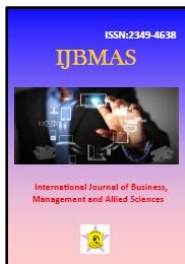

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**SUPPLY CHAIN PERFORMANCE AND ITS IMPACT UPON THE FINANCIAL
PERFORMANCE OF A FIRM**

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ABSTRACT

Supply chain performance is based on cash flows and asset utilization. This in turn has impact on the financial performance of the firm. This study is taken on basis of firms identified from S&P BSE-100 index in India. Data of past 2005-15 years of these firms is used to measure the supply chain ratio (SC ratio). It is found that the manufacturing sector has significantly higher investment in networking capital as compared to service sector firms. It is because of firms going for expansion either by sales or additional investments. Trade receivables formed the major component of additional net working capital resulting in lower free cash flows available to the firm. This resulted in the negative relation of SC ratio with Return on Equity (ROE) of firms for 2005-15 in manufacturing sector. However, the service sector has positive relation to SC ratio in both the 2005-10 and 2010-15 eras. That is the firms are less impacted by additional working capital, and have a focus on positive earnings only.

Keywords: Asset utilization, cash generation ratio, credit rating, financial performance, Return on Equity, Supply chain performance

Introduction

Advancement of technology in logistics sector has simplified the movement of physical goods across the globe. Developments of logistics sector and increased market demand have led to the integration of economies around the globe. The movement of physical goods across globe has exponentially increased. Availability of Cheap resources and human capital in developing nations has turned these locations favourable destination for manufacturing hubs and back office for service sector. All the major business conglomerates have increased their dependency on the suppliers from both the developed and developing nations[5] .

Supply chain integrates all the stakeholders from the supplier's supplier to the customer's customer. Value addition for a product happens at each entity across the supply chain. Inefficiency of any single entity will reflect in the final product either in terms of cost or quality.

In a typical transaction, the buyer waits for lapse of credit period for payment to the supplier towards the goods received. In an international transaction, it might run from 3 to 6 months from goods delivery to payment receipts. This forces the supplier firms to raise a large amount of funds to invest in the working capital.

There are various solutions provided by the different financial firms in order to fund the trade receivables. However, being supplier has lower credit rating than the buyer. So, the access to the capital comes at higher costs for the suppliers. This additional capital costs incorporates in the cost of the product. Whereas, in the case of supply chain finance, the funding to suppliers happens at the buyers credit rating. Hence, the financing costs of funds are lower in the case of Supply chain finance (SCF) funding[9]. The decrement in the financing costs results in the lower costs of supply chain and hence results in higher value addition to the supply chain[10].

In the case of equal availability of resources and human capital, there is intense competition in between the firms. Whereas, in production of a product, the competition is in between the supply chain versus supply chain[3]. Competition between the supply chains will lead to cost and time optimisation[1]. In this scenario, the Supply chain partners can no longer act as individual entities rather have to coordinate and cooperate with other partners in order to compete. The inefficiency of a single entity of supply chain will result in the loss of value and incompetent with respect to the competitors.

Literature review

The goal of supply chain management is not only to reduce the cost of the product but also to increase the customer satisfaction, retain customer loyalty and increase the profitability of all the firms across the supply chain[7]. Supply chain management impacts fixed asset utilization and working capital requirement. Effective SCM results in decreasing operational costs, increasing quality and customer service leading to higher revenues.

The 2007 crisis has resulted in the financial crunch in the global markets. As due to the global integration of economies, the crunch got reflected in the dependent firms. Financial crisis had significant impact upon the major firms who were suppliers to the large firms. The account receivables were the most impacted heading in this crisis [12].Qi Zhang & Xiaoxiao[17]study concludes that the more customisation needs to be made for financing models as per the requirements of the supply chain characteristics. Supply chain finance provides the solution to the working capital requirements by synchronising the forward flow of material and back ward flow of finance and information.

Optimization of working capital of one firm might not be best for the supply chain performance. A strong company can decrease the cash conversion cycle by extending the trade payable days to its supply chain members. These phenomena might not be healthy for the full supply chain performance. From a network perspective, Member with the low cost of capital needs to extend the cash cycle and the members with the higher cost of capital needs to shorten the cash cycle in order to minimize the supply chain costs. Hofmann & Kotzab [10] conclude that the long term stability is dependent on the entire supply chain profitability rather than individual member's costs optimization.

