MASTER THESIS
Cash to Cash Cycle with a Supply Chain Perspective

Paper within International Logistics and Supply Chain Management

Authors: Can Duman
Sawanee Sawathanon

Tutor: Susanne Hertz
Ass. Tutor: Benedikte Borgström

Jönköping, May 2009
Abstract

Title: Master Thesis within Business Administration
Authors: Can Duman
          Sawanee Sawathanon
Tutors: Susanne Hertz
Subject terms: Cash to Cash Cycle, Supply Chain Management, and Dell.

Introduction

This research puts forth a new perspective on cash-to-cash cycle, a performance metric that relates to both finance and supply chain management. In criticism of the existing literature, which virtually views the firm as an isolate body, we look at cash to cash cycle optimization through a supply chain lens, in the hope of being able to formulate a more discreet approach. Our study involves a literature review followed by a case study featuring Dell Inc., the American PC manufacturer.

Purpose

This study aims to explore the ways to mitigate negative effects on the firm’s suppliers and customers when the firm sets out to reduce its C2C.

Method

This study involves a qualitative analysis that makes use of secondary data from various sources. A case study of Dell, Inc. is conducted as part of the empirical study.

Conclusion

We discuss the effects of C2C optimization by dissecting the metric into its 3 constituents, whereby we are able to examine the effects of different C2C optimization methods separately. We bring up the caveats posed by these individual methods and also uncover the cases where reciprocal improvement opportunities lie. Lastly, we lay out our findings by proposing suggestions to deal with such effects under the defined scenarios and present future research suggestions.
Acknowledgments

We would like to extend our gratitude to Susanne Hertz and Benedikte Borgström, who oversaw our thesis writing process. Their feedback was instrumental in righting our course as we advanced. Likewise, we would like to thank our fellow-students for their suggestions and benevolent attitude.

We are indeed grateful to our families who made it possible for us to make our way to Sweden and study here.

Lastly, we consider ourselves lucky to have had access to the diverse data sources that the university library offers.
# Table of Contents

1 Introduction ......................................................................................................................1
   1.1 Background ................................................................................................................1
   1.2 Problem Discussion ...................................................................................................2
   1.3 Purpose .....................................................................................................................2
   1.4 Significance of the Study ...........................................................................................2
   1.5 Delimitation ..............................................................................................................2
   1.6 Disposition ............................................................................................................... 3

2 Literature Review ............................................................................................................4
   2.1 Working Capital Management .....................................................................................4
   2.2 Cash to Cash Cycle ................................................................................................... 5
       2.2.1 C2C: Definition ..................................................................................................5
       2.2.2 C2C: Computation ...........................................................................................5
       2.2.3 C2C: Interpretation ......................................................................................... 7
       2.2.4 C2C: Relationship between C2C and Profitability .........................................8
       2.2.5 C2C: Optimization ......................................................................................... 8
       2.2.6 C2C: A Supply Chain Lens .............................................................................9
       2.2.7 C2C: Alternatives ...........................................................................................10
   2.3 Financial Flows in the Supply Chain ........................................................................11
   2.4 Credit Management ................................................................................................ 12
   2.5 Inventory Management ............................................................................................13
       2.5.1 Bullwhip Effect ..............................................................................................15
       2.5.2 Just-in-Time Approach ....................................................................................16
   2.6 Demand Management ..............................................................................................16
   2.7 Supply Management .................................................................................................17
   2.8 Supply Chain Relationships .....................................................................................18

3 Methodology ....................................................................................................................20
   3.1 Qualitative Research ...............................................................................................20
   3.2 Research Design ......................................................................................................20
   3.3 Case study .................................................................................................................20
   3.4 Measurement ............................................................................................................23
       3.4.1 Internal Validity ..............................................................................................23
       3.4.2 External Validity ............................................................................................23
       3.4.3 Reliability ......................................................................................................23

4 Empirical Study ..............................................................................................................24
   4.1 Company Background (Dell) ...................................................................................24
   4.2 Dell's Working Capital Management .........................................................................24
   4.3 Dell's C2C Performance ...........................................................................................24
   4.4 Demand Management .............................................................................................27
   4.5 Supply Management ...............................................................................................29
   4.6 Inventory Management ...........................................................................................32
1. Introduction

First, some background on the topic will be provided. That will be followed by a problem discussion. We will then respectively lay out the purpose, significance and limitations of the study.

1.1 Background

Firms need cash to pay debts, wages, taxes and other expenses. In other words, firms need cash in order to start and maintain operations and grow. The difference between current assets and current liabilities of the firm makes up its working capital. Working capital management, as its name suggests, deals with the quantity and composition of working capital and aims to ensure that the firm is able to meet its short term obligations, which include short-term debts and operational expenses.

To measure how well a firm manages its working capital, we can use a financial performance metric called cash to cash cycle (abbreviated as C2C and also referred to as cash conversion cycle), which was developed by Richards and Laughlin (1980). This metric, which basically indicates the average length of the time frame between paying suppliers and getting paid by customers, has three determinants: days payable outstanding, days of inventory and days receivable outstanding. C2C tells us the average number of days that working capital is invested in the operating cycle. More on how this metric can be interpreted will be provided in our literature review.

Firms in different industries may exhibit great differences in terms of C2C due to its multi-determinant structure. There might be high variations even among firms in a given industry. Firms that have low levels of inventory and get paid by their customers quickly have relatively low C2C; conversely, firms will end up with long C2C if their working capital is tied up in large amounts of inventory and they need to wait long to collect their receivables (Churchill & Mullins, 2001).

Existing studies have revealed a negative correlation between C2C and profitability. Unsurprisingly, many firms in various industries try to reduce their C2C. And the length of C2C is variable over time, examples of which abound. A low value of this metric has generally been touted as being favorable and it has been suggested that its trend over time and within-industry benchmarking may help managers better gauge their firms’ standing in terms of C2C (Anders, Farris & Hutchison, 2007).

According to Farris II and Hutchison (2002), C2C is highly relevant to two perspectives: accounting and supply chain management. They state this as follows:

“For accounting purposes, the metric can be used to help measure liquidity and organizational valuation. For supply chain management activities, it serves as a measurement bridging the processes into and out of the firm….The C2C metric is an important measurement as it bridges across inbound material activities with suppliers, through manufacturing operations, and the outbound logistics and sales activities with customers.”
It is the latter that will be focused on in this study, as it has remained relatively unexplored.

### 1.2 Problem Discussion

Various works in the field of corporate finance have dealt specifically with C2C; featuring its definition, calculation, significance, benchmarking and management. Some studies have linked the metric to profitability (See Skomorowsky, 1988; Deloof, 2003; Teruel & Solano, 2007). Most studies favor lowering C2C without much consideration to the supply chain. Yet, this may give rise to negative effects on the firm’s suppliers and customers. Take the case where the firm reduces its C2C by speeding up cash collection: Its customers will, as a direct consequence, have to pay faster. The customers’ C2C will, therefore, end up longer. If the firm extends the credit period on its payables, it will then be the suppliers’ C2C that will end up longer.

According to Jespersen and Larsen (2005), the characteristic of successful Supply Chain Management (SCM) co-operations is "fair sharing of advantages and risks". C2C reduction without due consideration to the supply chain seems to contradict with a collaborative effort; and C2C optimization is in need of a new lookout. Even though there are some studies that bring up cautions with respect to hasty C2C optimization, they are far from being explicit and maintain their problematic perception of the firm.

### 1.3 Purpose

This study aims to explore the ways to mitigate negative effects on the firm’s suppliers and customers resulting from a reduction in the firm’s C2C. This raises the following research question: when the firm sets out to lower its C2C, what should it do to mitigate possible negative effects on its suppliers and customers?

### 1.4 Significance of the study

A reduction in the firm’s C2C may lead to an increase in the C2C of its trading partners. This is what we refer to as a negative effect in this text. Our study will present suggestions on dealing with such negative effects.

### 1.5 Delimitation

Most firms in the service sector inherently engage in cash sales or collect their receivables shortly, and typically hold little inventory or no inventory at all.

For the sake of keeping inventory management part of the discussion, this study will be centered on the manufacturing sector. We will conduct a case study on a single firm. We will confine ourselves to studying the effects on the firm’s immediate suppliers and customers, rather than all trading partners in the supply chain. And the negative effects that are considered are based on the elements of the C2C metric.
1.6 Dispositions

In the introduction, background on the research topic is provided. The points that raise the research question are brought up. Then we define the purpose and significance of the study as well as its limitations.

In the literature review, we present relevant excerpts from existing studies. The concepts of working capital management and cash to cash cycle are introduced, with the latter being in a more detailed fashion. They are followed by discussions of supply chain management processes that have to do with C2C. All of these will serve to support our analysis.

In the next section we elaborate on the methodology that we follow. Research design, case study approach, method of data collection and measurement methods of qualitative research are provided in this section.

A case study that features a firm with excellent performance in terms of C2C constitutes our empirical study. This section starts with the company background, its working capital management and C2C performance. We then examine the company’s demand management, supply management and inventory management.

In the analysis part, we link the information we extract from the case study back to the relevant parts in our literature review. This is where our findings begin to take shape.

We present our findings in the conclusion part. To be precise, we propose C2C reduction scenarios, the corresponding effects on suppliers and customers and provide suggestions on how to mitigate the negative ones.

In the discussion part, final remarks are made and future research suggestions.
2. Literature review

This study revolves around C2C. Accordingly, our literature review will start with a discussion of working capital management. We will then present a detailed treatment of C2C, including its relationship with profitability. In the remainder of this section, we will talk about financial flows in the supply chain, supply chain relationships and the processes of demand management, supply management and inventory management.

2.1 Working Capital Management

The amount by which the firm’s current assets exceed its current liabilities constitutes its working capital, or net working capital, as it is sometimes referred to as.

\[
\text{Working Capital} = \text{Current Assets} - \text{Current Liabilities}
\]

Current assets include cash, accounts receivable, inventory, marketable securities and prepaid expenses; whereas current liabilities comprise short term debt, accounts payable, accrued liabilities and other debts. The current characterization of assets and liabilities implies that it is within a short duration (1 year, strictly speaking) that they can be converted to cash and they have to be covered, respectively. This definition will make it easier to understand the relevance of C2C to working capital management.

According to Gardner, the chief interpretation of working capital is that it determines a firm’s ability to meet its short-term obligations using current assets as opposed to borrowed capital (Gardner, 2004). Financial & Investment Dictionary states the function of working capital thus:

“Working capital finances the cash to cash cycle of a business.”

For the time being, cash to cash cycle can be thought of as the time during which income generated by operations is yet to be collected in cash. Obviously, deficiency in working capital is not desirable, as it implies that the firm will have recourse to outside capital. And too much of it is not good, either: excessive value tied up in current assets may mean that the firm is making sub-optimal use of its resources. So, a working capital of zero appears to be optimal, but it is the study of its composition along with its amount that will reveal whether working capital is at an optimal level, or not. This is where liquidity comes into the picture (Gardner, 2004). Liquidity of an asset is how quickly it can be converted to cash. The more quickly an asset can be converted to cash, the more liquid it is deemed. Cash, therefore, is the most liquid asset of all. Inventory and accounts receivable have varying degrees of liquidity depending on their turnover rate and age, respectively.

A firm may suffer from low liquidity even though it may have positive working capital and consequently may have a hard time covering its liabilities. Too liquid a current asset structure may signal danger as well, in that inventories may be too low to meet demand, causing service levels to suffer.
In evaluating working capital position of a firm, these two facets, namely liquidity and utilization, are of primary importance (Gardner, 2004).

There are a variety of working capital management performance metrics. Five of the most frequently employed ones are the following: the current ratio, the quick ratio, inventory turnover, accounts payable turnover and accounts receivable turnover. Each of these metrics reveals a different aspect about working capital position. The last three directly relate to C2C, as will be shown later.

On an interesting note, Investopedia refers to working capital management as a managerial accounting strategy.

