A survey analysis of responsible SCM and its impact on overall performance of company

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ABSTRACT

The concept of paper begin with a review of the salient theory and available body of literature of SCM in terms of responsibility, manufacturing practices, competitive advantages, SCM practices and overall performance of company. As the study composed of surveys of 92 manufacturing companies nearby Bhopal and in-depth interviews is discussed and their findings shared. Various statistical tools are used for the analysis of collected data. Their reliability and content are checked using reliability analysis. The discussion of findings and their implications, and concluded with some suggestions for future research.

Introduction

The present paper aims to analyze the factors responsible and its effect on the various supply chain management (SCM) practices to the organization. It also aims at filling the gap in the literature on supply chain responsibility by empirically testing the effect of various practices between and within organizations, on the responsible supply chain. As it is of interest to study various factors on an outcome variable that is of practical importance to businesses, competitive advantage is the one that is of prime importance to survive and thrive in today's high paced business environment. The study will also assess the impact of responsible supply chain management on the outcome variable and competitive advantage of the firm. The purpose of this study is therefore to empirically test a framework identifying the relationships among SCM practices, manufacturing practices, supply chain responsiveness, and competitive advantage.

The potential benefits of Responsible SCM and the impact of SCM practices on overall manufacturing performances are analyzed. It is argue that for responsible supply chains to be successful, managers and scholars must not focus on one particular inhibitor or facilitator, but rather consider the manufacturing practices and competitive advantages in combination for the better performance of company. Doing so not only allows us to separate the trees from the forest but further allows firms to capitalize on the added benefits of SCM.

Supply Chain Management

The strategic supply chain continues to be adopted by organizations as the medium for creating and sustaining a competitive advantage (Ireland and Webb, 2007). Such a displacement is understandable considering the potential benefits of successful supply chain management (SCM). The term supply chain management has been defined by Mentzer et al. (2002) as, "the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole" and by Lambert et al. (2006) as, "the integration of key business processes from end-user through original suppliers, that provides products, services, and information that add value for customers and other stakeholders.

Sustainable supply chain management (SSCM): Review of the sustainability literature, SSCM has defined as the strategic, transparent integration and achievement of an organization's social, environmental, and economic goals in the systemic coordination of key inter organizational business processes for improving the long-term economic performance of the individual company and its supply chains. Of course, the social and environmental dimensions of SSCM must be undertaken with a clear and explicit recognition of the economic goals of the firm. Thus, like Carter and Jennings (2002), we are not suggesting that organizations blithely undertake social and environmental goals relating to the supply chain. In fact, in the same vein as Porter and Kramer (2002), the SSCM perspective advocates that such undertakings would be socially irresponsible unless considered within the broader context of a firm's overall strategic and financial objectives.

Responsible Supply Chain Management (RSCM)

Nowadays companies are in a continuous process of balancing their ethical and economic and legal responsibilities in their operations internally as well as externally. This process takes place at all levels: production, R&D, human resources, procurement. It not only touches internal processes and stakeholders, but also their external responsibilities towards communities, suppliers, consumers, governments etc. Additionally, companies cannot isolate their responsibilities within elie industry they are operating in, as the position competitors take and the broad public opinion regarding their industry are of equal importance. The potential success factors represent opportunities to successfully improve on specific

manufacturing and SCM practices issues. It should be realized that these opportunities should be viewed in the context presented in the case studies. Successful use of these success factors in other situations will require further research and adaption to the particular context. The same is true for the challenges identified such as the role of SCM practices on competitive advantages. Supply chain responsibility, also referred to as responsible sourcing, can be broadly defined as a voluntary commitment by companies to manage their relationships with suppliers in a responsible way. As a result of their purchasing activities without affecting their manufacturing practices, companies may have some opportunities to influence constructively their suppliers' social and environmental performance. This can be done using several incentives, including information and training, as well as audits of suppliers' practices. Whatever mechanism is used, the most effective way to achieve sustained improvement over time is through the development of a long-term collaborative relation between corporate buyers and their suppliers, through which suppliers can internalize change by participating in the shaping of social and environmental performance objectives, based on their own perception of their business capacity and needs.