Supply Chain Finance as a solution

Hofmann[9] defines Supply chain finance as *"intersection of logistics, supply chain management, collaboration, and finance..."*. Dyckman[6] defines the Supply chain finance as *"finance structure by which a large, credit worthy buyer ... through a third party, offers an early payment discount that reduces the supplier's carrying cost ..."*

All the traditional processes of financing of supply chain activities were dependent upon the credit rating of the supplier. Whereas, in supply chain finance, credit rating of the buyer is taken into consideration by the third party financier[9]. The credit rating of buyer results in the low financing costs for the receivables of the suppliers. Supply chain finance helps the buyers to increase their trade

payable days and suppliers to decrease their trade receivables days[12],benefiting both parties in the transaction.

Supply chain finance processes the bills once the buyer provides the approval. The buyer is generally expected to have higher credibility rating than the supplier. Since, the bank or third party financier pays the payment to the supplier on basis of credibility of the buyer; resulting in finance costs to be at lower side[18]. Whereas, in the traditional financing of trade receivables, credibility of the supplier is considered and were charged higher interest rates. In addition, SCF is automated process; the cash flow takes place in parallel with the physical goods flow. This results in the decrement in the Days Sales Outstanding (DSO) for supplier case and hence results in lower cash conversion cycle leading to better working capital management.

Asset utilization is the turnover rates i.e. the sales to the assets rate. It measures the amount of assets required to support the sales level. Higher the turnover rate implies that the higher utilisation of the same assets present in order to meet the higher sales. The SCF enhances the cash conversion cycle and hence resulting in the lower requirement of working capital expenditure investments[18]. The decrement in the cash conversion cycle etc leads to lower working capital requirements. This decrement in the working capital requirement results will also result in higher assets turnover rate.

Infrastructure of Supply Chain Finance

Infrastructure related to the supply chain become vital component for effective management. Supply chain and the logistics are used as synonyms in academics and practice[16]. However, supply chain is not only logistics, it also consists of productions costs, transportation costs, inventory carrying costs, internal material handling costs and ware housing costs i.e. an integrated view has to be taken for a supply chain. Firms considered for best practices of supply chain were having inventory days as low as 50% of their competitors, similarly the order costs were also comparatively too low[16]. Logistics related infrastructure might not be in purview of single entity in a supply chain, but makes a significant impact upon the performance of total supply chain. These type of logistics infrastructure needs to be financed with the collaborative effort by all stake holders of supply chain.

Information forms one of basic fundamental block in the supply chain management. The information exchange needs to be at both the intra and inter firm of the supply chain. All the departments i.e. marketing, finance, operations needs to exchange information of the material supply across the organisation for the better coordination from procurement, payment and to downstream distribution[14]. The timely information flow between the different entities of supply chain improves the logistics efficiency and client satisfaction. In the case of efficient logistics, the inventory costs and accounts payables are managed well and hence results in lower additional new working capital investments. However, in inter and intra firm level information flow, trust plays a vital role[13]. Building of trust comes from the experience and long-time relations between the trading partners [5]. Pettersson & Segerstedt 16] has found a significant difference between the actual costs and standard allocated costs in the study. This misinformation might bring additional inefficiencies in the supply chain management.

Firms with the strong belief in supply chain strategy have invested in supply chain infrastructure. Information technology is considered as vital component of supply chain infrastructure. Hence, it has also attracted large investment from the supply chain operators.

Competitive advance of supply chain

Major segment of manufacturing managers of industrialized nations have found that the supply chain strategy to be important for competitive advantage [8]. Supply chain strategy has strong impact upon the corporate strategy by the most of the firms irrespective of the industry they belong [8]. Most of the firms have confirmed the importance of supply chain performance and its impact upon the competitive advantage in the present scenario. Improvement of customer satisfaction and lower costs does results in the competitive advantage of the supply chain.

Coralie, et al., [4] finds that the supply chain ratio has a strong correlation with the cash cycle, receivable days, payable days, inventory days and Return on capital employed. The supply chain management is not limited to the operational issues, but it has direct impact upon the financial implication [19]. This makes its importance in the strategic implications of the firm. Better the supply chain fit as per the product type, higher is the Return on assets of the firm.

Value creation of supply chain

Filbeck, et al., [7] have found that the news of implementation of supply chain has positive impact shareholders perception and hence an increment of the price is observed. Investors perceive the investments in supply chain management would lead to additional profits. The whole supply chain can have more value rather than the sum of the parts. i.e. the cooperation among the supply chain partners can result in the additional value created across the supply chain resulting in higher value for each partner of supply chain [3]. With the lower cost of capital and effective functioning, there is additional value to the products sold to the customer [15]. Through improved operation performance by optimising finance utilisation can create value and risk adjustment [4].

The supply chain finance results in the access to low cost of capital, better performance of supply chain. SCF increases the sustainability of the supply chain. The SC ratio also reflects the performance of Supply chain. Better the performance of supply chain would result in the higher financial performance of the firm.

