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THE IMPACTS OF INFORMATION SHARING AND LOWER-TIER SUPPLIER SELECTION PROCESS ON THREE KEY ELEMENTS OF LOWER-TIER SUPPLIER VISIBILITY OBJECTIVES

ABSTRACT

The purpose of this research is to investigate the impacts of information sharing and lower-tier supplier selection processes on three key elements of lower-tier supplier visibility objectives. Data was collected from a survey of 74 companies and through interviews with 19 industry executives from 15 companies. The analyses of the data show that both the information sharing and lower-tier supplier selection process/approaches are correlated with three key elements of lower-tier supplier visibility objectives, namely: relationships with lower-tiers, lower-tier risks, and lower-tier performance. The analyses also show that most of the information sharing processes/activities and lower-tier supplier-selection approaches are considered to be important by company executives surveyed and interviewed.

Key Words: Supply chain risk, lower-tier supplier visibility, supplier relationship management

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INTRODUCTION

With more and more focus on lower-tier suppliers in the management of supply chains, there is now a great need for industries to adopt new methods/techniques for effectively managing their multi-tier suppliers in order to establish and maintain the visibility of their supply chains. Some leading companies like Apple, Dell, Motorola, Research in Motion, and Avon have extended their supply chain management practices and processes to include the management of their tier suppliers. They have developed some kind of electronic connectivity with suppliers, enabling them to collaborate on forecasts and demand, as well as increase visibility into supply commitments, inventory, shipments, delivery capabilities, and risks (Becks, 2010).

Supply Chain Digest (2012) reported that experts from both industry and academia agreed that a focus on supplier relationship management (SRM) with tier-1 suppliers only can cause issues while lower-tier visibility can reduce risks in multi-tier supplier chains. A survey reported from KPMG indicated that supply chain visibility is still very poor beyond tier-1. Specifically, 49% of manufacturing executives worldwide – and 54% in the U.S. – admit that their firms do not have visibility beyond tier-1 suppliers (KPMG, 2013).

A recent statement from Wal-Mart (2013) indicated that the firm does not permit unauthorized factories to produce merchandise for them. Furthermore, it was indicated that Wal-Mart has committed to increased transparency in its supply chain. This further stresses the importance of lower-tier supplier visibility. Wal-Mart has a mandatory requirement for all their first tier suppliers to report its lower-tier suppliers' (2^{nd}, 3^{rd}, …, n^{th} tier who produce the final products) information so as to improve its supply chain visibility and reduce the supply chain risks from lower-tier suppliers.

Research conducted by Olorunniwo, Jolayemi, Fan, and Li (2013) revealed six approaches that are used by companies to achieve that goal, namely: lower-tier supplier certification, dual function, strict contract with lower-tier supplier, multiple function oversight, empowerment with tightened control, and deep-down multi-tier probing and intra supplier collaboration. They also suggested that lower-tier visibility mechanisms should seek to achieve a few objectives such as continuity of supply, joint efforts on innovations, sound financial health of suppliers, collaboration with suppliers, measurable metrics for lower-tier suppliers, and self-service models that automate supplier selection and monitoring.

Another recent study by Fan, Olorunniwo, Jolayemi, and Li (2013) investigated industries' motivations for seeking lower-tier supplier visibility. They reported that minimizing supply chain risks and ensuring supply performance are primary motivations for companies to engender lower-tier supplier visibility. Although many benefits, including fast product launches, planning cycle reduction, supplier performance improvement, and supply chain risk mitigation, can be derived from multi-tier supplier visibility and collaboration across an entire supply chain, companies have their specific objectives on engendering lower-tier supplier visibility because of their unique competitive strategies, product characteristics, supply chain structure, and expectations. This paper aims to investigate the importance or correlation between information sharing and lower-tier supplier selection process on three key elements of lower-tier supplier visibility objectives. These objectives include the establishment of close relationships between lower-tier suppliers, the reduction of lower-tier supplier risks, and the improvement of lower-tier supplier performance. This study also investigates how important information sharing processes/activities and lower-tier supplier-selection approaches are for industry executives.

