

# Supply Chain Management Practices in the Mining Sector: Perspective of Managers in an Emerging Economy

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## Abstract

The study sought to examine the supply chain management practices in the mining sector of Ghana using Tarkwa Goldfields Limited as a case study. The study's focus was on sourcing decisions, management of supply chain risk and coordination in supply chain management. A survey approach was used as a design and structured questionnaire was used for the data collection. One Sample T-test, Multiple Regression and Kendall's Coefficient of Concordance were used to analyse the data. One Sample T-test revealed that multiple sourcing of suppliers and supplier selection team were key practices under sourcing activities. The Multiple Regression result suggest that supplier performance measurement systems and training programs had a positive and significant impact whiles the usage of the approved list of suppliers had a negative and significant impact on management of the supply chain risk. Operational and incentive obstacles were the major coordination issues whiles top management commitment on deployment of resources for coordination and effective communication among the supply chain participants were the essential coordination enhancers in the management of the supply chain. The study concluded that the need for a systematic way through a holistic approach for its supply chain management was an essential part of the company's continuous improvement. The study prescribes that since risk is not static and evolves from supply chains networks and procedures it must be recognized and subsequently manage it.

## Keywords

Supply Chain Management Practices, Mining Sector, Tarkwa Goldfields, Ghana

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## 1. Introduction

It is a fact in today businesses that it will be difficult for a business to be successful without depending on other businesses. Though businesses can be said to be individual and independent but their operations are interdependent. This is why supply chain management is everyone's concern to meet their business or individual need of goods and services for production or personal consumption. Organizations depend on their internal and external environment to achieve its objectives by delivering products and services to match the aspirations of that market. The external supply chain

activities contribute a higher percentage to the value of their finished products than the internal processes in many organizations in today's businesses.

[1] supply chain is the "management of upstream and downstream relationships with suppliers and customers in order to deliver superior customer value at less cost to the supply chain as a whole. The author further explained that the focus of supply chain management should be the management of relationship as an essential activity in order to achieve a more profitable outcome for all parties. [2] "supply chain is an extended enterprise that crosses the boundaries of individual firms to span the related activities of

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all the companies involved in the total supply chain". [3] any party involved in meeting a customer request directly or indirectly is part of the supply chain activities. [4] the focus of supply chain is value creation for clients through innovations and continues improvement for better profits. [5] satisfying market needs and wants is one of the major goals of supply chain which is attained through collaboration and cooperation among all players in the chain. [6] many companies coming from several industries have come to realize that their supply chain activities are crucial to their businesses. They pointed out that their supply chain is much more than the cost of getting their products into their customer's hands.

[7] corporate strategy is nothing without the basic knowledge that it is their supply chain activities that helps to translate their strategy into daily interactions with those in the company and beyond the company. [6] supply chain is so critical that even the very best companies are trying to find ways to evolve and reinvent their supply chains, even if they already have a leading position in their industry. Intense competition and shrinking of markets has put pressure on organisational leaders to find ways of improving their bottom line in terms of profits by rolling in effectiveness and efficiencies in their operations. [8] organisations can have a competitive edge over competitors if they can streamline their value chain activities to make it lean and agile to achieve its intended objectives for effective and efficient flow of materials that will meet customer's requirement and satisfaction.

### 1.1. Supply Chain Management Practices

[9] supply chain management practices are the set of activities undertaken by an organization to promote effective management of its supply chain. It comprises the approaches that are applied to integration, management and coordination of supply, demand and relationships in order to satisfy customers. [3] outlined elements of supply chain practices as sourcing decisions, demand forecasting, customer relationship management, information sharing, coordination, resource management, supplier management and risk management.