Performance of supply chain

Supply chain has influence upon the profitability, liquidity and asset utilization in turn impacting financial performance [5]. The cash generation ratio is the free cash flow available for the firm to the sales. This reflects the liquidity of the firm. The asset turnover rates reflect the assets utilization of the firm. Johnson & Templar [11] refers to the concept of financial measures to evaluate, enhance the performance of supply chain. The operations of supply chain needs to be in aligned with financial measures, as the overall performance is measured in terms of monetary. Reducing the financing costs and the optimising the cash flows forms the core activity of the supply chain finance [2]. The product of the cash generation ratio and asset turnover rate is considered as the supply chain ratio (SC ratio) that measures both the liquidity and asset utilization of the supply chain. Supply chain ratio reflects the performance of the supply chain.

Balance score card (BSC), Strategic profit model (SPM) and Supply chain operation reference (SCOR) models consider the financial aspect of supply chain. Activity based costing (ABC) also looks at costing and margins. Wuttke et al. [20] concludes that the different models and their applicability according to the maturity of the SCM. The performance models like ABC, SCM/SCE are applicable for the Supply chains having maturity of Level 1 or level 2 (in the initial era). Whereas, for matured supply chains the performance models like SCORE/ Supply chain advisor level evaluation (SCALE) are more applicable for measurement of performance.

SME's does form the major suppliers to the large firm both in domestic and international. At the same time the large firms do exploit the suppliers in terms of payable days. This combination of non-access to banking sector and increase of trade receivables results in the non-sustenance of the SME's. In turn, the sustainability of the supply chain of the major products (Kerle, 2014).

Supply chain ratio (SC Ratio)

Supply chain ratio is developed in order to analyse the impact of supply chain performance upon the financial performance. The supply chain ratio is based upon the cash generation ratio and asset efficiency ratio [11]. The cash generation ratio measures the cash generated from the operations in process of meeting its sales. The asset efficiency ratio measures the utilization of assets for generating the sales. The product of cash generation ratio and asset efficiency ratio is undertaken as the supply chain ratio. Improvement in the cash generation ratio has a strong impact upon the returns of the firm. That is, higher cash generation ratio leads to higher free cash flows available to the firm holders and hence the higher value of firm. Whereas, the higher asset utilization leads to increment in

returns to firm holders. Higher Returns to firm will lead to greater returns for equity holders as due to leverage component.

$$\text{Supply Chain Ratio} = \frac{\text{PAT} + \text{Interest} + \text{Depreciation} - \Delta\text{NWC}}{\text{Sales}} * \frac{\text{Sales}}{\text{Total assets}} \quad \text{-----} \rightarrow (1)$$

PAT - profit after taxes

Interest - financial charges

Depreciation- wear and tear of the capital assets

NWC - Net working capital

Materials and Methods

Data of 100 stocks identified on the basis of S&P BSE-100 index of Indian stock markets are undertaken for the study. Firms with 10 years of history are considered for the analysis. Financial services firms were not part of the data analysis, as the cash generation ratio and asset utilization ratios are highly dependent on the cash flows. In the case financial services, both the assets and the cash flows are cash and may provide biased results. This list of firms is classified into manufacturing and service domains. Past 10 years annual data of these firms is collected from the public databases.

In the first step the Supply chain ratio is calculated for the measurement of supply chain effectiveness with help of equation 1 for all the manufacturing and service domain firms. Correlation analysis is undertaken in the initial phase to study relation between the SC ratio and Return on equity for both manufacturing and service firms for the both the 2005-10 and 2010-15 periods. In second phase, regression analysis is used to study the impact of the SC ratio on Return of equity of firm. Where, SC ratio represents the supply chain performance and the ROE represents the financial performance of the firm. The regression analysis is undertaken for both the service and manufacturing categories for time periods 2005-10 and 2010-15.

Return on equity (ROE) is calculated with help of profit after taxes upon book value of equity, Debt to equity ratio measured by the Book value of debt divided by book value of equity is undertaken as the control variable.

Results and discussion

Initial analysis is undertaken on BSE 100 stocks for 2005-2015 and was found to have negative relation of supply chain ratio with Return of equity (ROE). The correlation analysis was conducted on the "manufacturing" firms of BSE 100. It is found the firms had negative correlation between SC ratio and ROE. The coefficients were significant in the 2010-15 time period, Whereas, in the 2005-2010, the correlation was not negative and not significant. Table 1 provides the coefficient of correlation matrix.

Table 1: coefficient of correlation of SC ratio with Return on equity in manufacturing sector

	ROE	Time period
SC Ratio	-0.061	2005-15
SC Ratio	-0.589**	2010-15
SC Ratio	-0.062	2005-10

** - significant at .01 level

The correlation analysis was conducted on the service domain firms of BSE 100. It is found the firms had positive relation between SC ratio and ROE. The coefficients were significant across time periods. However, the coefficient of correlation is higher in the previous 2010-15 years as compared 2005-10 years. Table 2 provides the coefficients of correlation analysis.

