

Benchmarking C2C Performance Approach for Supply Chains - A Colombian Case Study

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Abstract

The determination of the cash to cash cycle (C2C) for supply chains provides concrete and practical means to integrate financial flow into the scope of supply chain management. In this study we propose that segmenting benchmarked companies in accordance to its corresponding role in their supply chain enhances established methodology for conducting more accurate C2C Benchmarking. This paper contribution is two-fold, since demonstrates improved standards for supply chain benchmark practice and illustrates it on a Colombian office chair industry case study for a manufacturer and retailer dyad. The paper concludes that intrinsic differences between supply chain roles make direct comparison of little use.

Keywords

Supply chain management, Benchmarking, Cash to cash metric, Case study, C2C

1. Introduction

The concept of supply chain management (SCM) is diverse and has evolved from multidisciplinary origins, which reflects in the lack of robust conceptual frameworks for the development of supply chain management theory (Croom, Romano, & Giannakis, 2000). Supply chain management is been regarded as the integral administration of supply chain's material, information and financial flows. In his pioneering work, Forrester (1958) posits that "(...) industrial company success depends on the interactions between the flows of information, materials, money, manpower, and capital equipment." Mentzer et al. (2001) considers in their SCM model as supply chain flows: products, services, information, financial resources, demand and forecasts. Yet, the study of supply chain flows has historically focused on material and information flows (see reviews from Croom et al., 2000 and Mentzer et al., 2001; also, notice from definitions by: Kopczak, 1997; Lambert & James, 1993; Lee & Billington, 1992; Stevens, 1989; Tyndall, Gopal, Partsch, & Kamauff, 1998), oftentimes explicitly neglecting financial flow from SCM (Angerhofer & Angelides, 2000; Gunasekaran, Lai, & Edwin Cheng, 2008). The present work calls attention on the fact that overlooking financial flows from the scope of SCM not only deviates from the intended integral administration, but wastes interesting opportunities to relate operations domain decisions to improved supply chain financial results.

We propose that the assessment of the cash to cash cycle (Gitman, 1974) in supply chains provides concrete and practical means to integrate financial flow into the scope of SCM, in the lines of previous work by (Farris II & Hutchison, 2002). The cash to cash cycle (C2C), alternatively cash conversion cycle, is a measure of the average time elapsed since the company cash out money to buy raw materials until it returns from finished product sales. World-class companies such as Wal-Mart, Toyota, and Bose, had successfully conducted cash to cash studies identifying opportunities for improvement in their supply chains (Randall & Farris II, 2009a).

This paper introduces a benchmark study of C2C performance of a supply chain from the Colombian Metal Household Furniture Manufacturing industry, composed of a manufacturer and a distributor. The present study

differentiates from others (Farris II & Hutchison, 2003; Farris II, Hutchison, & Hasty, 2011; Hutchison & Farris II, 2003) Wang, 2002) in the recognition of the supply chain role (i.e., supplier, manufacturer, distributor, retailer) firms play as differentiating factor for further segmentation of benchmark company peers to be assessed. Our claim is that such additional segmentation within the industry sector refines diagnosis and enhances conclusions obtained by allowing fair comparisons among matching companies. The proposed methodology starts from a preliminary examination of the sector, which allows classifying companies to their role as component of supply chain networks. Then, it follows established supply chain benchmark methods (Hutchison, Farris II, & Anders, 2007; Randall & Farris II, 2009b) to evaluate C2C performance applied for supply chain segments.

The paper organization is as follows: the first section introduces the paper, followed by a literature review on C2C and its use on supply chain benchmarking. Next, the third section focuses on presenting the case study and results analysis, taking care in contrasting results from established and proposed C2C benchmarking approaches. The fourth section features a discussion on C2C components payback sensibility and practical implications on the case study companies. Finally, the conclusion section deals with closing remarks and future research.

2. Literature review

The cash to cash cycle metric involves three inputs, readily available from any company through its balance sheet and income statement, as follows:

$$\text{Days of inventory} = \frac{\text{Inventory (\$)}}{\text{Cost of good sold (\$)}} \quad (1)$$

$$\text{Days of receivables} = \frac{\text{Accounts receivable (\$)}}{\text{Net sales (\$)}} \quad (2)$$

$$\text{Days of payables} = \frac{\text{Accounts payable (\$)}}{\text{Cost of good sold (\$)}} \quad (3)$$

Thus, the cash to cash cycle is defined as:

$$\text{Cash to Cash cycle} = \text{Days of inventory} + \text{Days of receivables} - \text{Days of payables} \quad (4)$$

From the accounting perspective C2C index can be used to measure the liquidity of organizations, which allows assessing company's cash flow ability to meet its short term obligations (Gallinger, 1997; Lancaster & Stevens, 2011). It is worth noting that the approach to measure liquidity using C2C cycle is dynamic, so you can continuously capture organizations liquidity in time (Jose, Lancaster, & Stevens, 1996). To some authors this constitutes an advantage and a suitable measure of liquidity (Soenen, 1993; Emery, 1984), as opposed to the commonly used static approach of using liquidity ratios in business practice. From SCM standpoint, C2C serves as a measure of company processes input and output interrelation, since it dynamically portrays bridging (supply chain and firm) processes of sourcing from suppliers with operations manufacturing and logistics processes and sales activities with customers (Farris II & Hutchison, 2002).