2.2 Cash to Cash Cycle

2.2.1 C2C: Definition

Numerous definitions of cash to cash cycle (which is synonymous with cash conversion cycle) have been provided in earlier studies. Steward (1995) features the following:

“C2C is a composite metric describing the average days required to turn a dollar invested in raw material into a dollar collected from a customer.”

Moss and Stine (1993) define C2C as “days between accounts payable and accounts receivable”. Gallinger (1997) puts it somewhat differently: “The cash conversion cycle measures the number of days the firm’s operating cycle requires costly financing to support it” Operating cycle, Gallinger notes, can be thought of as the number of days of sales are invested in inventories and receivables. Although definitions vary, the concept is clear. To sum up, cash to cash cycle is a company-specific performance metric indicating the average length of the time frame between paying suppliers and getting paid by customers. What makes C2C particularly intuitive is that it is expressed in days.

2.2.2 C2C: Computation

C2C has three determinants: DOI, DRO and DPO, which respectively stand for days of inventory, days receivable outstanding and days payable outstanding.

\[ C2C = DOI + DRO - DPO \]

In what follows, details about each of these parameters will be provided.

Days of Inventory (DOI) = \( 365 / \text{Yearly Inventory Turnover} = \text{Average Inventory} / (\text{COGS}/365) \)

DOI is computed by dividing the number of days in a year by yearly inventory turnover. Days of inventory, therefore, is directly linked to inventory turnover, which is how many times a company turns over its inventory in a given time frame. Inventory turnover is computed by dividing the total cost of goods sold by the average inventory that the company keeps during the time frame in question. In other words, inventory turn-
over tells us how many times a company completes a full cycle of producing a product and selling it - and not necessarily getting paid in cash - during a given time frame. However, inventory turnover is a tricky metric as its numerator and its denominator may be correlated (Gardner, 2004). A company may seem to be doing well in terms of inventory turnover, that is, it may have a high inventory turnover, but it may concurrently be losing sales. Ruling out lost sales, though, it can safely be argued that the higher a company’s inventory turnover, the better it is.

To sum up, DOI is the length of the average time frame that elapses from the purchase of materials from suppliers to the sale of corresponding items to customers. As this metric is added up in the calculation of C2C, it may intuitively be said that the lower it is, the better it is for the firm. Trimming inventory will bring about a lower DOI; yet too low a DOI may mean that the firm is compromising its service levels.

Days Receivable Outstanding (DRO) = \( \frac{365}{\text{Yearly Accounts Receivable Turnover}} = \frac{\text{Average Accounts Receivable}}{\text{(Net Sales}/365)\} \)

DRO is computed by dividing the number of days in a year by yearly accounts receivable turnover. For that reason, DRO relates directly to accounts receivable turnover. Accounts receivable turnover is calculated through dividing net sales by average accounts receivable in a given time frame. It reveals how many times customers are invoiced and the payments received from them are recorded on the income statement during the time frame in question.

In simple terms, DRO is the average number of days that elapse from the issuance of a bill to a customer up to the collection of the corresponding cash from that customer.

Firms, naturally, would like to be paid on the spot for their products/services. And some do: retailers typically collect their payments quickly and hence have hardly any outstanding receivables. They are, thereby, at an advantage in terms of this metric. And some firms get paid before selling the relevant product or rendering the relevant service, which is by all means a desirable situation to be in. But this may not be feasible for every single firm and its feasibility hinges on industry characteristics (Farris II & Hutchison, 2003).

Days Payable Outstanding (DPO) = \( \frac{365}{\text{Yearly Accounts Payable Turnover}} = \frac{\text{Average Accounts Payable}}{\text{(COGS}/365)\} \)

DPO is computed by dividing the number of days in a year by yearly accounts payable turnover. Thus, it has a direct linkage to accounts payable turnover, which is calculated through dividing cost of goods sold by average accounts payable in a given time frame. It measures how many times a full cycle of being billed by suppliers and making the corresponding payments to those suppliers is completed in a given time frame. A low value may mean suppliers are being sweated, whereas a high value may signify that the firm is paying its suppliers too early, which suggests that the firm is suffering from power issues in its supply chain. It may be elusive to determine what makes an optimal value when it comes to accounts payable turnover, as payment ability is highly firm-
specific and payment speed, in some cases, is dependent on firm policy (Gardner, 2004).

DPO, in rather simple terms, is the average number of days that elapse from the purchase of materials up to making the relevant payment in cash. It is the only component that assumes a minus sign in the calculation of C2C metric. Thus, one can intuitively argue that the higher it is, the better it is for the firm. That is, for the purpose of C2C reduction, increasing DPO is a legitimate thing to do.

The three metrics that make up C2C metric are all expressed in days, which makes them more intuitive than their turnover counterparts. They can, for that reason, be said to make for an easier analysis. There are other methods that can be used to compute C2C; yet they might require more detailed data. For instance, average values in the formulae may be replaced by median values (Anders et al., 2007). Although this method may yield a more accurate picture, it is more convenient to adhere to the averages, since they only require commonplace financial statement data. An illustration of cash to cash cycle is presented below, with the one on the left having a positive value and the one on the right having a negative value.

![Cash-to-Cash Cycle Illustration](image.png)

Figure 2.2.1 J.C. Penny’s positive C2C vs. Dell’s negative C2C (Farris & Hutchison, 2002).

### 2.2.3 C2C: Interpretation

C2C may assume both positive and negative values, although the latter is less common. A positive value indicates the length of the time that cash remains tied up in inventory and receivables until receiving payment from customers (Churchill & Mullins, 2001). A negative number may arise from either of the following reasons or a combination thereof:

- The firm is quick to collect its payments (low DRO).
- The firm turns over its inventory frequently (low DOI).
- It takes long before the firm pays its suppliers (high DPO).
A low C2C suggests that the company is efficient in managing its cash flows, because it turns over its working capital more frequently (Anders et al., 2007). A low C2C may also be an indicator of lean capital operating, but that depends on whether it is attributable to lean practices (Bierley, 2008).

### 2.2.4 Relationship between C2C and Profitability

Apart from the obvious benefits, may C2C be working in an indirect fashion and affecting other aspects of a business than its ability to meet its short term obligations? In one of the early studies looking into the relationship between C2C and profitability, Skomorowsky (1988) suggests viewing cash as a driver of profits rather than a mere tool to meet short-term obligations. Skomorowsky (1988) goes on to argue that cash flows from previous transactions enable the company to move on to the next transaction that will generate further profits. That is, the lack of cash translates to squandered profitability.

Deloof (2003) reveals a negative correlation between C2C and gross operating income, thereby reaffirming the findings of Shin and Soenen (1998), who look into the case of a set of American firms. Garcia-Teruel and Martinez-Solano (2003), based on a large sample of Spanish SMEs, conclude a negative correlation between profitability and C2C, which they deem robust. Then they suggest that working capital management in general and C2C minimization in particular be viewed as sources of value creation. Farris, Hasty and Hutchison (2005) refute this link in the case of service and manufacturing firms; yet consider continuous C2C improvement essential to maintaining competitive advantage.

In one of the early quantitative studies, Jose, Lancaster and Stevens (1996) employ two different metrics, namely ROA and ROE, as measures of profitability. They conclude that there is a significant negative correlation between profitability and C2C, and that this relationship is independent of firm size and valid across natural resources, manufacturing, services, retail/wholesale and professional services industries.

Although there are exceptions, these studies seem to justify C2C reduction with their findings.

### 2.2.5 C2C: Optimization

Existing body of literature on working capital management generally recommends C2C reduction, which is plausible given that accounting perspectives prevail (Anders et al., 2007; Mullins & Churchill, 2004; Farris II & Hutchison, 2002).

The reasons behind this stance may be various: For instance, companies looking to grow are advised to revisit internal sources, in an effort to uncover avenues where they can free up cash to finance their growth and relieve themselves of the need for soliciting outside investors (Bhide, 2000). Self-financing requires a company to fasten its cash flows. Cash, after all, is the lifeblood of any business organization, certainly even more so in the case a growing company. The relationship of C2C with profitability, which we elaborated on in the previous section, constitutes another justification for reduction.
From the formula provided, it follows that there are three different ways to reduce C2C:

- Getting customers to pay faster, which translates to lower DRO.
- Improving inventory turnover, thereby decreasing DOI.
- Delaying payments, thereby increasing DPO.

Farris II and Hutchison (2002) elaborate on how to go about doing these:

- Reduce average accounts receivable by:
  - Following up quickly on delinquent accounts
  - Assessing interest on delinquent accounts
  - Requiring cash on delivery payments for future orders from delinquent customers
  - Allowing for automatic deposit of payments

- Shorten production cycle to reduce inventory days of supply by:
  - Reducing bad overage inventory, through adopting strategies such as just-in-time delivery, real time inventory tracking, Collaborative Planning Forecasting and Replenishment (CPFR)
  - Synchronizing supply/demand planning
  - Cross-docking of material at warehouse locations.

- Extend average accounts payable by:
  - Paying at the last possible minute or date
  - Making partial rather than full payments to vendors
  - Reducing frequency of payment
  - Utilizing interest-free credit cards.

Majority of these suggestions - with the exceptions being listed under “shorten production cycle to reduce inventory days of supply” - will increase the C2C of trading partners because they involve shortening customers’ credit period, delaying payments to suppliers, and possibly pushing inventory to upstream or downstream.

2.2.6 C2C: A Supply Chain Lens

Elements of C2C relate to suppliers and customers (DPO and DRO directly, whereas DOI in a roundabout fashion), which entails a closer look into the individual component rather than a binary evaluation of the overall value of the metric.
Although a low C2C may stem from good management principles, the question of whether it constitutes an end per se remains due to the possible side effects that it may bring about. It is the separate study of the three underlying components that will reveal the possible effects of C2C optimization. Gardner (2004) provides a breakdown of the metric, and talks about ways to optimize each component from a purely arithmetic perspective. Walker (2005) endorses C2C minimization on the basis of the velocity principle and goes on to suggest that steps making up the C2C are identified and dealt with individually. The same author subsequently lays out an extensive list of what can be done with the freed-up cash to justify that. The questions of what kind of implications this may have for supply chain partners, and probably more important, whether a collaborative effort may improve the C2C standing of all those involved, though, have remained unanswered.

C2C reduction, which in some cases results in negative values, dictates caution in that it may bear down on trading partners, whether it is by pressing customers to pay earlier than they can afford to, delaying payments to financially weak suppliers or trimming inventories typically at the expense of upstream actors. Concerning the last one, it is important to make sure that reductions in DOI are emergent from lean practices, rather than discount-driven sales, phantom sales or having upstream actors keep excess inventories and bear the burden of the waste in the chain.

According to Hutchison and Farris II (2003), firms should use C2C to examine overall financial flows in the supply chain, not to evaluate merely their own firm performance, because such individualistic attitudes may undermine the supply chain.

We have pointed out some pitfalls in using C2C. In the next section, we will introduce two alternative metrics, and provide comparisons with C2C.

### 2.2.7 C2C: Alternatives

Walker (2005) suggests the use of network C2C. This approach involves thinking of the network as a single body and computing C2C for it. Although this approach adopts a network perspective and it can be deemed original in that sense, it fails to preclude imbalances among the actors involved.
Operating cycle is another metric that may constitute a substitute for C2C, and it appears to be more innocuous than C2C in that it removes DPO from consideration, but for that very reason it fails to give an accurate picture of cash flows. C2C, in this sense, is more relevant than operating cycle (Gardner, 2004). Hence, for purposes of investigating cash flows, C2C can be deemed to be more fitting.

2.3 Financial Flows in the Supply Chain

In order to illustrate how relevant financial flows to the supply chain are, we shall start off with the supply chain definition by Mentzer (2000):

“Supply chain is a set of three or more companies directly linked by one or more of the upstream and downstream flows of product/services, finances, and information from a source to a customer.”

Coyle, Bardi and Langley (2003) provide the following definition, which is similar to that of Mentzer (2000):

“Supply chain is the physical, financial and information networks that involve the movement of materials, funds, and relate information through the full logistics process, from the acquisition of raw materials to the delivery of finished products to end user.”

