industry is late to the supply chain game because of the advantages they have received with such high gross margin values. As margins fall, pharmaceutical companies have the opportunity to learn from other industries as they redesign their processes. The focus needs to be outside-in from the consumer and channel back. Successful companies will embrace the increasing product complexity and the need for increased scale and more efficient process redesign. The good news is that others have gone before. This means they won’t be forced to make the same mistakes other early adopters have made in remaking and optimizing the supply chain. By taking a numbers- and metrics-based approach to supply chain management, pharmaceutical companies can make well-informed and grounded decisions to improve their maturity and avoid the stumbling blocks other companies and industries have already identified.

• **Focus on Adding Value in Value-based Networks.** In the same way that brick & mortar retailers are adapting to the new online shopping world by providing more value to customers, pharmaceutical companies need to embrace the changes in the channel by country and redesign the supply chain outside-in. These efforts should include both products and services. The historic relationship between physician and research scientist propelled the traditional supply chain; however, the future is patient sensing and the building of products and services for health and wellness. The change in the definition of the customer is significant and will be revolutionary, not evolutionary.

• **Embrace Big Data and New Forms of Predictive Analytics.** The amount of data available to personalize service and better understand customers is growing every day. This includes unstructured data such as online ratings and reviews, Facebook posts, and Twitter interactions. It also includes more structured data in more recognizable numerical formats and spreadsheets like T-log data or out-of-stock statistics. Pharmaceutical companies can harness this data to not only drive bigger and better scientific innovation, but also to better understand the end consumer’s wants and needs. The building of listening posts for unstructured data can reduce demand latency and improve a company’s ability to sense product issues and react accordingly.

• **Create an Environment That Fosters Process Innovation.** Pharmaceutical companies face many challenges in the coming years and the stakes are high, but with a growing population the demand for pharmaceutical products will continue to rise. Companies cannot continue to use the old approaches and must adapt and create a
more streamlined and reactive supply chain with well defined R&D processes to serve the customers of the present and future. In addition, they must be as aggressive on process innovation as they are on product innovation. The best pharmaceutical supply chains of the future will be known by flexibility and agility of both internal and external workflows.

"This is the fourth time I’ve been through a patent cliff in my career and the objective of this is to avoid a fifth one."

•Christopher Viehbacher, CEO Sanofi 4

Conclusion

For many years, the pharmaceutical industry was insulated from supply chain issues by high gross margins and patent protection. Those years are now ending. To not only survive, but profit moving forward, companies will need to reconsider their supply chain design and build innovation and stability dually into the company culture. By doing this, we believe pharmaceutical companies will not only weather the upcoming challenges, but also drive supply chain excellence and approach a new level of maturity for the industry.

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About Supply Chain Insights LLC

Supply Chain Insights LLC (SCI) is a research and advisory firm focused on reinventing the analyst model. The services of the company are designed to help supply chain teams improve value-based outcomes through research-based Advisory Services, a dedicated Supply Chain Community and Web-based Training. Formed in February 2012, the company is focused on helping technology providers and users of technologies improve value in their supply chain practices.

About Abby Mayer

Abby Mayer (twitter ID @indexgirl), Research Associate, is one of the original members of the Supply Chain Insights LLC team. She is also the author of the newly-founded blog, Supply Chain Index. Her supply chain interests include connecting financial performance and supply chain excellence as well as talent management issues, emerging markets, and improving risk management practices through the use of big data and analytical analysis.

Abby has a B.A. in International Politics and Economics from Middlebury College and a M.S. in International Supply Chain Management from Plymouth University in the United Kingdom. She has also completed a thru-hike of Vermont’s 280 mile Long Trail, the oldest long distance hiking trail in the United States. As part of the planning and food prep process, she became interested in supply chain management when she was asked to predict hunger pangs for the entire three-week trip before departure. If that isn’t advanced demand planning, what is?!?!