Manufacturing practices improves a company's flexibility by effectively meeting the changing needs of the customer, with quick response and greater product variety (Sanchez, 1999). Traditional organizations have fairly stable boundaries; modular or flexible organizations can quickly be recast as needed as per the task thus increasing flexibility (Ketchen and Hult, 2002) and speed in responding to changes in business conditions. Thus to summarize need based manufacturing practices leads to overall supply chain responsibility. The improvement of flexibility and speed of response received has become increasingly important as a method to achieve competitive advantage (Martin and Grbac, 2003). Responsibility to customer is critical to gaining competitive advantage (Martin and Grbac, 2003). Ellinger (2000) argues that competitive advantage accrues to those firms who are responsive to the customer needs. Lummus et al. (2003) argue that in the future, as supply chains compete with other supply chains, organizations must understand that responsive supply chains will outperform those that are less responsive. Creating responsive supply chains has become a source of competitive advantage (Lau and Hurley, 2001).

Research Methodology

This present study builds and constructs responsible supply chain management based on prior literature in: manufacturing and competitive advantages. As in any empirical study, it will not be possible to test a relationship without valid and reliable measurement instruments for the constructs involved in the relationships. Therefore a contribution of the current research is the development of a valid and reliable questionnaire instrument for the responsible supply chain construct. The measurement instruments for the SCM practices (Li et al., 2006), manufacturing practices (Tu et al., 2004), and competitive advantage (Koufteros et al., 1997) in the manufacturing industries are adopted with modifications from earlier studies. The newly developed instruments are then tested empirically, using data collected from respondents to a survey questionnaire. Figure 1, exhibits the theoretical concept depicting the four important constructs discussed in literature review. The numbers next to each arrow correspond to the research objectives to be developed. The outlined model (Figure 1) establishes direct, positive relationships between

SCM practices of firm and supply chain responsibility; manufacturing practices and supply chain responsibility; and supply chain responsibility and competitive advantage of a firm that has been discussed in the very first chapter in length. From figure or developed model it is very clear that the responsible supply chain management is directly related with the all other factors either it be SCM Practices, Manufacturing practices or competitive advantages of the companies.
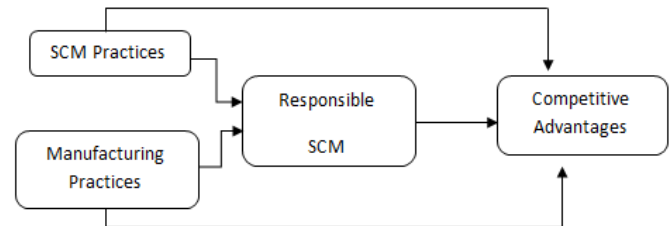

Figure 1. Relationship among Factors.

Questionnaire Design

The questionnaire was designed to quantitatively assess the comprehension, opinions, perceptions, expectations and reactions of supply chain personnel with regards to the manufacturing practices adopted by company.

The development of the questionnaire for the research enabled the research to answer research questions. For this outcome to be attained, a four steps process of developing a questionnaire is recommended and followed. A total 4 sections of questions on different criteria is developed. Section one include SCM practices and responsible supply chain, second section includes manufacturing practices, third section include competitive advantages while the last and fourth section collect basic information of the company along with the respondents profile. Other experts in the field of supply chain management were requested to be involved with the questionnaire design process so that their input can improve the quality of the questionnaire and uncover perspective not considered for the research.

Profile of the Respondents And Organizations

In the questionnaire section the last section has collected respondents and organizational details. It will discuss sample characteristics in terms of the respondents (job title, job function, and years worked at the organization) and the organizations (years of implementing SCM program, the primary production system, industry, employment size, and annual sales).