The rest of this paper is organized as follows. In the next two sections, we review the related literature and introduce our research hypotheses. Then we describe the research methodology and report the data analysis results. Finally, we conclude this study.

LITERATURE REVIEW

SRM with lower-tier supplier visibility is a new area which is becoming more and more critical to the success of a company's supply chain. SRM is an all-inclusive approach to manage relationships and interactions with the organizations who supply goods and services. Companies have gained a lot of advantages and enormous benefits from SRM. These include lower costs, higher quality, better forecasting, and win-win relationships with suppliers.

The supply chain and operations management literature is replete with research works on various aspects of SRM such as supplier selection, supplier stratification/segmentation, supplier performance/risk management, and information sharing. Some of these studies can be found in Howard (1998), Hirakubo and Kublin (1998), Dyer, Cho, and Chu (1998), Doran, Thomas, and Caldwell (2005), Shil (2010), Chikán and Gelei (2010), Avery (2007), Kulshrestha, Kulshrestha, Bhatnagar, and Katiyar

(2007), Day, Magnan, Webb, and Hughes (2008), Day, Magnan, and Moelle (2010), Genna (1997), Gordon (2008), Kearney (2004), Kraljic (1983), Pickett (2006), Wong (2000), Olorunniwo and Li (2010), and Li, Olorunniwo, Jolayemi, and Fan (2014). However, most of these works are limited to the first-tier suppliers. Only a few scholars recognize the importance of lower-tier visibility over the entire supply chain.

Christopher and Lee (2004) pointed out that "end-to-end" visibility is one of the key things to mitigate supply chain risks. Briscoe, Lee, and S.E. Fawcett (2004) indicated that quality could be improved if the original equipment manufacturers (OEMs) would know about the capabilities of their lower-tiers. More studies (Hannon, 2006; US GAO, 2006; Park, 2007) emphasized the importance of lower-tier visibility in different industries and various business environments. Hannon (2006), reporting a survey in Purchasing.com, indicated that the majority of buyers (78% of respondents) did not have a risk-management strategy in place for suppliers beyond the first-tier. Only 12% indicated they had risk management strategies in place for downstream suppliers. Several respondents provided examples of times when lack of downstream supplier visibility can impact OEM's production.

Tse and Tan (2011) pointed out that a series of product harm scandals, ranging from toxic toys to peanut butter indicate that firms and consumers alike are vulnerable to quality risks in global supply chains. Tse and Tan (2011) believe that better visibility for lower-tier suppliers can improve supply quality. Furthermore, they proposed a product quality risk and visibility assessment framework, which enables firms to have a better "visibility" of quality risks in a multi-tier supply network system, allows firms to establish risk indices for product components, and provides a traceable justification path for supplier selection.

Our research is related to two most recent studies by Olorunniwo *et al.* (2013) and Fan *et al.* (2013). Their research works are also on lower-tier supply management industry practices. Their research revealed some interesting results on lower-tier supplier visibility. Olorunniwo *et al.* (2013) reported six approaches that are used by some leading industry companies and suggested that lower-tier visibility mechanisms should be linked with specific objectives. Fan *et al.* (2013) investigated the motivations of companies for seeking lower-tier supplier visibility and indicated that minimizing supply chain risks and ensuring supply performance are primary motivations for companies in engendering lower-tier supplier visibility.

An innovative and useful research in the engenderment of lower-tier supplier visibility was conducted by Fan *et al.* (2013). They developed a composite process to establish and continuously maintain end-to-end visibility in multiple multi-tier supplier network systems.