Among the three flows featured in the definitions above, financial flows is arguably the one that has drawn the least attention. For instance, Jespersen and Skjøtt-Larsen, in a work that can be considered to be recent, rule out financial flows in their discussion of supply chains:

“The supply chain encompasses all organizations and activities associated with the flow and transformation of goods from the raw materials stage, through to the end user, as well as the associated information flows. Material and information flow both up and down the chain.” (Jespersen and Skjøtt-Larsen, 2005)

While much has been said on the importance of physical and informational flows in the supply chain, advice on streamlining financial flows seems to be relatively limited. Yet, the fact that 4 percent of cost of goods sold on the average is accounted for by financing - a figure that in some cases surpasses logistics and transportation costs - reveals the importance of financial flows in supply chains (Kerr, 2006). Another aspect that makes financial flows in supply chains worth looking into is that they have become the new avenue where opportunistic behavior set in, following the fairly old tradition of pushing inventory downstream and upstream. As Beth Enslow, senior vice president and supply chain practice leader at Aberdeen Group puts it:

“In a tiresome replay of the "pass the parcel" games once played with inventory, the cost of capital has become the new parcel.” (cited in Kerr, 2006)

Enslow also argues that like inventory, financing costs “are simply transferred, not removed from the supply chain” (cited in Kerr, 2006) and moves on to quote a practitioner: “Those buyers are not considering that if they actually helped the supplier reduce the cost of capital, they would have a healthy supplier for the long term”.


The fact that financing costs are merely passed on within the chain has the straightforward implication that the end customer will end up incurring these costs, which will have an adverse effect on the competitiveness of the entire chain. That can be said to be antagonistic to supply chain management, if we are to adopt the following definition:

“The management of upstream and downstream relationships with suppliers and customers to deliver superior customer value at less cost to the supply chain as a whole” (Christopher, 2005)

And, granted, some chain members, typically the ones who have less power as opposed to the other chain members, will bear more of the resultant burden, as the financing costs will converge in their operations. That can, by all means, be characterized as “inefficiency” in the supply chain. Given the increase in the length of supply chains, there can be said to be more room for such inefficiencies.

### 2.4 Credit Management

Credit and collections are widely considered problematic business issues (Harrison, 1993). Yet almost all businesses extend credit. Harrison, in her work devoted to credit and collection systems, suggests that extending credit be seen as an opportunity as well as a necessity (Harrison, 1993). In addition to these, credits may be seen as a manifestation of trust.

We have noted that extending credit is a necessity. In certain cases it may make sense to be liberal in terms of the period of these credits. These include cases where inventory levels are traditionally high, competition is fierce and profit margins are high enough to justify the long credit period (Harrison, 1993).

And firms’ involvement with credit is not confined to the cases where they are the creditor, there is the flip side of this scenario: firms make credit purchases themselves. When one thinks of the number of dyadic relationships in a supply chain, it is clear that there may exist many credit relationships. Streamlining these relationships has naturally received attention. Good credit management, Michael Hugos notes, can be likened to good inventory management; in cases where the firm extends credit, it helps tie up less cash in receivables, which is the analogue of inventory in credit management (Hugos, 2003).

In setting receivables and payables to rights, supply chain management principles may come in handy:

It is natural that credit terms vary across customers. As Mentzer (2004) puts it, “not all customer are created equal”. Those that bear importance to the firm ideally enjoy more favorable credit terms, which is reasonable considering the basic implication of the term “credit” – crediting the customer with the ability to pay. A firm that chronically has trouble covering its obligations would fail to be strategically important to its trading partners in the first place.
Mentzer, in the same work, suggests looking for synergies and engaging in collaborative relationships. He cites “sharing benefits”, “trust” and “helping each other” among others as enablers of collaboration whereas “limited view of the entire supply chain” and “doing things the old way” are two of the impediments to it (Mentzer, 2004). Mentzer exemplifies the “doing things the old way” by conventional accounting practices and suggests that accountants should determine the value of dealing with other firms and protect the company against a partner passing cost on to them. Similarly, understanding total system costs, Mentzer argues, is essential, and the lack thereof indicates a “limited view of the entire chain”, which, as noted earlier, acts an impediment to collaboration.

Finding a reasonable approach to making payments and receiving timely payments matters to the well-being of the firm (Harrison, 1993). And, in a Supply Chain Management (SCM) context, value creation for the end customer can take place at many points along the chain, and one way to achieve value creation is by making individual supply chain actors more cost-effective (Mentzer, 2004). SCM, with its guiding principles relating to relationships, holds promise with regard to the establishment of more reasonable credit and collection systems.

Getting back to “helping each other”, one of Mentzer’s enablers of collaboration, we will talk a bit about supply chain finance (SCF), an area of promise in streamlining financial flows in the supply chain. There are examples of large buyers helping their suppliers access cheap credit: Jenkins and Sutton (2007) bring up the case of Votorantim Celulose e Papel, a paper and pulp manufacturer in Brazil, working with ABN AMRO Real to fund small farmers growing eucalyptus, which goes into the making of pulp. A similar case presented in the same work is that of Cargill, who is helping barley growers via ICICI Bank. The barley produced by these farmers is processed into malt by Cargill, to be then shipped to SABMiller, a major brewer.

Kerr (2006) praises the emerging SCF solutions and argues that they help reduce cost of capital for individual actors, thereby increasing the competitiveness of the chain.

We will, in the rest of our literature review, talk about the processes of inventory management, demand management, supply management and lastly supply chain relationships. These will provide us with the framework to understand the implications of C2C reduction on the supply chain.

### 2.5 Inventory Management

We will insert a lengthy discussion of inventory management here, and it will provide the foundation for our analysis of days of inventory. We will start this section with a formal definition of inventory by APICS, The Association for Operations Management:

> “Those stocks or items used to support production (raw materials and work-in-process items), supporting activities (maintenance, repair, and operating supplies), and customer service (finished goods and spare parts).”
Investment Dictionary provides the following definition:

“The raw materials, work-in-process goods and completely finished goods that are considered to be the portion of a business's assets that are ready or will be ready for selling.”

One thing to note early on is that it is safe to treat inventory as synonymous with stock. Inventory has a number of attributes, which - when extensively laid out - may help us better comprehend what purpose it serves and why there is an entire field dedicated to the study of it. Howard and Lancioni (1978) list the following set of attributes that they think are essential to understanding inventory: type, function, demand, lead time, cost and item importance.

**Type:** There are, as is common knowledge, three types of inventory: raw materials, work-in-process, finished goods. Different inventory management approaches propose different treatments of each. Just-in-time inventory management, for instance, is particularly intended to reduce work-in-process inventory (Peterson, Pyke & Silver, 1998).

**Function:** Inventory, in taking the three forms noted above, serves as working stock, safety stock, anticipation stock and pipeline stock.

**Demand:** Demand, in this case, means the requirement for a particular item over a definite time frame (Howard, 1984). Howard (1984) brings up a misconception and suggests that demand be distinguished from sales and usage, which don't necessarily amount to it.

**Lead time:** Lead time is the length of the time that elapses from order placement on to delivery. Magnitude as well as variability of lead time are of importance as they relate to when to order and how much to hold in stock at any given time.

**Cost:** Quantitative studies of inventory take cost as their bases. Inventory poses three types of cost: ordering cost, carrying cost and stock-out cost.

- Ordering cost (analogous to set-up cost) results from issuing a purchase requisition, preparing the necessary paperwork to submit an order, processing of an order or from issuing a manufacturing requisition, carrying out the necessary planning and scheduling, setting up the machine and other one-off expenses in cases where the item is to be manufactured.
- Carrying cost (also referred to as *holding cost*) comes in the form of capital cost, storage expenses, insurance payments, taxes levied on inventories, costs associated with shrinkage. Carrying cost, on an important note, can be said to be the one that is the most relevant in a working capital management context.
- Stock-out cost encompasses all costs that are incurred when an item is out of stock.

**Item importance:** In this context, it is typically the financial value of the item that constitutes its importance. Although inventory classification approaches like *ABC classification*
cation have overgeneralizing aspects to them, they are deemed to hold good for the most part.

The theory of the firm, which is aimed at explaining the raison d'être of firms, may guide us in understanding the purpose of inventory management. Regardless of whether the firm is driven by profit maximization, sales maximization or some sort of satisfying, it seeks to keep inventories just high enough so as not to pass up sales and low enough not to incur unnecessary carrying costs. Inventory management can be said to boil down to managing this tradeoff, which concurrently serves the various purposes proposed in the theory of the firm.

2.5.1 Bullwhip Effect

“A phenomenon that is relevant in the current discussion is the bullwhip effect, which is also termed supply chain rollercoaster effect or supply chain nervousness” (Crum & Ireland, 2005). This phenomenon relates to the days of inventory metric that has been introduced earlier.

So, how does the bullwhip effect manifest itself? For reasons that will be laid out shortly, the variability in demand that upstream actors in the chain face is greater than that faced by those downstream. That is to say, the further away from the end-customer a supply chain actor is, the less accurate its demand information will be, if the bullwhip effect is at play. See the following illustration.

Hugos (2003) cites five reasons for this phenomenon:

- **Demand Forecasting**: Forecasting may yield an inaccurate picture if it is based on orders rather than end-user demand.

- **Order Batching**: Due to order batching, the amount of orders diverges from the actual demand, and this divergence grows further upstream in the chain.

- **Product Rationing**: Rationing is what firms resort to in the event of a shortage. In order to be able to lay hands on as much of the limited supply as possible, firms place orders
that are larger than usual, in view of the fact that the available supply will be allocated proportionally to the size of their orders. That creates a misrepresentation of the actual need.

- **Product Pricing**: Changes in price may lead customers to buy less or more than they normally would.

- **Performance Incentives**: In an effort to meet preset performance targets, managers may be urged to push the available supply to customers, while there is no actual demand for the relevant product.

Bullwhip effect, whether it be caused by any of the individual factors above or an interplay of them, has been empirically proven to be real (Peterson et al., 1998). Deviations from the actual demand basically result in either shortages or overages, none of which are favorable circumstances for the chain. Overage means higher days of inventory, which deteriorates the working capital position of the firm. And shortages lead to lost sales. In either case, the implications bear upon the rest of entire chain as well. However, this is not bound to be the case for all supply chains. Preclusive actions are available. And they basically involve information sharing. Crum and Ireland (2005) argue that this is why “supply chain collaboration makes plain old commonsense”

### 2.5.2 Just-in-Time Inventory Management

JIT *philosophy* emerged in Japan and spread to the rest of the world. It basically involves sourcing parts right before they are needed on the assembly line (Peterson et al., 1998). JIT inventory management brings about reductions in all three types of inventory, although it is particularly intended to reduce work-in-process inventory (Peterson et al., 1998).

JIT systems depend on high quality components and capable logistics systems to attain small lot sizes and short lead times (Coyle et al., 2003).

Atkinson (2005b) points out the pitfalls in implementing JIT inventory management. There are, for instance, risks associated with heavy reliance on particular suppliers. Should there happen to be an interruption in the supply of a certain item, production comes to a halt as the firm holds either minimal or no buffer stock.

### 2.6 Demand Management

Larry Lapide, Research Director at MIT’s Center for Transportation & Logistics, defines demand management as “*matching of supply and demand over time*” (Lapide, 2006).

The goals of demand management are to gather and analyze information about customers’ needs and problems, move the functions to the channel member performing effectively and share logistical information with supply chain members (Coyle et al., 2003).
Demand management involves long-term, medium-term, short-term and real-time planning processes (Lapide, 2006). These include updating the product, brand, marketing and sales plans (Crum, 2003).

According to the American Production and Inventory Control Society, the definition of demand forecast is “estimate of future demand” (Crum, 2003). Demand forecasting plays an important role in shaping demand plans and customer service activities such as establishing customer segments and matching service programs to those segments.

The traditional supply chains incur distortion in demand information because only the firm facing the end-customer enjoys visibility of demand while other supply chain members merely receive orders from their immediate customer (Jones & Towill, 1997).