As per the consistency with the organizations 33% of the respondents indicate they have been with the organization over 10 years, 21% indicate having been at the organization between 6-10years, and 27% state their years stayed at the organization as between 2-5 years. Also the respondents with years stayed at the organization less than 2 years account for 19% of the sample.
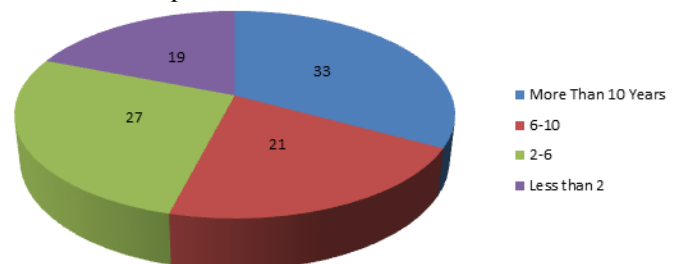

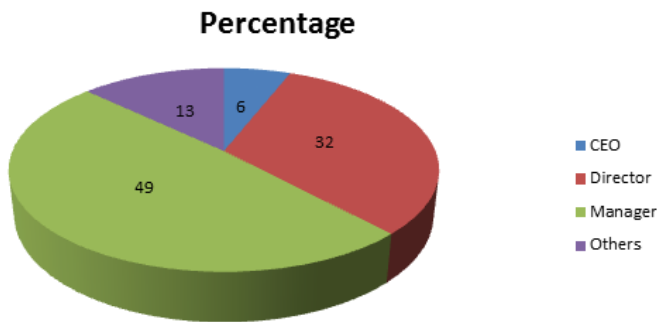**Figure 2. Respondents by Years of association with company.**

Percentage

Figure 3: Respondents by designation in the company

Data Analysis

Data analysis enabled the researcher to reduce raw data from complex to information and meaning. It is a body of methods that help to describe facts, detect patterns, develop explanations, and test the impact. After data is collected, the researcher must evaluate the data to determine if it meets expectations according to its characteristics and quality. The choice among possible analyses must be based partly on the nature of the data—for example, whether many observed values are small and a few are large and whether the data are complete. Reliability of the obtained data has been operationalized using the internal consistency method that is estimated using Cronbach's alpha (Cronbach, 1951). Typically, reliability coefficients of 0.70 or higher are considered adequate and permissible alpha values can be slightly lower (0.60) for newer scales. The constructs developed in this study are new even though they are strongly grounded in the literature. Therefore, an alpha value of 0.60 was considered as the cut-off value. As can be seen from Table 1, Cronbach's alpha values of the factors were well above the cut-off value and ranged from 0.65 to 0.95 with only one value below 0.70. These results suggest that the theoretical constructs exhibit good psychometric properties.

Table 1. Reliability analysis of Items

S.No.	Items	Cronbach's alpha
1	Responsible SCM	0.878
2	Manufacturing Practices	0.825
3	SCM Practices	0.818
4	Competitive advantages	0.80
5	Companies Performance	0.86

Correlation Analysis

In order of the measurement to be generalized, predictive validity or criterion related validity must be performed by comparing the second order factor criteria with one or more external variables (criterion) known or believed to measure the attribute. Criterion-related validity is characterized by prediction to an outside criterion and by checking a measuring instrument, either now or future, against some outcome or measure. In this study, the criterion used to test the predictive validity is dependent variable (also called as endogenous latent variable). To check for preliminary statistical validity (predictive validity) of the set objectives and knowing the impact and relationship presented in very first chapter, the Pearson correlation (i.e. does not specify causal relationships) was used. Each construct was represented by a composite score, computed by taking the average scores of all items in a specific construct (i.e. average of all the items for a sub-construct as the score for the sub-construct; further the average of all the sub-constructs that comprised the higher order

construct was calculated and this score was treated as the composite score for the higher order construct). The results are presented in Table 2. As evident from the table, all correlations are statistically significant at 0.01 levels. Thus all hypothesized relationships of interest are statistically supported by the Pearson correlation. Further relation testing using regression analysis is discussed in the following sections.