In the literature, there are a number of studies attempting to establish the relationship between the Cash to Cash cycle and operational performance measures such as return on assets (ROA) and return on equity (ROE). Wang (2002) performed a study in various sectors of the Japan and Taiwan economy, which concluded that in the vast majority of cases there was a significant correlation between reduced C2C cycle and good standing profits in the companies under study. Garcia-Teruel and Martinez-Solano (2007) conducted a similar study in Spanish small and medium enterprise, finding as well a significant correlation between C2C and profits. There seems to be a consensus in the literature (see for instance Jose et al., 1996; Shin & Soenen, 1998; Wang, 2002; Deloof, 2003) in that reduced C2C relates with improved profits.

A number of authors had shown the use of C2C cycle with regards to SCM (Farris II & Hutchison, 2002; Randall & Farris II, 2009a) and supply chain benchmarking (Farris II et al., 2011; Hutchison & Farris II, 2003; Randall & Farris II, 2009b). Randall & Farris (2009) conducted a comparative evaluation of C2C on a group of companies from the same sector, concluding that such assessment allows for companies to establish where to focus on improvements with their supply chain trading partners and to identify C2C leverage points for enhanced operations performance.

3. Supply Chain C2C Benchmark: the Colombian Office Chair Industry Case

This paper presents a benchmark study on cash to cash performance of the Colombian Office Furniture (except Wood) Manufacturing sector (US SIC code 337214; Colombian CIIU 3612) and considers results for year 2011. The case study takes as reference firms a dyad of metallic chairs *manufacturer* and *retailer*. After a preliminary review of the industry sample, it was determined as representative firms a number of 47 companies. Such review served as well the purpose of identifying the supply chain role each of the sampled companies played in the industrial sector. The two supply chain roles of interest determined segmenting criteria for the original industry sample, resulting in two groups named after their supply chain role as *Manufacturers* and *Retailers*. The aggregation of both is termed *Industry*.

It is appropriate to distinguish firms according to their corresponding supply chain role for C2C comparative analysis, as such position features differential behavior in C2C variables that might obscure conclusions and mislead appropriate actions when aggregately considered as homogeneous part of the benchmark sample. Take for instance the case of manufacturers, in need to maintain raw materials, work in process and finished goods inventories in large amounts for economies of scale, while distributors and retailers might mainly carry finished product inventory. Since aggregate records from publicly available financial data do not distinguish supply chain roles, comparisons from undifferentiated samples might be imprecise.

For the sakes of contrast, this section initially introduces the C2C performance benchmarking results and analysis for the *Industry* group, followed by *Manufacturers* and *Retailers* groups. The following section will conclude by comparing results, findings and treatment for all groups.

3.1 Case study: *Industry*

The first group studied corresponds to the whole industry sample. In all cases, the benchmarked sample will distinguish the median for all quartiles¹ and the overall sector, in order to reference the case study companies against its matching performance group. The results for the whole industry sample are shown in Table 1.

Table 1. *Industry* C2C performance (US SIC 337124) n=47 companies

	Payables	Receivables	Inventory	C2C
1st quartile median	44.0	44.2	50.2	40.2
2nd quartile median	45.7	69.8	59.8	73.9
<i>Industry</i> median	48.5	61.4	91.6	98.1
3rd quartile median	49.4	71.5	94.4	113.6
4th quartile median	44.1	64.9	166.2	173.7
Case study: <i>manufacturer</i>	37.5	49.1	17.2	28.8
Case study: <i>retailer</i>	57.7	81.6	8.2	32.1

Table 1 shows an *Industry* C2C median of 98.1 days, which sets for the overall industry a representative time of about 3 months between cash recovery from purchases investment to liquid income. Both *manufacturer* and *retailer* C2C is below the *Industry* median, ranking among the best companies on the first quartile. Further analysis of the companies in the top quartile indicates its C2C performance is close to 40 days, which signals for both case study companies superior performance even in the top quartile.