HYPOTHESES DEVELOPMENT

Among the several motivations for companies to seek lower-tier supplier visibility is to improve supply chain performance. This entails timeliness and quality of supplies. Additional reasons include mitigation against risk, and steady and continuous flow of raw materials or finished products. Some researchers suggest that lower-tier visibility efforts should seek to have some or all of the following objectives: continuity of supply, joint efforts on innovations, sound financial health of suppliers, collaboration with suppliers, measurable metrics for lower-tier suppliers, and self-serve model(s) that automate supplier selection and monitoring. From our pilot study, we find that industries focus more on three of these desirable objectives, namely: risk mitigation of lower-tier suppliers, lower-tier supplier performance metrics, and relationship with lower-tier suppliers.

In order to achieve the above three desirable objectives of lower-tier supplier visibility, some information sharing and supplier selection processes need be put in place. To identify the key information sharing processes/elements that should be put in place, we develop a list of some information sharing processes/elements. This list was the base used to ask the following question to company executives via a survey and telephone interviews: "*How important is each of the following elements in the information your company shares with your lower-tier (2nd, 3rd and etc.) suppliers?"*

Those information elements that can be shared include: Lower-tier supplier evaluation; supplier certification/qualification; any agreement on information sharing; information on lower-tier supplier scorecard performance; new technology and system in place that impact on supply; supplier's process for its supplier selection, stratifying, and development; and the process in place for lower-tier supplier evaluation and management.

Monitoring risk and performance requires that some processes be put in place and tracked continuously (Fan *et al.*, 2013). The tracking requires maintaining exchanges of information among the companies involved, which are easier done when the respective companies have developed some form of relationships with its tier suppliers. To identify key information that should be collected in relation to lower-tier supplier evaluation and

selection, the following question was asked to industry executives via survey and telephone interviews: "*In terms of the process used by your company's supplier in selecting its 1st tier suppliers, how important is each of the following elements?"* A respondent was expected to indicate any one or all or none of the following in his/her response: the supplier uses established process and criteria for approving its suppliers; the supplier uses established process and criteria for stratifying suppliers; the supplier develops good scorecard metrics based on its organization's goal; and the supplier provides the evaluation results on which the selection of its suppliers are based.

We believe that it would be useful and interesting to test the relationships (correlations) among the key information that should be collected and the three objectives of lower-tier supplier visibility engenderment stated earlier above. Towards this end, we developed and tested the following hypotheses.

Hypothesis 1: Each of the lower-tier information sharing implementation elements will be positively associated with each of the three components of lower-tier supplier visibility objectives.

Hypothesis 2: Each of the lower-tier supplier selection process elements will be positively associated with each of the three components of lower-tier supplier visibility objectives.

METHODOLOGY

Survey and telephone interviews were used to collect the data. Firstly, we interviewed nineteen senior supplier relationship managers from fifteen companies. Secondly, we designed a questionnaire that surveyed the depth of lower-tier visibility in terms of different supplier categories and the motivations for tracing lower-tier visibility. Respondents could answer the questionnaire through either an email attachment or an online survey. We contacted 30 purchasing executives at various professional conferences and meetings, and received 23 responses. Additionally, we compiled our own list of 548 purchasing executives from public information available online and received 51 responses after two rounds of reminders. Overall, we collected 74 usable answered questionnaires. Our response rate is 12.8%, which is in the range of typical rates of 10-20% in surveys (e.g., Terjesen, Patel, and Sanders, 2012).

All statistical tests were conducted in SPSS 18. To assess nonresponse bias, we tested significant differences between early and late responses (Krause, Scannell, and Calantone,

2000). We divided all responses into two groups: an early group of first 37 responses and a late group of last 37 respondents. t-tests showed no significant differences between these two groups. This result suggests that nonresponse may not be a problem in our survey.

Although we used different methods to collect our survey data (i.e., the respondents were contacted in person at conferences or by email, and the questionnaire could be answered by email attachment or online), we ensured homogeneity by using the same set of questions for all senior SRM managers. Also, we checked their background information and compared it with their responses to understand the extent of the influence of group differences on their responses.

RESULTS

The background information we collected includes company size and type of industry. For company size, we collected information on the number of employees. More than 50% responding companies have more than 10,000 employees, 18% have 500 to 999 employees, and 29% have less than 500 employees. About 34% are in manufacturing, 47% are in service industries, and 19% are in others.