### 1.2. Supply Chain Risk

[10] supply chain in any form is likely to have associated risk with quality, compliance and safety challenges. [11] the nature of the business environment in terms of network complexity can be an influential factor on supply chain risk exposure to an organization. [2] it has become the norm for top executives from several industries to accept the fact that one of their main operational concerns is supply chain disruptions and its related cost. [10] supply chain managers

have to deal with the unexpected challenges in the day-to-day operations of an organization. [12] as globalization and internalization efforts intensify, companies are faced with even greater challenges to manage the supply chain of their products and services which include political, environmental, economic and technological uncertainties. The coordination of the supply chain activities with the view to direct and control an organization flow of materials to the end-to-end of the chain in terms of supply chain risk is the management of supply chain risk [13].

[14] the possibility of supply chain disruptions were poor planning and execution, intense competitive environment, increased complexity of operations, focusing on efficiency, outsourcing and single sourcing. [1] the successes of supply chain management to a very large extent are dependent on an organization's managerial team knowledge of risk management and its application of appropriate techniques to mitigate the risk. [15] any robust risks related system must have an action plan that has the ability to stipulate how and which risks need to be addressed.

[11] one of the best ways to manage supply chain disruption is to perform three tasks continuously and concomitantly by identifying the risk source, its assessment and mitigation. [16] mitigating risk must have organizational perspective which must extend beyond the company to the suppliers site. [17] managers in the field of supply chain may not forget that any time steps are taken to reduce or eliminate risks it definitely affect the risk profile of the organization which will have a direct effect on other parties of the supply chain network.

### 1.3. Sourcing Related Issues

One of the important elements of supply chain management is sourcing related issues. Efficient and effective sourcing strategy can give a company a competitive advantage [17]. Sourcing basically has to do with how organisations purchase its goods and services through the processes of selecting a supplier, contract management, transportation and payment related issues between a company and a supplier. [2] sourcing decisions must be strategic in nature to make sure that the strategy will be able to find the highest value with the highest service and at the lowest cost without compromising on the quality of materials and services available which has the potential to ensure value adding activities. [9] strategic sourcing should and must embrace all activities within the procurement cycle, that is from the stage of product specification through to receipt and payment of goods and services. [18] supply chain can improve significantly if all participants in the supply chain are able to align their objectives and planning processes through an effective collaboration. [19] it will not be out of order to argue that selecting the right source of supply is one of the most

important decisions concerning procurement of goods and services.

[20] effective decisions on sourcing will be relevant when all the indicators on sourcing have been considered and weighted against the risks and opportunities which must be applied within the scenario of sourcing activities. [15] effective sourcing goes beyond just simply selecting a supplier or contractor for a purchase requirement which cannot be done in isolation. [3] sourcing is the entire set of business processes required to purchase goods and services. The authors went further to indicate that the sourcing processes include the selection of suppliers, design of supplier contracts, product design collaborations, procurement of materials and evaluation of supplier performance. [21] senior managers must apply advanced strategic sourcing so as to significantly improve supply chain's efficiency, effectiveness and sustainability. The authors further stressed that senior managers must go beyond mere cost cutting and contract management to redesign and orchestrate their entire supply chain to transform sourcing and procurement into a key competitive differentiator.

#### 1.4. Supply Chain Management Coordination

[22] demand-driven supply chain management is an end-to-end supply chain planning and replenishment process that enables companies to achieve their planned service levels. [13] managing the supply chain is a competitive necessity in today's global marketplace where differentiation between products and services means providing a total value package that can compete for an increasingly discerning and empowered customer. [23] the concept of supplier partnering is one of the mutual dependencies, trust and choice where the author stated that businesses are viewed as independent but dependent on each other. [3] supply chain coordination requires each stage of the supply chain to take into account the impact its actions have on other stages. Indeed the authors indicated that effective supply chain coordination improves if all the stages of the chain take actions that would together increase the total supply chain profits. The authors warned that lack of coordination occurs either because different stages of the supply chain have objectives that conflict or because information moving between stages gets delayed and distorted.