Drilling down to C2C components of each firm, the *manufacturer* C2C performance noticeably rests in reduced inventory days which are below most companies on any quartile. Payable days are as well below the median industry and all quartiles, which hurts *manufacturer* C2C and implies a faster payment to suppliers than companies from all performing quartiles. Days in accounts receivables comply with best companies' behavior.

¹ the quartiles of a ranked set of data values are the four (company) subsets whose boundaries are the three quartile points.

On the other hand, the *retailer* behaves better than *Industry*, its corresponding quartile and the *manufacturer*. Superior *retailer*'s C2C performance is based both on exceptional days of inventory and accounts payable, highlighting outstanding performance on inventory where less is better, as opposed to longer payables, where the *retailer* outperforms any other median quartile. By contrast, overall C2C performance is restrained by poor receivables execution, markedly worst than any quartile median.

3.2 Case study: *Retailers*

Taking aside manufacturers from the original sample, the second subsample under study considers 12 retailers operating in different country regions, broken down in similar fashion as in the previous subsection and assessed against its corresponding *retailer* case study company. Table 2 summarizes the retailers' C2C performance for the aggregate and fractioned subsample termed *Retailers*.

Table 2. *Retailers* C2C performance n=12 companies

	Payables	Receivables	Inventory	C2C
1st quartile median	50.5	23.3	13.6	32.1
2nd quartile median	19.7	2.5	58.5	55.1
<i>Retailers</i> median	33.6	42.6	60.0	66.9
3rd quartile median	48.5	57.3	57.5	71.0
4th quartile median	19.3	39.0	94.4	114.2
Case study: <i>retailer</i>	57.7	81.6	8.2	32.1

It follows that *Retailers* C2C median is 66.9 days, which departs in 31.2 days less from the industry central mark obtained from the aggregated sample shown in the previous subsection. C2C analysis allows to establish that the examined *retailer* case study falls again among the best of its class in the *Retailer* role segment, only now days of inventory and accounts payables are not prominently higher than top competitors of its kind; however, accounts receivable days remains as a significant leverage point, since about 40 days above the industry median of retailers, not to mention 58.3 days higher than its quartile median.

3.3 Case Study: *Manufacturer*

The third and final subsample considers 35 manufacturers, featuring the same treatment as in previous subsections and now taking into consideration the *manufacturer* case study company. Table 3 shows C2C results obtained from the *Manufacturers* subsample.

Table 3. *Manufacturers* C2C performance n=35 companies

	Payables	Receivables	Inventory	C2C
1st quartile median	54.4	49.1	53.0	47.3
2nd quartile median	64.5	71.6	88.4	94.7
<i>Manufacturers</i> median	49.9	68.5	94.2	101.2
3rd quartile median	49.4	53.4	110.7	135.9
4th quartile median	45.1	68.5	177.7	174.2
Case study: <i>manufacturer</i>	37.5	49.1	17.2	28.8

It can be seen a *Manufacturers* C2C median of 101.2 days. As in the previous, overall C2C benchmark analysis establishes that the *manufacturer* case study company is a top performer in its manufacturer segment and quartile. The company C2C behavior is explained mainly by exceptionally low days of inventory, noticing now that the *Manufacturers* inventory median departs in more than 10 days from the former *Industry* median mark on subsection 3.1. While receivables behaves in parity with its segment, payable days still exhibit a significant gap with reference to the overall manufacturer segment median, and ranking as well below its quartile mark.

4. Discussion

Figure 1 exhibits comparative results when differentiating benchmark company samples by their role in the supply chain. Bars show the C2C components for the top quartile of the overall industry and subsampled manufacturers and retailers, respectively from left to right. Dots inform about the central mark (median) of each overall segment, and lines expose the performance marks by the case study companies.