PC industry used to constitute an example of this: There was chronical misalignment between demand and supply, that is, differences among actual end-user demand, production volumes and channel orders (Coyle et al., 2003). Right after a product was launched, demand for it would peak and production volumes wouldn’t suffice to meet the whole demand due to unstable production processes. Consequently, product shortages would come about. In the wake of this, distributors and resellers would start accumulating the product, in an effort to preclude stock-outs. And later on, when demand dropped, these actors would end up with excessive stocks.

Towill (1996) suggests that all members within the supply chain should seamlessly work together to minimize delay and distortion of demand information (cited in Jones & Towill, 1997). Likewise, Crum (2003) states that demand collaboration can preclude the bullwhip effect and views “substituting demand information for inventory” as essential.

Demand collaboration involves sharing demand information throughout the chain, so that each trading partner knows the rate of the actual demand, resulting in reduced uncertainty (Jones & Towill, 1997).

Gunasekaran and Ngai (2005) point out that build-to-order systems reduce inventory levels and production costs (cited in Gunasekaran & Ngai, 2008). They cite the PC industry as an example, where build-to-order systems allowed firms to be more responsive and cost-effective.

Price/quality ratio and customization can be seen as aspects of customer service (Coyle et al., 2003). Lead time is also one of the factors considered in developing customer service policy and performance measurement standards (Coyle et al., 2003).

### 2.7 Supply Management

This section will start with the definitions of the concepts of procurement and supply. Procurement is “the act of purchasing the goods and services” or it may be defined rather broadly as “the process of obtaining goods and services for the firm” (Coyle et al., 2003). Effective procurement can beget competitive advantage (Coyle et al., 2003). According to Harland, Lamming and Cousins (1999), the concept of supply are “the purchasing, use, and transformation of the resources to provide goods or service packages to satisfy end customers today and in the future”.

There is a trend to work with fewer suppliers by forging closer relationships with them and in some cases taking those relationships to alliance level (Harland et al., 1999; Coyle et al., 2003). Firms, in doing so, seek to ensure the proper quantity and quality of supply (Harland et al., 1999).

Manufacturing companies view sourcing decisions as strategically important. The traditional “make or buy?” analysis is resulting in more “buy” than before, which elevates the importance of sourcing (Harland et al., 1999).

Hong and Holweg (n.d.) provide the following description of global sourcing:

“Products are made with parts sourced from abroad as part of a global procurement strategy to satisfy local demand or foreign demand.”

Fawcett and Birou (1992) mention that global sourcing often involves transportation over large distances and in large batches whereas just-in-time systems dictate frequent deliveries of small shipments (cited in Hong & Holweg, n.d.). Vickery (1989) studies the practices of three US companies aimed at reconciling JIT requirements with those of global sourcing and proposes the key success factors for global JIT sourcing (cited in Hong & Holweg, n.d.):

- Improved logistical planning, production planning and scheduling by the buyer
- Establishment of effective buyer-seller communication links with consideration to time zone differences
- The development of long term buyer-seller relationships with consequent logistical advantages
- Expeditious clearance and movement through customs.

2.8 Supply Chain Relationships

In this section, we will present a model that describes supplier-buyer relationships in order to illustrate how firms in the supply chain interact with one another. Supplier-buyer relationships can be characterized by a continuum, the extremes of which are transactional and collaborative relationship (Whipple et al., 2009).

Transactional relationship is marked by low interdependence and antagonism between parties as well relative insignificance of the tasks and functions involved. Hoyt and Huq (2000) characterize transactional relationships by opportunistic behavior in the absence of preclusive governance mechanisms. There is no reason for a buyer to stay in the relationship if another supplier comes along with a better offering. If the governance mechanism in place dictates otherwise, then firms involved will end up less responsive, because there will typically be no compromises from either side, leading to mutual loss.

Arm's length contracting closely fits the transactional relationship paradigm, and it is marked by the repetition of the transaction. Interests of the parties involved are typically conflicting, though.
The other extreme of this continuum, i.e. collaborative relationship, is characterized by mutuality, lastingness and interdependence. There is, in addition to the economic element which is present in transactional relationships as well, a social element to collaborative relationships. In collaborative relationships, information sharing is typical, as is changing business practices for the sake of the relationship. These two are especially reminiscent of the *alliance* definition by Whipple and Frankel (2000):

“A long term relationship where participants cooperate and willingly modify their business practices to improve joint performance”

Wagner (1987) brings up the following outcomes of collaborative relationships:

- Seller enjoys orders of higher volumes.
- Seller develops a greater understanding of the buyer and is able to cater to its special needs in terms quality, cost etc.
- There are more exchanges in terms of sensitive information.
- There is recognition of dependence and consideration for mutual benefit. For example, if the buyer faces problems out of the seller’s mistake, the seller may take responsibility.

Although more and more relationships are evolving towards collaborative relationships - i.e. shifting away from the transactional paradigm - and it may thus be luring to think of collaborative relationships as superior, whether collaborative relationships lead to more favorable outcomes than those with a transactional nature is a research question per se and Whipple et al. (2009) seek to answer this particular question. Hoyt and Huq (2000) argue that long term relationships based on trust make for sustainable competitive advantage, by helping garner resources that give firms an edge. Many companies, though, choose to maintain antagonistic relationships with their supply chain partners and keep making use of bid-buy methods, for reasons that may be justified or not. Hoyt and Huq (2000) also bring up the essential role information plays in initiating collaboration and keeping it up. They state that traditional demarcations between firms are a hindrance to trust, and thereby a lasting relationship (Hoyt & Huq, 2000).
3. Methodology

In this section, the methodology to be used in the empirical study as well as its criticism will be provided.

3.1 Qualitative Research

Creswell (2003) has suggested that the choice of the methodology should be based on the nature of the research topic (cited in Quinton & Smallbone, 2006). Qualitative analysis can be considered an appropriate way for the purposes at hand. Qualitative analyses provide detail, process, richness and sensitivity to context. According to Tharenou, Donohue and Cooper (2007), qualitative analyses are appropriate if the aim is to build theoretical explanations.

3.2 Research Design

This research concerns two fields of study, namely working capital management and supply chain management. In the literature review, we presented a detailed treatment of the C2C metric under study and relevant supply chain management processes.

We will conduct a case study and explore how a firm with a negative C2C implements the processes of demand management, supply management and inventory management. We have selected a firm that is doing remarkably well in terms of C2C, and we will examine its practices which bring about a negative C2C position and how they bear on its trading partners. We will also talk about the rationale behind our selection.

Following the case study, we will provide a critique of the business practices of the firm in question based on the literature review and the empirical study. We will then present the results of our study.

3.3 Case study

A case study is an in-depth empirical investigation of a single instance to explain the processes of a phenomenon in context (Tharenou et al., 2007). Hartley (1994) has outlined the following eight steps involved in conducting a case study (cited in Tharenou et al., 2007):

1. Choose the case study organization

As part of the empirical study, Dell Inc. is selected as the case study organization to understand how C2C reduction can be achieved while maintaining close relationships with suppliers and customers.

We look into how Dell implements the processes of demand management, supplier management, and inventory management.

There are two reasons that led us to select Dell: Firstly, Dell has been able to reduce its C2C while maintaining close relationships with its suppliers and customers. Secondly, various sources of information such as books, interviews, articles, case studies, and cor-
porate documentation concerning the company are available. That is, there is no shortage of secondary data. AMR Research (2008) has released a ranking of its “Supply Chain Top 25” companies with respect to C2C (See Appendix1). Dell is one of the 4 companies that have a negative C2C and second to only Apple Computer among the “Supply Chain Top 25” companies.

2. **Gain and maintain access**

Surveys rely greatly on respondents and require large samples to generate reliable results. Interviewing, too, may not be the right way to go, since the research question has to do with corporate strategy. Firms might be reluctant to reveal their opinions on the issue. Therefore the authors will not employ primary data from survey and/or interview in this research.

According to Calantone and Vickery (2009), there are significant advantages of using archival and secondary data sources in supply chain management research. Secondary data sourced from archives are generally more objective than survey data since they are free from contamination by respondent perceptions and bias on the part of the researcher. We utilize secondary data which can be accessed via Jonkoping University’s Library.

3. **Choose an initial theoretical framework**

In the previous section, we conducted a literature review, which constitutes the framework of our study. We employed the following keywords: “cash to cash cycle”, “working capital management” and “supply chain management”. The authors have compared similar and contrasting points of view on each topic. The empirical study will be carried out based on the structure adopted in the literature review, which will facilitate figuring out what kind of information is needed.

4. **Collect systematic data**

The empirical study will be conducted following the structure provided in the literature review. We will access various databases via Jonkoping University Library, namely ABI/Inform for scientific journals, Business Source Premier for company information, Emerald Fulltext for scientific journals and ScienceDirect for scientific journals. In addition to these, we have found a student thesis which features a case study on Dell. We have sifted through the reference list of this thesis and located some sources that might be useful to us, including *Direct From Dell*, authored by Michael Dell. In addition, some non-academic articles and corporate documents available online provide us with in-depth information concerning Dell’s business practices. Dell has frequently been mentioned in studies featuring cash to cash cycle, build-to-order manufacturing and just-in-time inventory management, so we can extract quite a bit of information from those studies and insert them into relevant contexts.
We obtained up-to-date background information on the company, released in 2008 by Datamonitor, a business information and market analysis company. We accessed this source via Business Source Premier.

For the majority of the topics, we started our search in the library databases. However, some articles were outdated so we needed to double-check on them to determine if they were still relevant. And some studies were only available in abridged versions, whereas some lacked enough detail although they were seemingly relevant.

We conducted web searches and tracked down useful articles regarding Dell’s working capital management practices, some of which talk about C2C in particular. Both topics are mainly based on a few article written by Fisher (1998) and Byrnes (2003) and data are crosschecked with annual reports, other articles and the book by Michael Dell, Direct from Dell (We incidentally found out that Dell prefers the term “cash conversion cycle” to “cash to cash cycle”; however, to prevent confusion, we have adopted the term C2C throughout this text). C2C figures have been extracted from the company’s financial reports.

Based on direct experience and our studies in International Logistics and Supply Chain Management, we knew that Dell operates on a direct sales model, offers on-site service, and implements build-to-order manufacturing and JIT inventory management. These have served as keywords in our searches. Regarding demand management at Dell, we mainly relied on Dell (1993) at the beginning. Later, we figured that the information in this article is rather outdated and Dell might be implementing new strategies; therefore, we had recourse to the book, Direct from Dell (published in 1999), and more recent articles on ABI/Inform. Regarding supply management, we based our findings largely on Kraemer & Dedrick (2002) and Breen (2007). As for inventory management, we again made use of the articles that have just been mentioned, namely Breen (2007), Kraemer & Dedrick (2002) and Byrnes (2003).

We didn’t confine ourselves to these articles: We searched for more information on other databases and the web and found miscellaneous sources. The data sources consulted in the empirical study are dated from 1993 up to 2009. The book “Direct from Dell”, as it is the product of firsthand experience, is an especially reliable source, and it allowed us to double-check on information that we obtained from various studies.

Studies that feature direct quotes from Dell insiders have been particularly useful as they offer better insight into the company’s practices. And serendipity was at play at times: Searching for information on a particular topic, we ran into sources that proved valuable in other contexts.

5. Manage the data collection

In the empirical study, data, upon collection from various sources, will be inserted into one of the following contexts: working capital management, C2C, demand management, supply management and inventory management. Irrespective of the context, we will do crosschecking on the data. If we happen to find a contradiction, we will look for new data sources and decide on one that we deem reliable and up-to-date.
After gathering information regarding Dell Inc. in the empirical study, we will provide a critique of Dell’s business practices in connection with its C2C position. Our critique will be supported by the literature review we have made.

In the analysis part, we will clarify how the three constituents of C2C, i.e. DRO, DPO and DOI, relate to the processes of demand management, supply management, and inventory management respectively. We will conduct a case analysis to look into the direct and indirect effects on suppliers and customers.