Table 2. Item Level Correlation Analysis

S. No.	Independent Variable	Dependent Variable	Pearson Correlation
1	SCM Practices (SCMP)	Responsible Supply Chain (RSCM)	0.437**
2	Manufacturing Practices (MP)	Responsible Supply Chain (RSCM)	0.450**
3	Responsible Supply Chain (RSCM)	Competitive Advantage (CA)	0.429**
4	Manufacturing Practices (MP)	Competitive Advantage (CA)	0.442**
5	SCM Practices (SCMP)	Competitive Advantage (CA)	0.357**

** Correlation is significant at 0.01 level

Dimension-Level Analysis for Responsible Supply Chain

Stepwise multiple regressions are often used in studies that are exploratory in nature (Aron and Aron, 1999). In our study we have a set of predictors (individual dimensions of MP; individual dimensions of SCMP) and want to explore as to which specific independent variables (IVs) make meaningful contributions to the overall prediction of RSCM. The ANOVAs results depict that manufacturing practices predict responsible supply chain to a large extent, whereas SCM practices predict responsible supply chain to a moderate extent.

A stepwise regression analysis is performed to determine what dimensions of MP (i.e. product modularity (PM), process modularity (PRM), and dynamic teaming (DT)) and SCMP (i.e. strategic supplier partnership (SSP), customer relationship (CR), and information sharing (IS)) are significant predictors of SCR (composite score). These regressions were carried out independently first for the MP dimensions on RSCM, followed by the SCMP dimensions on RSCM. The results are tabulated and discussed in the order of significance of predictors of RSCM (i.e. MP followed by SCMP), as evident from the results tabulated in previous sections.

Manufacturing Practices (dimension level) – Responsible Supply Chain (composite score)

The stepwise regression results shown in Table 3, indicate an overall model of two dimensions of MP (namely DT and PRM) that reasonably predict SCR, $R^2 = 0.249$, $R^2 \text{adj} = 0.244$, $F_{(2,291)} = 48.324$, $p < 0.001$. The model accounted for 24.4% ($R^2 \text{adj}$) of the variance in Responsible supply chain. A summary of regression coefficients is presented in Table 4, and indicates that only two dimensions of MP in the order of DT ($\beta = 0.317$) and PRM ($\beta = 0.250$), significantly predict RSCM (composite score). From these results it is clear that product modularity (PM) does not contribute significantly to the prediction of responsible supply chain. These are interesting findings and shall be more meaningful if analyzed on the individual dimensions of supply chain responsiveness.

Table 3. Dimension Level Stepwise Regression Result Model Summary for MP Dimensions on responsible supply chain.

Step	R	R^2	R^2_{adj}	ΔR^2	Fchg	p	df 1	df 2
DT	0.456 3	0.20 5	.202	.205	74	<0.00 1	1	29 2
PR M	0.498	0.24 9	0.24 4	0.04 4	17.13 2	<0.00 1	1	29 1

Table 4. Coefficients for MP Dimensions (DT and PRM) on RSCM

Step	B	β	T	p
DT	0.221	0.317	5.249	0.000
PRM	0.17	0.25	4.13	0.000

We now proceed to the stepwise regression of SCMP dimensions on the dependent variable responsible supply chain management, as it is evidently the second significant predictor of responsible supply chain.

SCM Practices (dimension level) – Responsible Supply Chain (composite score)

The stepwise regression results shown in Table 5, indicate an overall model of all the three dimensions of SCMP (in the order information sharing IS, selective supplier SSP and customer relationship CR) that reasonably predict RSCM, $R^2 = 0.194$, $R^2adj = 0.186$, $F (3,290) = 23.271$, $p < 0.001$. The model accounted for 18.6% (R^2adj) of the variance in RSCM. A summary of regression coefficients is presented in Table 6, and indicates the three dimensions of SCMP in the order IS (β = 0.223), SSP (β = 0.203), and CR (β = 0.128), that significantly predict RSCM (composite score).

Table 5. Dimension Level Stepwise Regression Results Model Summary for SCMP Dimensions on RSCM.

Ste p	R	R^2	R^2_{adj}	ΔR^2	Fchg	p	df 1	df2
IS	0.373	0.13 9	.136	.139	47	<0.00 1	1	29 2
SS	0.426	.185	.176	0.04 3	15	<0.00 1	1	91
CR	0.044 0	0.19 0	0.18 6	0.01 2	4.45 7	<0.05	1	90

Table 6. Coefficients for SCMP Dimensions (IS, SSP, and CR) on RSCM.