[2] today's supply chain relationships are most effective when collaboration occurs among the participants who are involved. The authors went further to indicate that collaboration may be thought of as a business practice that encourages individual organisations to share information and resources for the benefit of all the supply chain players. [3] the effects of lack of coordination on performance include

increase of manufacturing cost, inventory cost, transportation cost and labour cost for shipping and receiving. It also affects replenishment lead time, level of product availability and relationships across the supply chain. [3] any factor that leads to either local optimization by different stages of the supply chain, or an increase in information delay, distortion, and variability within the supply chain, is an obstacle to coordination.

[1] no industry is an island; no matter how large a company is it will need the services of other organizations. [24] a company that is able to produce its own raw materials and manufacture its own products obviously cannot move to the doorsteps of every consumer, neither can it buy all the products that it manufactures. Similarly, almost every mining company outsources some aspect of its materials and stock for its operations. The purpose of the study is to examine the supply chain management practices of Tarkwa Goldfields Limited in the Western Region by focusing on sourcing issues, risk management and coordination of the supply chain activities

## 2. Methodology

[25] the understanding of a research design is important for a researcher to do a good research or for readers to understand how a research was done to appreciate a research paper. [26] "a research design is an integrated statement of and the justification for the technical decisions involved in planning a research project". The study in terms of time horizon is cross-sectional in nature. [27] cross-sectional designs are used to obtain information from a single group of respondents at a single point without any intention of follow up study over time. The study in terms of design is primarily a survey. The study was mindful on the research objectives in the construction of the questionnaire and what the study want to achieve, moreover consideration of the study to generalize the results to the population and having an intended plan of what analysis to use even before the administration of the questionnaire were factored in using the survey design.

[28] survey is valuable, fast and inexpensive if a study want to collect a lot of information about a sample of interest. The author went further to indicate that survey is appropriate for studies to find out what people are thinking, feeling or doing. [29] a survey is a research design which aims to collect data from a relatively large population, but where it is difficult in practice to contact all population members. Therefore it is necessary to select a sample. [30] the group of people who are the focus of a research project are known as the research population.

The population of interest is where a researcher wants to conduct a study and come out with insight from it. The

population for this study was all staff whose role was at the supervisory and managerial levels were the focus of this study as respondents from Tarkwa Goldfields Limited in the Western Region of Ghana. Thus the sample size of eighty (80) were purposively sampled from six departments from the company. Where it is not possible to use simple random sampling it is right to use purposive sampling as suggested by [30] who further indicated that often there is the necessity to identify people who have specialized knowledge or experience of a question, these are termed as key informants.

The structured questionnaire was the data collection instrument. The questionnaire was self-administered due to the caliber of the respondents. All the respondents were of supervisory or managerial positions. Their educational level justified the used of the self-administration of the questionnaire and their busy schedules were also a factor. The structure of the questionnaire had four parts. Part 1 is respondent's profile which contain eight items, Part 2 on sourcing decisions in a supply chain which contain ten items and Part 3 on supply chain coordination which contain twelve items and Part 4 on risks in a supply chain contain ten items. The scale contains open-ended and closed-ended questions but prominently was the five-likert scale as measurement of the questionnaires.

## 2.1. Analytical Framework

Descriptive statistics aided the explanation of the respondent's characteristics through percentages and bar chart illustrated the responses on obstacles to supply chain management in Tarkwa Goldfields Limited. One Sample T-test ( $t$ ) analysis was used on the respondents view on the sourcing activities and decisions.

### Hypotheses

The null hypothesis ( $H_0$ ) and (two-tailed) alternative hypothesis ( $H_1$ ) of the one sample  $T$  test is expressed as:

$H_0: \mu = 0$ , [Ineffective nature of the sourcing activities]

$H_1: \mu \neq 0$ , [Effective nature of sourcing activities]

The decision rule involves comparing the hypothesized population mean (i.e. the test value) and expected mean (test statistic). The result is considered statistically significant if the  $p$ -value is less than chosen alpha level. The null hypothesis must be rejected.