Table 2: coefficient of correlation of SC ratio with Return on equity in service sector

	ROE	Time period
SC Ratio	0.667**	2005-15
SC Ratio	0.773**	2010-15
SC Ratio	0.535**	2005-10

** - significant at .01 level

In the next step, with help of debt to equity ratio as the control variable, regression analysis is undertaken to study the impact of SC ratio on ROE for both the manufacturing firms and service firms. Table 3 provides the summary of the results of regression analysis. It is found that the SC ratio has negative impact upon the ROE of manufacturing sector. However, the impact is larger coefficient in the 2010-15 era than the 2005-10. Similarly, in service sector, the SC ratio has positive impact upon the ROE of the firm. The impact is greater in the 2010-15 than the 2005-10 even for service sector.

Table 3: coefficient of SC ratio with Return on equity as dependent variable

		Dependent variable	R square	SC ratio coefficient	Time period
Manufacturing	Model 1	ROE	0.367	-0.583**	2010-15
	Model 2	ROE	0.03	-0.003**	2005-10
Service	Model 3	ROE	0.63	0.684**	2010-15
	Model 4	ROE	0.269	0.526**	2005-10

** - significant at .01 level

One of the factors for the negative impact of SC ratio in manufacturing is because of the increment in the working capital expenditure investment is greater than the operating profits. It means that the firms were having consistent growth in investment in short term assets, especially the trade receivables. This has led to lesser cashflows available to the firms. Whereas, in the case of service sector, the investments were lower in working capital in both the time era. The SC ratio has significant impact on the manufacturing in 2010-15 with stronger coefficients; this is due to consistent impact of the financial crisis on NWC expenditures. This has resulted in increased investments in the NWC expenditures and hence the lower cash generation capabilities in manufacturing sector.

In the service sector, firms were able to have positive impact upon the ROE from 2005 and have stronger impact in post 2010. This is due to either of two reasons: primary being the increment in the operational earnings, which did happen in the Indian scenario. In addition the decrement in net working capital expenditures resulted in the additional free cash flows.

The investments in net working capital for both the manufacturing and service sector were decreased in 2010-15 as compared to 2005-10. Additional investments in NWC in service sector have fell by 56% 2010 to 2015 as compared to 2005 to 2010, whereas the fall in the NWC of manufacturing sector was only 18%. This differential fall of additional investments of net working capital lead to favourable SC ratio of the service sector. Lead to the SC ratio to have positive impact upon ROE for service sector. The major additional investments were into the accounts receivables. Finally, the financial crisis also had a stronger impact on the manufacturing than service sector in resulting in negative cash flows for manufacturing domain.

Conclusion

The impact of supply chain performance on the financial performance of the firm is studied on the basis of service and manufacturing sectors of BSE-100 index. It is found that the SC ratio of the manufacturing companies has negative impact upon the ROE. The impact is stronger in 2010 to 2015, i.e. the impact of financial crisis has been stronger in the manufacturing sector. It is because of the additional investments for the last 10 years has resulted in the lower cash flows available to the firm. However, It is found that the ROE of manufacturing firms were higher in 2010 -15 in comparison to 2005-10. Increase in the short term investments in 2005-10 has lead to increased revenues and hence higher profit from operations and leading to higher ROE in 2010-15 era. Post crisis, the global markets had negative impact upon the trade receivables. The buyers have exploited the trade payables in order to optimise their Cash conversion cycle. However, this action of buyers has resulted in the lowering the efficiency of the manufacturing suppliers. This delayed trade receivables of suppliers had its impact upon the supply chain performance, as due additional costs incurred in terms of costs

of short term loans. These costs are either transmitted in terms of additional costs or lower quality of product by suppliers.

Supply chain ratio had positive impact upon the ROE for the service industry. This reflects their better capability of the generation of cash flows. The 2010-15 era was more favourable for the service industry as contribution of supply chain ratio has a stronger positive relation with ROE as compared to 2005-10 era. Even in the manufacturing industry, it is found that the investments in the new working capital have started to decrease in the recent 5 years. Hence the manufacturing industry is expected to have positive relation between the SC ratio and ROE in the near future.

Study finds huge potential of supply chain finance, which can decrease the Days sales outstanding (DSO) of suppliers and increase the Days Payable Outstanding (DPO) of buyers resulting in the benefit for all the stakeholders[2]. This also adds the addition value to enterprise. As decrement in cash conversion cycle results in lower investments in NWC for suppliers [15] leads to better SC ratio and in turn higher ROE.

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