Step	B	β	T	p
IS	0.185	0.223	3.5	0.000
SS	0.17	0.203	3.365	0.001
CR	0.104	0.128	2.111	0.036

Following the above dimension-level analysis for MP and SCMP on summated RSCM score, it is further of interest as to what dimensions within MP and SCMP significantly predict the dimensions within RSCM. We therefore first carry out a dimension-level stepwise regression analysis of MP dimensions as Independent Variables (IVs) (PM, PRM, and DT) on each individual dimension of RSC as a Dependant variable DV (operations system responsiveness (OSR), logistics process responsiveness (LPR), and supplier network responsiveness (SNR)). This is followed by a stepwise regression analysis of SCMP dimensions (as IVs) on each individual dimension of RSCM (as a DV).

ANOVA'S Analysis for Organizational Performance

It has also been examined the ANOVA results (i.e. univariate tests of individual DVs). Univariate ANOVA results (Table 7) were interpreted using a more conservative alpha level (α = 0.05/5 = 0.01) to counteract the potential of an inflated Type I error rate which can be caused due to multiple ANOVAs.

ANOVA results indicate that the competitive advantage of a firm based on low market share (F(1, 292) = 9.637, p< 0.01, partial η 2 = 0.032), high growth (F(1, 292) = 16.085, p< 0.001, partial η 2 = 0.052), high return on investment (F(1, 292) = 16.568, p< 0.001, partial η 2 = 0.054), and low customer faith (F(1, 292) = 20.421, p< 0.001, partial η 2 = 0.065), significantly differs for high and low levels of operations system responsiveness.

Although significant group differences were found for these four DVs, the effect sizes are small, indicating that a small proportion of variance in the individual abilities of a firm to compete based on: market share, return on investment, growth in sales, competitive positions and customer faith, is accounted for by operations system responsibility. The ability of an organization to compete based on return on investment does not significantly differ for high and low levels of operations system responsiveness (F (1,292) = 0.095, p= 0.759, partial η 2 = 0.000).

Conclusions

Tables summarize the regression analyses results for – responsible supply chain and its dimensions - as the outcome variables. These results imply that organizations can achieve higher levels of responsible supply chain by having product, process and organizational modularity, as well as by implementing the said SCM practices.

The dimension-level stepwise regression analyses signify that with regards to the dimensions of the predominant practice that improves responsible supply chain on a composite level. Also with regards to the dimensions of SCM practices, information sharing is the predominant practice that improves responsible supply chain on a composite basis, followed by strategic supplier partnership and customer relationship practices. An explanation to this result could be that process modularity gives an organization greater flexibility in terms of sourcing various products that are needed for various sub processes from suppliers, rather than sourcing a whole product. This could improve the suppliers' responsibility to the focal firm. Thus it can be said with a fair degree of confidence that manufacturing practices are the predominant dimensions that are key to the improvement of responsible supply chain management as well as two of its dimensions – operations system responsiveness and supplier network responsiveness. The results of this study have several important implications for practitioners. First, as today's competition is moving from among organizations to between supply chains, more and more organizations are increasingly adopting SCM practices, in the hope for securing competitive advantage. During analysis of survey 49% of the respondents indicated that their firm has not embarked upon a program aimed specially at implementing supply chain management.

Table 7. ANOVA Summary Table for overall performance of company.

Dependent variable	Sum of Square	Df	Mean Square	F	Sig. (p)	Partial Value Squared
The growth of market share	7.812	1	7.812	9.637	0.002	0.032
Growth in return on investment	0.030	1	0.030	0.095	0.759	0.000
The growth of sales	7.434	1	7.434	16.085	0.000	0.052
Overall competitive position	11.314	1	11.314	16.56	0.000	0.054
Customer Faith	13.092	1	13.092	20.421	0.000	0.065

Of the remaining 51% of the respondents, over 55% indicated that their firm has embarked on a supply chain management program for just three years or less. The findings of this research assure the practitioners that SCM is an effective way of competing, and the implementation of SCM practices does have a strong impact on a responsible supply chain and competitive advantage of the firm.

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