Table 1 shows the results of the survey with respect to the importance of lower-tier supplier visibility objectives. Most respondents believed lower-tier risk and performance are very important, while relationship is less important than lower-tier risk and performance. Overall, roughly 50% respondents rate these three objectives as very/absolutely important.

Table 1. Responses to the question: How important is each of the following criteria in selecting your suppliers?

Objectives of engendering lower-tier supplier visibility	Not/hardly/fairly important	Very/absolutely important
Strengthen supplier's relationship with its lower tiers	60.7%	39.3%
Reduce supplier's lower-tier risks	41.0%	59.0%
Improve supplier's lower-tier performance	44.3%	55.7%

Note: The result is based on the sample size of 578 and 74 valid responses.

As shown in Table 2, information elements appear not to be very important. The most important information elements are *agreement on information sharing* and *the process for supplier evaluation and management*. Agreement is normally the first step for engendering

lower-tier supplier information sharing, so it is understandable that it is the most important among the information elements. *Process for supplier evaluation and management* is very important because the purchasing company has to evaluate and manage lower-tier suppliers. On the other hand, *lower-tier supplier's scorecard and evaluation* seem to be the least important.

Table 2. Responses to the question: How important is each of the following elements in the information your company shares with your lower tier (2nd, 3rd and etc.) suppliers?

Information a company can share with its lower-tier suppliers	Not/hardly/fairly important	Very/absolutely important
Lower-tier supplier's evaluation, certification/qualification	65.4%	34.6%
Lower-tier supplier's scorecard performance	69.2%	30.8%
Need for agreement on information sharing.	53.8%	46.2%
New technology and system	55.8%	44.2%
Process for supplier selection, stratifying, and development	60.0%	40.0%
Process of supplier evaluation and management	53.8%	46.2%

Note: The result is based on the sample size of 578 and 74 valid responses.

In general, the responses show that the approaches used to select suppliers are more important than those to collect and/or share information (see Table 3). The most important supplier selection process is the *1st tier supplier of the purchasing company uses established process and criteria for approving suppliers*, which has two implications: (1) approving suppliers into the supply chain can itself be costly and time consuming, and (2) due to the trend of long-term relationship among supply chain partners, approving a wrong supplier can be devastating. To our surprise, most respondents did not think that the 1st tier supplier needs to provide the evaluation results on which the selection of its suppliers is based.

Association or correlation between information elements and lower-tier supplier visibility objectives (Hypothesis 1)

To illustrate the association between information elements and lower-tier supplier visibility objectives, we conducted crosstab frequency analysis with chi-square statistics. Two examples of these are shown in Tables 4a and 4b.

Table 4a shows that overall 60.0% responded that *relationship with lower-tier* is not/fairly/hardly important and 40.0% thought it to be very/absolutely important; 66.0% responded that *sharing lower-tier evaluation result* is not/fairly/hardly important and 34.0% thought it is very/absolutely important. The two numbers in each cell show their percentages in terms of the row and the column, respectively. For example, in the first cell, 76.7% means that for those who responded not/fairly/hardly important relationship with lower-tier, 76.7% thought sharing lower-tier evaluation result is not/fairly/hardly important; 69.7% means that for those who responded not/fairly/hardly important sharing lower-tier evaluation result, 69.7% thought relationship with lower-tier is not/fairly/hardly important. In a same fashion, Table 4b shows an example for non-significant association.

Table 3. Responses to the question: In terms of the process used by your company's supplier in selecting its 1st tier suppliers, how important is each of the following to your company

Processes that can be used to select suppliers	Not/hardly/fairly important	Very/absolutely important
The supplier uses established process and criteria for approving suppliers	43.4%	56.6%
The supplier uses established process and criteria for stratifying suppliers	58.5%	41.5%
The supplier develops a good scorecard metrics based on its organization's goal	52.8%	47.2%
The supplier provides the evaluation results on which the selection of its suppliers is based	60.8%	39.2%

Note: The result is based on the sample size of 578 and 74 valid responses.