Lastly, we will list C2C reduction scenarios and corresponding effects on the supply chain. Thereafter, we will lay out propositions to mitigate the negative effects and these will constitute the results of our study.

3.4 Measurement

Maximizing reliability and validity of the empirical research is the key to ensuring proper quality in the work (Tharenou et al., 2007).

3.4.1 Internal validity

In order to increase internal validity, we will try to gather data from various researchers and identify similarities and contrast in those data. The empirical study will be conducted based on the structure adopted in the literature review. And we will refer to the literature in the analysis part in order to analyze the data obtained.

3.4.2 External validity

External validity was originally seen as the generalizability of the research (Quinton & Smallbone, 2006). It is difficult to generalize by conducting a single case study. Due to the time constraint and limited access to information on corporate strategies, the authors can’t perform multiple case studies. In case studies, generalization has to do with extrapolation to theoretical propositions (Tharenou et al., 2007). Taking this into account, we will keep the range of our propositions as wide as possible.

3.4.3 Reliability

There are a number of ways to increase research reliability, such as using different data sources and different data collection tools (Quinton & Smallbone, 2006). We use information from various sources, which come in the form of articles, reports, statistics, interviews, etc. This serves to crosscheck information provided in different sources. The authors rely mostly on corporate documents, such as annual reports and form 10-k, as well as accounts of Dell’s top management.
4. Empirical Study

This chapter will start with company background. That will be followed by an examination of Dell’s working capital management practices and its C2C position. And we will look into how Dell implements demand management, supply management and inventory management processes.

4.1 Company Background

Dell is one of the world’s largest suppliers of PCs and PC related products. It designs, manufactures, markets, and services personal computers, servers, printers and other products. Michael Dell started the company in 1984 (it was at the time named Dell Computer Corporation) in order to sell personal computer systems directly to end-customers. Today, the company’s customer portfolio includes large corporations, governmental institutions, healthcare and education companies, small and medium-sized enterprises and individual customers (See Appendix2). Dell offers products in six categories: desktop computer systems, mobility products, software and peripherals, servers & networking products and storage products. Dell operates in the Americas, Europe, the Middle East and Africa, and Asia Pacific-Japan (DataMonitor, 2008).

4.2 Dell’s Working Capital Management

In 1986, Dell decided to focus on growth. But it was not long before it found out that the direct sale model limited its performance in a niche market (Fisher, 1998). With the limitations of its strategy (direct sales with build to order manufacturing), Dell decided to deliver some of its products through PC superstores and other retailers such as CompUSA, Wal-Mart and Best Buy (Fisher, 1998; Dell, 1999). In 1994, quality problems surfaced and it began to take more cash to sustain growth to remain a first-tier PC provider (Byrnes, 2003). Dell was suffering from a serious cash shortfall. In the fiscal year ending in January 1994, sales had surged to 2.8$ billion but the income statement was alarming: the company reported a net loss of $36 million (Dell annual report, 1995).

In order to remedy this situation, Dell decided to implement just-in-time inventory management and the results were extremely satisfactory: days of inventory dramatically dropped. Instead of tying cash up in inventory, Dell was able use the freed-up cash to fuel its growth (Byrnes, 2003). Dell subsequently achieved strong positive cash flow and subsequently strong profitability as indicated in its financial reports.

4.3 Dell’s C2C Performance

In 1993, Dell was undergoing rapid growth with high inventory levels while its working capital was going down (Barr, 1998). In the wake of a fast growth mode that led it to run out of cash, Dell suffered its first loss in 1994, as noted earlier. According to Thomas J. Meredith, Dell’s Chief Financial Officer, who joined the company in 1993, focusing only growth could destabilize profitability and liquidity (cited in Fisher, 1998).
Meredith therefore identified cash to cash cycle as a key performance metric to balance the objectives of growth, liquidity and profitability (Barr, 1998).

Meredith points out that Dell’s employees are committed to this metric. Employees from the lowest to the highest level must grasp the importance of the metric (Fisher, 1998).

In late 1994, Dell’s C2C stood at +41 days. As a result of improvements in inventory management, component cost and quality, Dell was profitable again in fiscal year 1995 and its C2C dropped to +35 days (Dell annual report, 1995).

Dell’s success actually stemmed from a simple idea, eliminating the middlemen. Thereby, it allows Dell eliminate the substantial resellers’ mark-up and avoid the costly inventories (Dell, 1999). Dell is able to deliver its products directly to end-customers for lower prices and provide high service and support (Dell, 1993). After the new performance metric, C2C, was adopted in 1994, Dell sharpened its direct-sales and build-to-order strategies (Barr, 1998). Dell continued to grow and it incorporated liquidity into its strategic concerns (Dell, 1999).

Fisher (1998) looks into Dell’s working capital management and identifies three reasons that Dell's direct model makes for C2C improvement:

- It keeps little or no finished-goods inventory as it sells directly to end-customers.
- It keeps very little semi-finished goods inventory as it purchases components on a just-in-time basis.
- Cash flow remains positive as customers often pay Dell before Dell pays its suppliers.

Figure 4.3 Dell’s C2C position between 1993 and 2008
Between 2002 and 2008, Dell’s C2C maintained an average of -40 days. Another aspect this figure reveals is that the reduction in C2C is largely attributable to the decrease in days of inventory, which is a direct outcome of Dell’s revamping of its inventory management process (Dell annual report, 1997).

The company generated $1.4 billion in cash from operations during the fiscal year 1997. Contrasted with that of 1996, which was merely $175 million, there can be said to be a remarkable improvement in this respect (Dell annual report, 1997).

Since 2006, Dell’s C2C has had an upward trend (from -44 days in 2006 to -42 days in 2007, -36 days in 2008, and -30 days in first quarter of 2009).

Overall, Dell was able to significantly shorten its C2C from +56 days in late 1993 (DOI=55, DRO=54, DPO=53 days) to -29 days in the second quarter of 2009 (DOI=7, DRO=38, DPO=74 days).

According to Marc Brien (2009), the recent position of Dell in terms of C2C suggests that the company may have problems about its financial strategy. He cites the following reasons for the upward trend in C2C:

- Less strict build to order model
- Suppliers’ taking over of more of the final assembly
- Handling of more sales service and production fulfillment functions by retailers and value added resellers (VARs).

That said, Dell has demonstrated the success of its direct business model, by its rise from a local PC assembler in the early 1980s to 33rd place on Fortune’s annual ranking of America’s largest corporations 500 list in 2009. Since the direct model eliminates the reseller’s markup, Dell is able to offer greater value to its customers (Dell, 1999). The model involves comprehensive customer relationship development, high level of service and support, build-to-order (as opposed to build to stock), maintaining low levels of inventory and short time-to-market (Dell annual report, 1996).

Dell exploits the direct model to improve service and support, thereby maintaining its competitive position (Dell, 1999). In order to illustrate how Dell has been able to achieve a negative C2C, we will provide insights into the company’s demand management, supply management and inventory management as these three processes directly relate to the components of C2C.

4.4 Demand Management

Dell’s product strategy is to interpret the customer’s needs and tailor its offering to those needs (Dell, 1993). Dell actually focuses more on process innovation than product innovation in order to be more efficient in manufacturing and distribution (Dell, 1999; Weisman, 2004; Agile Anywhere drives efficiency improvements across Dell’s supplier network, 2001). Francis (1997) says the following about Dell:

“For PC makers, build to order can mean delivering product the Dell Computer way”.

With the direct model, Dell is able to provide custom-tailored PCs to its customers (Dell, 1999). One may wonder how Dell can ensure such reasonable lead times as not to repel customers in this build-to-order setting. In order to be able to respond to demand quickly, Dell dictates its suppliers to deliver parts and components within short notice and performs the assembly at its premises. Dell makes use of advanced information systems as a key enabler to build these manufacturing and logistics capabilities (Kraemer & Dedrick, 2002).

Customer orders are dispatched to Dell assembly sites and delivery of parts and components takes place once in every two hours (Fields, 2004).

Dell has excelled in manufacturing and distribution and consequently has been able to generate high return on invested capital (ROIC) (Ghiassi & Spera, 2003 cited in Gunasekaran & Ngai, 2008). Dell focuses on reducing order cycle time and in turn expects shorter payment collection periods. Danny Caswell, manager of Dell’s Asset Management Department, notes that Dell uses custom payment collection software called Get Paid to streamline order processing and collection activities (Banham, 1997).

This tool lets Dell identify the causes of the problems arising in payment collection. Thanks to the build-to-order model, Dell is able to collect payments shortly from small customers as they pay via credit cards on the spot when they order (Serwer, 1998; Breen, 2007). This leads to low days of account receivable.

Dell pays much attention to both intracompany relationships and customer relationships to identify special needs and continuously improve its service and support (Dell, 1999).

Internal relationships

Michael Dell notes that he wants everyone in the company to commit to satisfying customers by cross-functional sharing of information, as in (Dell, 1993; Dell, 1999):

- Manufacturing, finance, service, products and sales departments are integrated into the feedback system to receive and share daily customer feedback to achieve timeliness and high quality (Dell, 1999; Dell annual report, 1998).

- Dell has a weekly customer advocate meeting in which customer responsiveness is evaluated. People from manufacturing, sales, finance, human resources, accounts receivable and product organization attend the meeting to discuss abandonment rates and lead times in order to determine to what extent Dell is able to satisfy its customers’ requirements.
Dell empowers its employees to take initiative for the sake of customer satisfaction. If the employees come up with a promising idea, it can be implemented if a consensus is reached among the parties involved (Dell, 1999).

And Byrnes (2003) points out some practices that relate to how Dell manages demand in his article titled “Dell Manages Profitability, Not Inventory”:

- In a monthly MSP/MPP (master sales plan / master production plan) meeting; product strategies, competitive factors and constraints are discussed by Dell's functional department leaders to refine the sales commission plan and the agreed production plan.

- Dell holds a weekly *lead-time meeting* to interpret demand trends and determine where overages or underages of supply are likely to develop.

- The order takers can view available components on their computers and suggest configurations to customers accordingly. By offering attractive prices, they induce customers to purchase substitute items, thereby precluding shortages and overages.

**Customer Relationship Management (CRM)**

Dell recognizes that, in the PC industry, where obsolescence rate is high, services can matter a lot to customers. For that reason, Dell is interested in the *total value* provided to its customers rather than mere low prices (Dell, 1993). *Total value*, in this context, comprehends the buying experience, product integrity, quality, service and support, availability and suitability of peripherals and accessories (Dell, 1993).

Relationships between Dell and its customers become more powerful in the wake of the sale (Dell annual report, 1996). On-site service constitutes one of Dell’s competitive edges. Dell segments its customers (See Appendix2) and develops marketing strategies based on specific needs as it believes that each customer group has unique computing needs (Dell, 1999; Dell annual report, 1998). For the sake of cost effectiveness in customer service, Dell uses mass-customization strategy to tailor its products and services (Dell, 1999).

Service support teams are assigned to take care of corporate customer accounts (Dell, 1993; Dell, 1999). The sales people are well-trained to work closely with technical experts to provide solutions for customers (Dell annual report, 1996). Moreover, Dell conducts online surveys and outbound call surveys (Dell, 1999). Dell’s customers occasionally receive calls from customer support desk and are asked if there is anything Dell needs to improve (Dell, 1993; Dell, 1999). These are aimed at tracking service quality in order to understand how well the company responds to customer’ needs (Dell, 1993; Dell, 1999).

Dell launched its website in 1994 and online sales followed in 1996 (Fields, 2004). When shopping online, customers are able to view multiple configurations and corresponding prices in real time. Thereby, they can put together a product that suits their budget and requirements (Dell, 1999). Custom websites, called Premier Pages, have been launched for large customers so that they can access information related to ap-
proved system configurations, contract pricing, specialized reports and technical data (Dell, 1999; Dell annual report, 1997). And small customers make use of the common online interface to customize their orders (Dell, 1999).