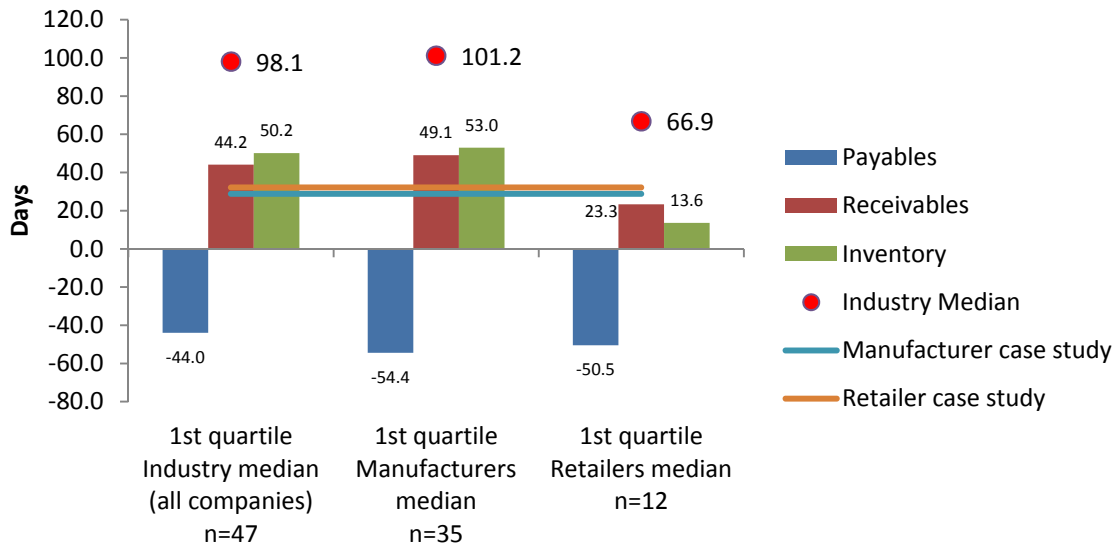


Figure 1. C2C differentiated by supply chain role

Note from figure 1 the graphical difference between results obtained by performing benchmarking study including all firms and when considering the supply chain role of sampled companies. Retailers (segment median 66.9) have an inherently lower C2C values than manufacturers (segment median 101.2), only noticeable when appropriately clustering companies within the sample. When benchmarking against best companies of each supply chain role, it now follows that retailers accounts receivable and inventories consistently marks in lower levels than manufacturers. The case for inventories has been previously discussed, so we will now extend on the sales nature of this industry retailers: they deal with consumers more prone to cash transactions than its upstream supply chain partners. Regarding accounts receivable, this results in average payment policies of around 30 days. Accounts payable performs similarly in both segments, close to 50 days.

As a complement and for sensibility means, Table 4 shows the impact on improving one day from its current marks, both for the retailer and the manufacturer, discriminated by C2C components. Figures shown are in US dollars computed from local currency amounts (in Colombian pesos).

Table 4. Improvement estimates from improving C2C variables by one day

	Retailers		Manufacturer	
	One-time Improvement (\$)	Annual savings (\$)	One-time Improvement (\$)	Annual savings (\$)
Inventory	801.68	144.30	4,914.49	1,228.62
Payables	801.68	160.34	4,914.49	737.17
Receivables	1,049.98	210.00	5,937.19	890.58
Notes: 18 percent ICC , 20 percent WACC (Retailer) 25 percent ICC, 15 percent WACC (Manufacturer) Exchange rate (12/31/2011): US\$ 1=COP 1935.18				

For the case of Retailers, it becomes evident a greater payback on improving accounts receivable. This aligns with the former finding about Retailers' receivables, ranking considerably above the industry median. It follows that an improvement effort in accounts receivable is in order. For illustration, if the retailer case company manages to set its

accounts receivable days close to the segment mark, all things being equal, will achieve US\$ 8,190 in annual savings.

On the manufacturer side, the greater economic impact lies in inventory days. However, given the current superior performance achieved in this variable, makes it difficult to accomplish further advances. Hence, relevant courses of actions for the case study manufacturer rest on accounts payable. As an instance, if the company secures similar payables' performance to the median industry will attain annual savings in the order of US\$ 12,531. The combined effect of former treatments yields a supply chain potential annual savings in the amount of US\$ 20,721.

Conclusions and Future research

The application of C2C benchmarking techniques allows for improved cash flow performance of supply chains, as shown in this paper and in previous studies found in the literature. This paper contribution consists on proposing a more precise method for C2C benchmarking, which takes into consideration the role that observed companies play in their supply chains. By conducting a C2C benchmark study on the Colombian office chair industry sector, the authors were able to illustrate the significance of comparing companies with competitors of its own kind, who play the same role in the chain. Observed results from this practice leads to more accurate benchmarks assessment and appropriate identification of relevant courses of improvement.

By clustering studied companies in distributors and manufacturers segments, it becomes evident that the retailers segment has a much lower C2C median mark than manufacturers, in about 30 days; the differences surge from inherent differences in inventory and accounts receivable practices from both segments, i.e., best retailers naturally outperform best manufacturers in both inventory days (-40 days) and accounts receivable (-26 days). This fact simply means that there is an intrinsic difference between manufacturers and retailers (more generally, by their supply chain role with its own business practices and environment) that makes direct comparison of little use.

Finally, specific improvement points were determined for a supply dyad conformed by a retailer and manufacturer. Potential payback for both constituting companies and overall supply chain were estimated, by means of computing expected economic on C2C variations. The extent to which it is possible to achieve improved global results, as opposed to merely aggregate individual improvements, lies ahead as a future research path.

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