Table 4c summarizes our results on how information elements affect lower-tier supplier visibility objectives. All results of the chi-square and Kendall's Tau-b (Kendall, 1995) statistics are significant (most of them at 1% level), except the one related to the need for agreement and lower-tier risk. Kendall's Tau-b (Kendall, 1995) also indicates a positive association. That is, information elements positively affect lower-tier supplier visibility objectives. In other words, better information sharing in lower-tier supplier evaluation, scorecard performance, agreement, and technology will cause better relationship, reduce risk, and improve performance. These results support our Hypothesis 1.

Table 4a. Illustrative result for significant association p(Chi)-square

Relationship with lower-tier vs. sharing lower-tier evaluation result		Sharing lower-tier evaluation result		
		Not/fairly/hardly important	Very/absolutely important	Total
Relationship with lower-tier	Not/fairly/hardly important	76.7%; 69.7%	23.3%; 41.2%	60.0%
	Very/absolutely important	50.0%; 30.3%	50.0%; 58.8%	40.0%
	Total	66.0%	34.0%	100%

Note: p (Chi-Square) = 0.050, p (Kendall's Tau-b$^{(+)}$) = 0.051

Table 4b. Illustrative result for non-significant association p(chi)-square

Supplier's lower-tier risks vs. Need of Lower-Tier Agreement on Information Sharing		Need of lower-tier agreement on information sharing		
		Not/fairly/hardly important	Very/absolutely important	Total
Supplier's lower-tier risks	Not/fairly/hardly important	63.2%; 44.4%	36.8%; 30.4%	38.0%
	Very/absolutely important	48.4%; 55.6%	51.6%; 69.6%	62.0%
	Total	54.0%	46.0%	100%

Note: p (Chi-Square) = 0.235, p (Kendall's Tau-b$^{(+)}$) = 0.301

Table 4c. Chi square and Kendal's tau-b analysis of information elements

Sets of variables: Information sharing and selection Process/criteria for lower tiers	How important is each of the following in selecting your suppliers? Supplier's relationship with its lower tiers	Supplier's lower-tier risks	Supplier's lower-tier performance
How important is each of the following elements in the information your company shares with your lower tier (2nd, 3rd and etc.) suppliers?			
Lower-tier supplier's evaluation, certification/qualification	0.050[0.051(+)]	0.006[0.001(+)]	0.012[0.005(+)]
Lower-tier supplier's scorecard performance	0.020[0.001(+)]	0.002[0.000(+)]	0.001[0.000(+)]
Need for agreement on information sharing.	0.006[0.003(+)]	**0.235[0.301(+)]**	0.008[0.003(+)]
New technology and system	0.003[0.001(+)]	0.011[0.005(+)]	0.015[0.008(+)]
Process for supplier selection, stratifying, and development	0.036[0.032(+)]	0.002[0.000(+)]	0.002[0.000(+)]
Process of supplier evaluation and management	0.001[0.000(+)]	0.028[0.020(+)]	0.008[0.003(+)]

Note: Key: 0.05[0.051(+)] = p-value for Chi-Square [p-value for Kendall's Tau-b (direction: '+' or '-')]

How selection process elements affect lower-tier supplier visibility objectives (Hypothesis 2)

Table 5 summarizes our results on how lower-tier selection process elements affect lower-tier supplier visibility objectives. Most results of the chi-square and Kendal's Tau-b statistics are significant, except three instances that are shown bolded in Table 5. Kendal's Tau-b indicates all positive associations. In words, process elements positively affect lower-tier supplier visibility objectives. That is, use of better processes in lower-tier supplier approval, stratification, scorecard metrics, and evaluation base will cause better relationship, reduce risk, and improve performance. These results support our Hypothesis 2.