Clearly, strategies Dell has been implementing have made improvement in customer service and support possible, which in turn boosted customer satisfaction and loyalty (Dell, 1999).

4.5 Supply Management

Buying components from specialized suppliers affords Dell more flexibility in its operations than making in-house (Dell, 1999; Coyle et al., 2003). Dell only carries out final assembly at its premises and it relies on outside suppliers and contract manufacturers to supply the necessary parts and components (Dell, 1999; Kraemer & Dedrick, 2002).

Sourcing

Dell’s manufacturing facilities are serviced by a global supplier network (Dell, 1999). Dell has adopted information systems that coordinate production in its facilities (Kraemer & Dedrick, 2002).

For small components, Dell maintains a very large supplier base. On the other hand, it opts to work with fewer suppliers for components like processors, chipsets and memory (Dodge, 2005). For major components, Dell seeks suppliers with global capabilities and usually works with a limited number of suppliers (Dell, 1999; Kraemer & Dedrick, 2002).

Most sourcing is global and Dell sources major components for all locations from their headquarters. Worldwide procurement and product development based in Austin make most of the sourcing decisions. However, not all sourcing is global; consumables such as packaging boxes, shipping material and product manuals are sourced from local companies (Kraemer & Dedrick, 2002).

Dell’s supplier network may be roughly classified into two based on their proximity to the assembly sites: Some supplier plants are located far away from Dell assembly sites and some others are located in hubs that are close to the assembly premises, which are termed supplier logistics centers (SLC) (Fields, 2004). These suppliers, in addition to locating in supply hubs in proximity of Dell’s assembly plants, are required to maintain adequate levels of inventory to ensure the continuity of manufacturing (Kraemer & Dedrick, 2002; Fields, 2004). This is the foundation for just-in-time inventory management and build-to-order manufacturing and it also makes for communication (Dell, 1999; Coyle et al., 2003).

Implementing build-to-order depends on suppliers (Dell, 1999). Suppliers are encouraged to continually reduce price and they are, in turn, rewarded by larger orders and longer contracts (Kraemer & Dedrick, 2002).
Supplier Relationships

Thanks to working closely with few suppliers, Dell ensures flexibility in manufacturing, and it is able to respond quickly to the dynamic demand in the PC market (Dell, 1999; Byrnes, 2003) and introduce new products to the market on a timely basis (Dell, 1993; Dell, 1999). It is important for Dell that its partners are able to operate in accordance with its build-to-order production (Coyle et al., 2003).

Dell shares requirements with its suppliers as to design, quality, logistics, service, global requirements and lastly cost, which is one of the considerations but not the most important (Dell, 1999; Fields, 2004).

According to Kevin Kettler, Dell’s Chief Technology Officer, becoming Dell’s suppliers depends on product lifecycles; Dell picks the one who can adjust their technology according to the prevailing needs (cited in Dodge, 2005).

And in choosing its suppliers, Dell doesn’t just consider product features and performance. It also requires that suppliers be able to supply the necessary volumes and be open to interaction regarding customer related issues. One of the key attributes that Dell looks for in a supplier is flexibility (Dell, 1999).

Dell maintains continuous communication with its suppliers (Dell, 1999). A formal feedback session is held every quarter; the suppliers’ executive teams meet Dell’s procurement people at Dell headquarters in Round Rock, Texas (Breen, 2007). In these meetings, suppliers are told how they rank against their competitors and Dell rewards them with a percentage of the purchases in the upcoming quarter. One of the tools Dell uses to measure a supplier’s performance is the supplier report card which contains Dell’s standards as to quality and delivery (Dell, 1999).

In order to encourage competition among suppliers, their position in terms of cost, technology, supply predictability and service are rated and posted on a password-protected website (Breen, 2007). Marty Garvin, Dell’s Procurement Chief, puts Dell’s view of its suppliers thus:

“The ones that don’t get less and less and can’t balance over the long run, well, their business goes away, so suppliers have to continually redefine themselves in terms of their efficiency and reliability” (cited in Breen, 2007).

Jerry Gregoire, who served as Chief Information officer from 1995 up to 2000, has the following to say regarding Dell’s approach to its suppliers:

“If you aren't performing, Dell won't hesitate to take some of your business and give it to a competitor.” (cited in Breen, 2007).

Nigel Johnson, a supply chain management consultant at Eclipse Group, states that “as a market leader in every aspect of the PC supply chain, Dell has the bargaining power to structure these relationships in order to maintain build to order model” (cited in Fields, 2004).

Thanks to its high days payable outstanding, which is partly responsible for the negative C2C standing, Dell obtains free financing from its suppliers through accounts payable; and the company’s operations can, thus, be said to be financed in part by its suppliers (Brien, 2009; Breen, 2007).
Other PC manufacturers pay their suppliers approximately a month *before* getting paid by their customers (Breen, 2007) whereas Dell pays its suppliers nearly a month *after* it collects payments from its customers (Brien, 2009; Breen, 2007) (These are average figures). This manifests how Dell employs its market power to its advantage and derives financial benefits from it. Not all suppliers yield themselves to Dell, though: SMTC Corporation, for instance, opted to terminate its relationship with Dell (Fields, 2004).

**Information Sharing with Suppliers**

Dell shares information about inventory levels, component quality and purchasing decisions with its suppliers (Dell annual report, 2000).

Dell’s business model has been fostered by the advent of Internet (Coyle et al., 2003). For one, the company is able to post point of sale and demand forecast information online on a real time basis, and its suppliers are able access that information, thereby better managing their operations and reducing channel inventory (Strausl, 2001).

And via [*valuechain.dell.com*](http://valuechain.dell.com), Dell and its suppliers collaborate in the forecasting process through a secure extranet (Fields, 2004). They exchange precise and up-to-minute information regarding volume, quality and customer satisfaction issues (Sovereign Publications, 2008; Agile Anywhere drives efficiency improvements across Dell’s supplier network, 2001).

To improve interaction with suppliers around the world, Dell has adopted a software package called ‘Agile Anywhere’ developed by Agile Software Corporation, a provider of collaborative manufacturing commerce solutions. Agile Anywhere lets Dell ensure that all product content information is aggregated in a single global system. If there happens to be any changes in any of the products, relevant information is immediately disseminated across the supply chain through the internet (Agile Anywhere drives efficiency improvements across Dell’s supplier network, 2001).

According to Glenn Neland, Vice President of Worldwide Procurement at Dell, this technology supports the enormous volume of Dell’s transactions with its suppliers and it has improved communication between internal divisions and with the supplier network and increases supplier visibility (Agile Anywhere drives efficiency improvements across Dell’s supplier network, 2001). Concisely stated, it enables Dell to be more efficient in procurement.

Dell’s supply chain management database systems handle key business functions that support worldwide operations, including inventory management and distribution (Jaffe, Muirhead, Tey, & Avutu, 2007). In 2005, Dell started to replace its supply chain management database applications based on the UNIX OS with Oracle Real Application Clusters (RAC) 10g. The new application provides real-time information, thereby enabling Dell to handle increasing loads of information and keep its operations running smoothly (Jaffe et al., 2007).

---

2 Agile Anywhere is a complete suite of collaborative manufacturing solutions that enable manufacturers to build private product manufacturing collaboration exchanges, automating the distribution and synchronization of product content across the e-supply chain, with all information and services available through Agile e-Hubs (Agile Anywhere drives efficiency improvements across Dell’s supplier network, 2001).
4.6 Inventory Management

Dell’s direct business model exemplifies a pull system within the supply chain (Wyatt, 2001). Dell pulls parts from its suppliers just whenever they are needed for production (Dell, 1999; Gunasekaran & Ngai 2008). In other words, production starts after receiving customer order. In order to “invest in what their customers want, rather than trying to guess what they might want”, Dell virtually integrated its supply chain, thereby increasing visibility, strengthening relationships with its customers and suppliers and reducing inventory throughout the chain (Dell, 1999; Wyatt, 2001).

Flexible manufacturing techniques such as computer-controlled transfer line assembly systems have been developed to do make computers based on lean manufacturing principles (Gunasekaran & Ngai 2008).

According to Kevin Rollins, Dell’s CEO (2004-2007), the longer you keep inventory, the faster it deteriorates because computer components have short product lifecycles and high depreciation rates (Atkinson, 2005a; Breen, 2007). Wyatt (2001) states that lower inventory levels put Dell at an economic advantage because PC components lose about one percent of their value over a week (cited in Broyles, Beims, Franko & Bergman, 2005).

Dell reexamined the direct model in 1995 and found that inventory management could be leverage and it began to focus on increasing inventory velocity. To that end, the company adopted just-in-time inventory management and sought to change its product designs so that a wider range of products could be made with fewer parts (Dell, 1999).

In 1993, annual inventory turnover was 4.79, which means that parts sat around for around 11 weeks. By 2001, annual inventory turnover had risen to 63.50, which amounts to less than 1 week of days of inventory (Atkinson, 2005a).

Dell, by that means, saves on inventory carrying costs. Besides, Dell gains a time-to-market advantage, which matters a lot in a market where products have short life cycles. Wyatt (2001) states that Dell ultimately passes these benefits on to its customers; which, in turn, allow Dell to generate more revenues by locking its customers up (cited in Broyles et. al., 2005).

We shall present the case of Topfer Manufacturing Center (TMC) in North Austin to illustrate how Dell implements build-to-order. TMC dispatches information to its suppliers once it receives orders from the internet or over the phone. As noted earlier, Dell’s core suppliers are required to locate in supplier hubs close to Dell premises in Austin (Kraemer & Dedrick, 2002; Breen, 2007). These suppliers spend no more than 90 minutes to deliver the necessary parts to the assembly plant. There is a set of thin white lines on the floor of the TMC plant. These lines determine the owner of the shipments. That is, Dell doesn't take ownership until the forklift crosses the white line, where shipments are registered through barcode scanning (Breen, 2007).

Dell’s just-in-time inventory management also affects the company’s non-immediate suppliers. A case in point would be that of MMC Technology (Breen, 2007). MMC Technology is based in the United States and it supplies 65% of the disks for Maxtor's hard drives. It holds inventory amounting to 3 weeks of DOI. The first week typically
elapses in testing, the second in shipping from California to Maxtor's Singapore factory and the last week in buffer at the warehouse located beside Maxtor’s production site.

What basically happens here is that MMC carries inventory for Maxtor, Maxtor carries inventory for Dell, and Dell, thanks to its cushioned position, is able to implement just-in-time inventory management.

Dell has obviously benefited from JIT practices, but one might argue that it is shifting the inventory burden to its suppliers. Dell (1999) asserts that Dell doesn't focus only on increasing own inventory velocity but also helps its suppliers increase their velocity. Stephen Cook, director of Dell's Nashville manufacturing center, refutes pushing inventory to suppliers and states that they recognize the promise in reducing inventory throughout the chain because cost savings resultant from holding less inventory are ultimately passed on to the end customers (Breen, 2007).

Dell streamlines its distribution activities based on the well-known motto “Replace inventory with information”. Dell is capable of forecasting demand with 70 to 75 percent accuracy thanks to its huge databases containing customers’ purchasing patterns and budget cycles (Byrnes, 2003). Dell does not hold inventory against forecasted sales, yet tightly aligns inventory with sales (Byrnes, 2003).

According to data from UBS, one of the world’s leading financial firms, Dell holds 7 days worth of inventory, which is much lower than its competitors: Lenovo averages 15 days, while HP’s average is as high as 32 days (cited in Gamet, 2009). Dell is only second to Apple, who, by averaging 5 days worth of inventory, has achieved the highest inventory turnover rate in the PC industry.
5. Analysis

In this section, empirical analysis is represented. The authors will examine the business practices of Dell Inc. and how they relate to the company’s C2C standing.

Working capital is, in simple terms, what the firm uses to cover its short term obligations. In the literature review, we made it clear how subtle it is to figure out the optimal level and composition of working capital.