Table 5. Chi square and Kendal's tau-b analysis of information elements

Sets of variables:	How important is each of the following in selecting your suppliers?		
Information sharing and selection process/criteria for lower tiers	Supplier's relationship with its lower tiers	Supplier's lower-tier risks	Supplier's lower-tier performance
In terms of the process used by your company's supplier in selecting its 1st tier suppliers, how important is each of the following elements?			
The supplier uses established process and criteria for approving suppliers	**0.109[0.114(+)]**	0.002[0.001(+)]	0.000[0.000(+)]
The supplier uses established process and criteria for stratifying suppliers	**0.094[0.104(+)]**	0.054[0.045(+)]	0.001[0.000(+)]
The supplier develops a good scorecard metrics based on its organization's goal	0.009[0.005(+)]	0.002[0.000(+)]	0.000[0.000(+)]
The supplier provides the evaluation results on which the selection of its suppliers is based	0.013[0.009(+)]	**0.088[0.084(+)]**	0.001[0.000(+)]

Note: Key: 0.05[0.051(+)] = p-value for Chi-Square [p-value for Kendall's Tau-b(direction: '+' or '-')]

CONCLUSIONS

This paper tests and shows the degrees of importance of three major lower-tier supplier visibility objectives and the degrees of association/correlation with key elements/processes involved in information sharing among tier suppliers and lower-tier supplier selection processes/approaches. Data was collected through a survey of 74 companies and interviews with 19 industry executives from 15 companies. The analyses of the data show that both the information sharing and lower-tier supplier selection process/approaches are correlated with three key elements of lower-tier supplier visibility objectives, namely: relationships with lower-tiers, lower-tier risks, and lower-tier performance.

The obvious conclusion from our study is that better information sharing (among tier suppliers) on lower-tier supplier evaluation, scorecard performance, technology, lower-tier supplier evaluation and selection processes, supplier approval processes, supplier evaluation and score-carding, and supplier stratification processes will lead to better relationship, reduction/elimination of supply chain risks, and improved performance.

This research does not only contribute to the literature on SRM and lower-tier supplier visibility, it is expected to also encourage and motivate industries to adopt and put processes in place for engendering lower-tier supplier visibility.

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REFERENCES

A.T. Kearney. 2004. Creating value through strategic supply management. http://www.atkearney.com/shared_res/pdf/AEP_2004_S.pdf (accessed October 10, 2013).

Avery, S. 2007. Pathways to convergence. *Purchasing* 136(5): 52-54.

Becks, R. 2010. The next big thing: Multi-tier supply chain management. *Supply chain digest*, available online http://www.scdigest.com/experts/E2Open_11-08-11.php?cid=4840&ctype=content (accessed October 2, 2011).

Briscoe, J., T.N. Lee, and S.E. Fawcett. 2004. Benchmarking challenges to supply chain integration: Managing quality upstream in the semiconductor industry. *Benchmarking: An International Journal* 11(2): 143-155.

Chikán, A. and A. Gelei. 2010. New insight into the competitiveness of supplier firms: Aligning competences and customer expectations. *Supply Chain Forum: An International Journal* 21(11): 30-44.

Christopher, M. and H. Lee. 2004. Mitigating supply chain risk through improved confidence. *International Journal of Physical Distribution & Logistics Management* 34(5): 388-96.

Day, M., G. Magnan, M. Webb and J. Hughes. 2008. Strategic relationship. *Supply Management Review* April: 40-48

Day, M., G.M. Magnan, and M.M. Moelle. 2010. Evaluating the bases of supplier segmentation: A review and taxonomy. *Industrial Marketing Management* 39: 615-639.

Doran, D., P. Thomas, and N. Caldwell. 2005. Examining buyer-supplier relationships within a service sector context. *Supply Chain Management: An International Journal* 10(4): 272-277.

Dyer, J.H., D.S. Cho, and W. Chu. 1998. Strategic supplier segmentation: The next 'best practice' in supply chain management. *California Management Review* 40(2): 57-77.

Fan, C., F. Olorunniwo, J. Jolayemi, and X. Li. 2013. A characterization of lower-tier supplier visibility practices in supplier relationship management. *Supply Chain Forum: An International Journal* 14(1): 4-16.