To gauge working capital position, the firm may employ the current ratio, the quick ratio, inventory turnover, accounts payable turnover and accounts receivable turnover (Gardner, 2004). But each of these metrics appears to be deficient in some way when one adopts a supply chain perspective. Current ratio only takes account of the amount of current assets as opposed to its current liabilities without any consideration to the firm’s trading partners. Quick ratio is almost the same as the current ratio, its sole difference is that it removes inventory from consideration. Inventory turnover, accounts receivable turnover and accounts payable turnover consider only one aspect. Therefore, it would be more reliable to evaluate the working capital position on the basis of a combination of these three metrics. C2C, which measures time frame of the firm’s operating cycle requires costly financing to support it, is such a metric (Gallinger, 1997).

C2C allows the firm to evaluate its working capital position by taking into account both the major current assets (Inventory and accounts receivable) and the major current liabilities (accounts payable).

From the formula adopted by Lancaster et al. (1998), MDM (2000), Schilling (1996), and Soenen (1993), “\( C2C = DOI + DRO – DPO \)”, it follows that C2C reduction can result from either a decrease in days of inventory (DOI), a decrease in days of accounts receivable (DRO) or an increase in days of accounts payable (DPO). That is, reducing C2C requires more frequent inventory turnover and accounts receivable turnover and less frequent accounts payable turnover.

In the event of C2C reduction, suppliers’ DRO or customers’ DPO will be directly affected if that change is emergent from increasing in DPO or decreasing in DRO of a firm, respectively.

Beth Enslow notes that financing costs are simply transferred to other actors within the chain (cited in Kerr, 2006). That is, when suppliers face long payment collection periods or when customers have to pay the firm faster than before, they probably need to look for other sources of capital, which means that they will incur financing costs. From a supply chain viewpoint, it is clear that C2C reduction resulting from a decrease in DRO or an increase in DPO has unfavorable implications for trading partners. Therefore, the firm is rather supposed to seek to decrease its DOI in order to reduce its C2C. That said, if the firm is able to shorten payment collection periods and/or delay its payments without causing trouble to its trading partners, it may consider doing so. We will now look into how the firm should deal with its trading partners and manage its inventory when it sets out to improve its C2C.
As Farris II and Hutchison (2002) put it: “C2C bridges across inbound material activities with suppliers, through manufacturing operations, and the outbound logistics and sales activities with customers”. Therefore DRO, DPO and DOI will be analyzed in association with demand management, supply management and inventory management respectively.

DRO in association with demand management

As noted earlier, a reduction in DRO of the firm gives rise to an increase in DPO of its customers. That is, the customers’ C2C ends up longer.

The main question we are seeking to answer here is what the firm can offer its customers in return for shortening credit periods. Recalling the purpose of demand management may be of help.

Coyle et al., (2003) lay out the goals of demand management; two of them is to gather and analyze information about customers’ needs and problems, and to develop products and services and execute the best logistics to deliver products to consumers. The goal of demand management is, in short, to understand customers’ needs and respond to those needs.

Dell, for example, integrates demand planning processes with its customers to shape and create customer demand in association with supply (Lapide, 2006). To that end, necessary IT systems should be put in place and demand information should be communicated across the chain. Effective forward and backward information flow allows chain actors to manufacture based on actual demand and thereby precluding the bullwhip effect. These practices, in addition to preventing misalignment of demand and supply, bring about customer satisfaction. Another way of improving customer satisfaction is adopting build-to-order manufacturing. It involves meeting customers’ special needs and dictates that the lead time be reduced through the standardization of components. Short and predictable lead times are essential to build-to-order systems. Moreover, cost savings can be realized by holding less finished goods inventory.

DPO in association with supply management

Increase in DPO of the firm will increase DRO of its suppliers. Suppliers naturally don’t want to extend credit periods, but it may be that the customer has enough buying power to force the supplier to do so. Buying power in the supply chain may result from, for example, global sourcing, which typically involves buying in large batches (Fawcett & Birou, 1992). Buying power allows the firm to negotiate better pricing and longer credit periods.

However, the firm should exercise caution with regard to drastic increases in its DPO. After all, if the firm helps its suppliers reduce their costs of capital, it will have healthy suppliers for the long term, which it can count on (Kerr, 2006).

Three lenses with which to analyze relationships are communication, trust and commitment (Whipple et al., 2009). Developing relationships with suppliers requires continuous communication, strong commitment and high level of trust. By working closely with key suppliers, the firm ensures the right quantity and quality of supplies at an optimum total cost (Harland et. al. 1999), while the suppliers derive benefits from accessing critical information, which makes for their responsiveness. Besides, suppliers re-
ceive more orders and other rewards owing to their commitment. Once the relationship takes on a collaborative nature, the firm and its supplier become more interdependent and strive for mutual benefit (Whipple et al., 2009).

**DOI in association with inventory management**

Reducing days of inventory is, at first glance, a perfectly legitimate way of reducing C2C. It does not seem to have much to do with trading partners’ C2C. But in fact there are cases need to be noted. Reducing inventory *may* involve pushing it to upstream actors due to ineffective information flow and to customers through discount-driven sales (Bierley, 2008). These lead to increases in trading partners’ DOI and thereby their C2C as well.

When the firm sets out to decrease its DOI, it should make sure that it is reducing its inventories as a result of effective information flow across the chain, not by pushing inventory to its suppliers and customers.

To reduce inventory, the firm needs to collaborate with its customers and suppliers in forecasting and replenishment. Those who have access to actual demand information should share it with upstream players.

Implementing JIT inventory management is one way to decrease DOI. But the downside to JIT systems is that they must rely greatly on suppliers (Atkinson, 2005b).

JIT coupled with global sourcing seems to be an oxymoron at first: JIT dictates frequent deliveries in small batches (Coyle et al., 2003), whereas in global sourcing, large batches are transported over long distances (Fawcett & Birou, 1992). To operate global JIT sourcing, the firm should improve logistical planning and strengthen relationships.

**Case analysis:**

One of the findings of our empirical study is that Dell has strong profitability as demonstrated by its return on total capital (ROTC), and it is highly efficient in managing its working capital, as proved by its negative C2C cycle. Existing studies, some of which have been brought to notice in our literature review, have revealed a negative correlation between C2C cycle and profitability. Dell, apparently, is reaping benefits from its C2C standing.

The negative value of Dell’s C2C cycle means that the company receives money from its customers before it pays its suppliers for parts and components. As a result, the company obtains interest-free financing to use in its operations, discretionary spending or investing. In other words, Dell can make use of its suppliers’ money to generate returns. As on its financial reports, Dell takes pleasure in this positive cash flow from operating activities and high liquidity, which has a major role in generating high profitability down the line.

In the empirical study, we have found that Dell has improved its C2C metric by chiefly by decreasing its days of inventory. As a result of Dell's practices, Dell’s suppliers and customers are probably ending up with longer C2C. The authors will analyze the direct and indirect impacts upon Dell’s suppliers and customers by considering these three situations.
Scenario 1: Dell extends days of accounts payable

Supplier side:
Dell acts as a focal firm who integrates the supply chain network. It does final assembly by sourcing parts and components from its global network. Thereby, it buys large amounts of some types of parts and components and distributes them to plants located in different regions.

Dell has information on actual demand because it delivers products directly to the end customers. Dell taps into its buying power to select suppliers who are willing to play by its rules. Dell is able to negotiate better terms of payment and ensure high quality. Dell’s suppliers, who typically have less power, have to accept payment terms set by Dell to continue doing business with the company.

Its suppliers allow Dell to extend its payment period, and Dell benefits from this. It is, in a way, a strategic way to reduce cost of capital; Dell can make use of suppliers’ money to generate profits. But the effect on its suppliers is that they may have to seek another source of capital to pay further upstream suppliers in time. Its suppliers are unlikely to be pleased to extend credit period for Dell because that bears down on their cash flow. Their C2C cycle ends up higher, which may cause profitability to deteriorate. Even though Dell’s suppliers suffer from longer payment collection, they gain benefits from being part of Dell’s direct model, which is delivering their component technologies to a large and growing market. In other word, they gain more volume of orders.

Customer side:
Dell’s customers may benefit from this scenario in a roundabout fashion. As a result of less cost of capital and more cash on hand, Dell may invest in something that benefits its customers, such as improving process efficiency, service and support, research and development. Ultimately, the benefits will be passed on to its customers. They will enjoy fair pricing, quick response to their requirements and service that meets their individual needs.

Scenario 2: Dell reduces days of accounts receivable

Customer side:
In our empirical study, we found that Dell’s small customers, which comprise small companies and private customers, pay Dell via credit card upon placing orders online or on the phone. Dell is thereby able to collect payment promptly from its customers. In the case of large customers, Dell resorts to a payment collection software to expedite payment from corporate customers. This technology lets Dell monitor inward financial flows and expedite them.

Dell’s competitors sell their products via distributors and resellers who basically want to extend days of accounts payable for the sake of better liquidity in their business. Unlike its competitors’, Dell’s customers are largely made up of end customers thanks to Dell’s direct model. Logically, the end users view responsiveness to their requirements much
more important than when Dell demands payment from them. Thus, on the part of Dell’s customers, it seems that short payment collection periods are acceptable.

From our perspective, the reason why Dell’s customers are fine with paying Dell within a short period derives from their experience with response to customers’ unique needs, short and reliable order cycle times and high level of customer service and support, and new technologies introduced to the market faster. Dell focuses on total value of the offering rather than mere low pricing. Dell views service as an edge. It provides on-site service to private customers and it supports corporate customers via its home page and direct phone line. Shorter payment collection periods are justified by these kinds of value added services. To sum up, its customers are willing to pay Dell faster and that is attributable to competitive prices, short lead times, high level of service and support.

Supplier side:
The sooner Dell collects payments from its customers, the easier it will be for it to maintain positive cash flow and liquidity. Its suppliers indirectly benefit from this situation as well, in that they are more likely to receive their payments in time.

Scenario 3: Dell reduces days of inventory

As mentioned earlier, Dell is the focal firm who integrates upstream and downstream players in the supply chain network by creating visibility of flow of goods and information. Dell has efficient manufacturing processes as it successfully shares information in the value chain by feeding its suppliers with actual demand information on a real time basis. Dell has adopted Just-In-Time inventory system which has implications for both the supplier and customer side of its supply chain.

Supplier side:
JIT can be seen as an ordeal for Dell’s suppliers because they have to provide the necessary components whenever Dell requires them in final assembly. Without collaboration from its suppliers, Dell wouldn’t have achieved this low inventory levels. As the focal firm in the chain, Dell has sufficient power to dictate its suppliers to deliver parts and component just in time. As Dell operates global JIT sourcing, it sources parts and components from various locations. Therefore, it should be difficult for Dell to ensure JIT delivery. Thus, Dell requires some of its suppliers to stock their inventory close to its assembly plants.

Consequently, Dell can significantly reduce days of holding raw material inventory. Besides, efficient manufacturing processes based on standardization of parts and components allow Dell to reduce work-in-process inventory. And thanks to build-to-order system, Dell can maintain minimal finished goods inventory.

Nevertheless, Dell has been trying hard to eliminate inventory from the supply chain, i.e. not to push inventory to its suppliers, by utilizing IT systems like Oracle Real Application Clusters (RAC) 10g, Get Paid software, and Agile Anywhere solutions. As Dell is in touch with the end customers, it continuously conveys the information it extracts from these direct relationships to its suppliers to keep them up-to-date on demand.
Customer side:
When Dell improves its inventory turnover, the resultant benefits bear on Dell’s customers as well. Since Dell’s inventory management is founded on JIT principles, Dell does not have its own warehouses; it only has supply storages to keep parts and components for a limited period. Besides, Dell has low finished goods inventories due to build-to-order practices. Thus it has been able to greatly cut inventory carrying costs. And lower costs translate to competitive pricing, which benefits the end customers.
6. Conclusion

We will now talk about C2C reduction scenarios that may bear down on the chain or afford mutual improvement opportunities. That will be followed by suggestions on how the firm can mitigate the adverse effects on its supply chain.

We have laid out three general scenarios:

1. When the firm increases its days of accounts payable, its suppliers suffer from late payment collection, while its customers may enjoy some indirect benefits if the firm opts to use the capital in a way that enhances the product or the customer service.
2. A reduction in the firm’s days of accounts receivable entails that its customers pay faster. The same phenomenon has favorable implications for the firm’s suppliers: the firm is more likely to pay them in time.
3. When the firm reduces its days of inventory, its suppliers may have to act as a cushion for the firm by keeping more inventory level. That deteriorates their days of inventory position. Its customers, on the other hand, may face lower or higher product price as a result of the firm’s inventory holding costs.

Negative effects on its suppliers and customers when the firm improves its C2C may come in the following forms: Suppliers have longer payment collection periods; customers have to pay faster and suppliers may have to hold more inventory level.

The situation that we would like to discuss here is that wherein a firm improves its C2C cycle, whether by extending days of accounts payables, reducing days of accounts receivable or reducing days of inventory. This may give rise to the following adverse impacts on suppliers and customers:

Impact 1: Days of accounts receivable of suppliers will be higher. Suppliers will be subject to lower liquidity because they will have to wait longer to collect payments from the firm. In other words, it takes more time to convert inventories into cash and supplier may require more working capital for its operations.

Impact 2: Days of accounts payable of customers will be shorter. Customers will have to pay the firm within a shorter period. Its access to interest-free capital, which could be used to generate further income, will be restricted.

Impact 3: Suppliers may have to keep more inventory as a cushion against variability. It is likely that setting out to reduce days of inventory can lead to pushing inventory to the suppliers and the suppliers’ suppliers.

Following the discussion of negative impacts resulting from C2C reduction, we will lay out six propositions to mitigate adverse effects on the chain:
Proposition 1: Reduce product price

When the firm wants to expedite payment collection, it may offer discounts for early payments. Customers will recognize that they will pay less for products that are of the same quality as the competitors’ offering, and they will naturally be willing to pay faster. However, this requires that the firm have the capability of reducing operation costs so that net profit is not affected significantly. This may be made possible by designing more efficient manufacturing processes, lowering transportation and inventory carrying costs.

Proposition 2: Reduce lead time

If the firm gets paid upon delivery, it may seek to reduce lead time to expedite payment collection. In the case of the firms who make to order, part of the lead time that is accounted for by manufacturing has to be improved, since tailoring the product to individual requirements typically takes a long time, unlike mass production. Standardization of parts and components can be a smart way to fasten the manufacturing process. Real time communication via intranet or internet across the chain also plays an important role in reducing lead time. The firm should adopt appropriate IT systems to speed up order processing, preparation and delivery.

Proposition 3: Improve customer service

The firm should improve customer service along with expediting payment collection. If the firm’s product has a similar function or quality to that of the competitors’ and the customers happen to be indifferent to price, they are likely to make purchasing decisions based on service. The firm should differentiate itself by continuously improving customer service and increasing value added. As a result, customers are supposed to be willing to pay faster for the sake of satisfactory service.

Proposition 4: Perform on time payment to suppliers

The firm should pay its suppliers on time and eliminate accruals and overdue transactions as soon as possible. This makes the suppliers feel more secure. The firm needs to understand that financial flows are typically “one directional - backward in the supply chain” (Coyle et al., 2003). That is, the firm’s suppliers rely on the firm to be able to pay their own suppliers.

Proposition 5: Reduce the total inventory in the chain

When the firm wants to reduce its days of inventory, it should take account of the implications on the chain and avoid pushing the inventory to upstream and/or downstream players. Shifting closer to a pull strategy may make for effective inventory management. And this takes effective backward and forward flow of information along the chain regarding demand or sales data. When firms learn to be more responsive to demand and produce as their products are demanded; inventories will, as a result, be reduced in the entirety of the chain.
Proposition 6: Collaborate for mutual benefit

In its dealings with the suppliers, the firm should show concern for mutual benefit. It should review financial status of its suppliers and identify those who are ready to bear longer payment collection periods and act accordingly. If the firm is the one facing the end-customer, it should create reliable demand forecasts. A collaborative effort with the preferred suppliers includes sharing sensitive information, setting common goals, shaping strategies and tactics to accommodate their requirements and avoiding conflicts (Coyle et al., 2003).
7. Discussion

In this last part of our thesis, we will make some final remarks. Thereafter, we will present future research suggestions.

Cash to cash cycle (C2C) is a metric that measures the efficiency of working capital management. A reduction in C2C can, in a general sense, be said to translate to better working capital position. A low value of C2C metric is therefore preferred, and there are studies that have proven that C2C is negatively correlated with profitability.

Reductions in cash to cash cycle may come from one or more of the following: shortening the time that cash is tied up in inventory and receivables and stretching payments. All of these result in more cash which can be used in discretionary spending or in order to finance growth.

The result of our study is divided into six propositions. In order to mitigate the negative effects on customers, the firm should offer discounts, seek to reduce lead time and improve customer service level. In order to mitigate the negative impacts upon suppliers, the firm should perform in time payment, replace inventory with information and collaborate with key suppliers for mutual benefit.

Coyle et al. (2003) point out the key factors that lead to successful supply chain management and our six propositions seem to be in line with them:

- **Inventory**: Inventory should be maintained at a level that ensures acceptable customer service. Visibility of inventory flow is a necessity.
- **Cost**: Costs should be viewed as landed cost. Firms should engage in cost reduction but shouldn’t be oblivious to the implications for suppliers and customers.
- **Information**: Sharing information on a real time basis reduces uncertainty and stock levels across the chain.
- **Customer service**: Value, be it in the form of price or related services, should be added for the end-customer.
- **Supply chain collaboration**: Collaboration in planning strategy and tactics among supply chain partners makes for mutual wins.

Therefore, whenever the firm wants to improve its C2C cycle, it should implement that with due consideration to its supply chain. The firm should keep key characteristics of successful supply chain management in mind when it follows our suggestions in order to mitigate negative effects on its suppliers and customers. In more concrete terms, the firm should increase inventory turnover without causing any stock-outs, expedite cash collection without pressing customers and extend credit period of its payables without damaging the firm’s reputation and squeezing suppliers.

**Future research questions**

In this study, the authors conducted a case study of a company from the PC industry. Multiple case studies can be conducted in order for the results of this research to be tested by *replication* in contexts where the results are comparable (McCutcheon &
Meredith, 1993 cited in Tharenou et al., 2007). For instance, other companies in PC market like Apple, HP, or Compaq may be applying different tactics and strategy from those of Dell to deal with such situations as the ones referred to above.

It may be asked whether those six propositions are applicable to other industries. So future studies may look into to what extent they hold good in other industries and provide additional ones. Future studies may also examine the relevant effects from a quantitative perspective and seek to answer what the total effect to the company’s bottom line will be after those six propositions are applied.
Reference List


Appendix 1
A Cash to Cash Lens on the Top 25

<table>
<thead>
<tr>
<th>2000 Rank</th>
<th>Company</th>
<th>AR Days</th>
<th>Inventory Days</th>
<th>AP Days</th>
<th>Cash-to-Cash Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Apple</td>
<td>61.3</td>
<td>8.0</td>
<td>114.4</td>
<td>-45.2</td>
</tr>
<tr>
<td>2</td>
<td>Nokia</td>
<td>80.1</td>
<td>51.1</td>
<td>76.5</td>
<td>34.7</td>
</tr>
<tr>
<td>3</td>
<td>Dell</td>
<td>46.0</td>
<td>6.7</td>
<td>84.8</td>
<td>-30.2</td>
</tr>
<tr>
<td>4</td>
<td>P&amp;G</td>
<td>51.6</td>
<td>67.8</td>
<td>56.8</td>
<td>42.7</td>
</tr>
<tr>
<td>5</td>
<td>IBM</td>
<td>106.4</td>
<td>17.0</td>
<td>51.5</td>
<td>71.9</td>
</tr>
<tr>
<td>6</td>
<td>Wal-Mart</td>
<td>3.5</td>
<td>44.8</td>
<td>38.7</td>
<td>9.6</td>
</tr>
<tr>
<td>7</td>
<td>Toyota</td>
<td>20.8</td>
<td>44.0</td>
<td>44.0</td>
<td>30.8</td>
</tr>
<tr>
<td>8</td>
<td>Cisco Systems</td>
<td>41.7</td>
<td>38.3</td>
<td>22.8</td>
<td>57.2</td>
</tr>
<tr>
<td>9</td>
<td>Samsung Electronic</td>
<td>10.3</td>
<td>26.0</td>
<td>15.1</td>
<td>21.2</td>
</tr>
<tr>
<td>10</td>
<td>Anheuser-Busch</td>
<td>17.0</td>
<td>94.4</td>
<td>46.3</td>
<td>51.8</td>
</tr>
<tr>
<td>11</td>
<td>Pepsi</td>
<td>40.6</td>
<td>46.3</td>
<td>51.8</td>
<td>35.1</td>
</tr>
<tr>
<td>12</td>
<td>Tesco</td>
<td>10.1</td>
<td>20.3</td>
<td>35.9</td>
<td>-5.4</td>
</tr>
<tr>
<td>13</td>
<td>Coca-Cola</td>
<td>42.0</td>
<td>77.9</td>
<td>46.4</td>
<td>71.4</td>
</tr>
<tr>
<td>14</td>
<td>Best Buy</td>
<td>5.6</td>
<td>54.1</td>
<td>52.9</td>
<td>6.8</td>
</tr>
<tr>
<td>15</td>
<td>Nike</td>
<td>35.0</td>
<td>84.5</td>
<td>41.4</td>
<td>90.6</td>
</tr>
<tr>
<td>16</td>
<td>Sony Ericsson</td>
<td>52.8</td>
<td>17.8</td>
<td>51.5</td>
<td>10.2</td>
</tr>
<tr>
<td>17</td>
<td>Walt Disney</td>
<td>47.4</td>
<td>8.1</td>
<td>30.8</td>
<td>4.7</td>
</tr>
<tr>
<td>18</td>
<td>Hewlett Packard</td>
<td>47.0</td>
<td>37.3</td>
<td>54.7</td>
<td>20.5</td>
</tr>
<tr>
<td>19</td>
<td>Johnson &amp; Johnson</td>
<td>56.4</td>
<td>105.1</td>
<td>142.1</td>
<td>19.4</td>
</tr>
<tr>
<td>20</td>
<td>Schlumberger</td>
<td>84.1</td>
<td>38.6</td>
<td>403.2</td>
<td>154</td>
</tr>
<tr>
<td>21</td>
<td>Texas Instruments</td>
<td>46.0</td>
<td>79.6</td>
<td>36.0</td>
<td>88.7</td>
</tr>
<tr>
<td>22</td>
<td>Lockheed Martin</td>
<td>42.9</td>
<td>16.7</td>
<td>21.0</td>
<td>30.0</td>
</tr>
<tr>
<td>23</td>
<td>Johnson Controls</td>
<td>60.6</td>
<td>24.3</td>
<td>66.3</td>
<td>27.6</td>
</tr>
<tr>
<td>24</td>
<td>Royal Ahold</td>
<td>12.2</td>
<td>22.1</td>
<td>39.2</td>
<td>-4.9</td>
</tr>
<tr>
<td>25</td>
<td>Publix</td>
<td>5.7</td>
<td>27.8</td>
<td>21.2</td>
<td>12.3</td>
</tr>
</tbody>
</table>

Median (without retail) 46.0 31.1 51.5 29.5

Data is sourced from company financial statements, supplemented by Google Finance and Hoover’s Calculations:
Accounts Receivable (AR) Days: (AR * 365) / Revenue
Inventory Days: (Inventory * 365) / Cost of Goods Sold
Accounts Payable (AP) Days: (AP * 365) / Cost of Goods Sold
Cash to Cash Days: AR Days + Inventory Days - AP Days

Source: AMR Research, 2001
Appendix 2

Dell’s Customer Segmentation
Appendix 3

Cash-to-Cash balance

Figure 1: Top 25—cash-to-cash balance

Source: AMR Research, 2008