Genna, A. 1997. Suppliers are keys to giving customers what they want. *Purchasing* 123: 33-40.

Gordon, S. 2008. *Supplier evaluation and performance excellence: A guide to meaningful metrics and successful results*. J. Ross Publishing, Inc. Fort Lauderdale, FL.

Hannon, D. 2006. Downstream supplier become bigger concern. *Purchasing* 135: 18-22.

Hirakubo, N. and M. Kublin. 1998. The relative importance of supplier selection criteria: The case of electronic components procurement in Japan. *International Journal of Purchasing and Materials Management* 34(2): 19-24.

Howard, A. 1998. Valued judgments. *Supply Management* 3 (25): 37-38.

Jolayemi, J., F. Olorunniwo, C. Fan, and X. Li. 2013. A composite process for establishing and continuously maintaining end-to-end visibility in multi-tier supplier network systems. *Annals of Management Science* 2(1): 17-44.

Kendall, M. 1955. *Rank correlation methods* (Second edition). London, UK: Charles Griffin and Co.

KPMG. 2003. *Report: Supply chain visibility very poor beyond tier 1*, available at http://industrytoday.com/article_view.asp?ArticleID=we514 (accessed July 2013).

Kraljic, P. 1983. Purchasing must become supply management. *Harvard Business Review* 61(5): 109−117.

Krause, D., T.V. Scannell, and R.J. Calantone. 2000. A structural analysis of the effectiveness of buying firms' strategies to improve supplier performance. *Decision Sciences* 31: 33-55.

Kulshrestha, R., M. Kulshrestha, S.P. Bhatnagar, and C.K. Katiyar. 2007. Supplier performance evaluation and selection in the herbal industry. *Supply Chain Forum: An International Journal* 21(8): 46-55.

Li, X., F. Olorunniwo, J. Jolayemi, and C. Fan. 2014. Re-examining the structure of supplier stratification matrix: A focus on differential value and relationship. *International Journal of Procurement Management* 7(2): 219-237

Olorunniwo, F. and X. Li. 2010. Information sharing and collaboration practices in reverse logistics. *Supply Chain Management: An International Journal* 15 (6): 454-462.

Olorunniwo, F., J. Jolayemi, C. Fan, and X. Li. 2013. Lower-Tier visibility in supplier relationship management: Issues and illustrative industry practices. *Journal of Business and Economic Perspectives* 1: 7-18

Park, T.H. 2007. Inter-organizational relationships with toyota's first-, second-, and third-tier suppliers. *Asian Business & Management* 6: 179-198.

Pickett, C. 2006. Prepare for supply chain disruptions before they hit. *Logistics Today* 47(6): 22-25.

Shil, N.C. 2010. Customized supplier selection methodology: An application of multiple regression analysis. *Supply Chain Forum: an International Journal* 21(11): 58-70.

Supply Chain Digest. 2012. Managing risk in a multi-tier supply chain. http://www.e2open.com/resource-center/resource/managing-risk-in-a-multi-tier-supply-chain (accessed June 8, 2013).

Terjesen, S., P.C. Patel, and N.R. Sanders. 2012. Managing differentiation-integration duality in supply chain integration. *Decision Sciences* 43: 303-339.

Tse, Y.K. and K.H. Tan. 2011. Managing product quality risk in a multi-tier global supply chain. *International Journal of Production Research* 49(1): 139.

US GAO. 2006. *Highlights of GAO forum: Managing the supplier base in 21st century*. Washington: U.S. Government Accountability Office (GAO).

Wal-Mart. 2013. *Promoting responsible sourcing in Bangladesh, available at* http://corporate.walmart.com/global-responsibility/ethical-sourcing/promoting-responsible-sourcing-in-bangladesh.

Wong, A. 2000. Integrating supplier satisfaction with customer satisfaction. *Total Quality Management* 11(Nos. 4/5 and 6): S427-S432.