The test statistic for a One Sample ( $t$ ) Test is denoted ( $t$ ), which is calculated using the following formula:

$$t = \frac{x - \mu}{s_x} \quad (1)$$

Where:

$$s_x = \frac{s}{\sqrt{n}} \quad (2)$$

Where:

$\mu$  = proposed constant for the population mean

$x$  = sample mean

$n$  = sample size (i.e., number of observations)

$s$  = sample standard deviation

$S_x$  = estimated standard error of the mean

Kendall's coefficient of concordance ( $W$ ) analysis was used to rank the items identified in the sourcing activities and decision making processes in Tarkwa Goldfields Limited. The degree of agreement of the rankings by the staffs was then measured.  $W$  ranges from 0 to 1. In deriving  $W$ , let  $T$ ; represent the sum of ranks for each sourcing activity factor being ranked. The variance of the sum of ranks is given by:

$$Var_T = \frac{\sum T^2 - (\sum T)^2/n}{n} \quad (3)$$

Where  $Var$  denotes variance and  $n$  denotes the number of each sourcing activity factor. The maximum variance of  $T$  is given by

$$m^2 (n^2 - 1)/12 \quad (4)$$

Where  $m$  is the number of respondents. The formula for Kendall's coefficient of concordance  $W$  is given by

$$W = \frac{(\sum T^2 - (\sum T)^2/n)/n}{m^2 * (n^2 - 1)/12} \quad (5)$$

By simplifying equation 5 above, the result in the computational formula for  $W$  as:

$$W = \frac{12[\sum T^2 - (\sum T)^2/n]}{mn^2(n^2 - 1)} \quad (6)$$

In addition the study made used of multiple regression analysis to establish the relationship and the significance of the independent variables on management of supply chain risk. The regression equation is stated as:

$$IG = \beta_0 + \beta_1 SPM + \beta_2 TPM + \beta_3 ALS + \varepsilon_t \quad (7)$$

Where  $\beta_0$  represents the constant of the intercept and  $\varepsilon_t$  is the error term. IG is the dependent variable which represents information gathering for the purposes of risk management of supply chain. Supplier performance measurement systems, training programs and usage of approved list of suppliers are represented by  $SPM$ ,  $TPM$  and  $ALS$  respectively. The independent variables are expected to have a positive relation with information gathering on supply chain risk management activities.

Hypothesis of the study for the regression were constructed as follows:

$H_{01}$  = Supplier performance measurement systems has an insignificant impact on information gathering.

$H_{02}$  = Training programs has an insignificant impact on information gathering

$H_{03}$  = Usage of approved list of suppliers has an insignificant impact on information gathering

Variable description

Dependent variable

Information Gathering (*IG*): information is crucial to the performance of a supply chain because it provides the basis upon which supply chain managers make decisions at each stage of the supply chain from the strategic phase to the operational phase. Information is used when making a wide variety of decisions about sourcing, inventories, transportation, risk management, demand and supply planning, coordination among others. Information is the glue that holds the entire supply chain together and allows it to function, making information the most important supply chain driver.

Independent variables

Supplier Performance Measurement Systems (*SPM*): Supplier performance measurement includes on time delivery, compliance with contract terms, technical capability, quality of goods/services and service capability/performance. Effective and efficient supplier measurement system hinges on the integrity of the available information. It is therefore hypothesised that supply chain management practices that leads to improve performance measurement is positively related to the information gathering of the organisation.

Training Programs (*TPM*): the heart of any training program is the intention to achieve the result of the program. Training and development of staff to advance knowledge to better their roles and task performance is imperative to any organisation that is serious of getting results through its human resource practices and procedures. Training programs on supply chain related issues such as training to better manage risk, robust assessment of supplier selection, team management through organisational cohesion among others. It is hypothesised that a learning organisation through its training programs leads to superior performance is positively related to the available information gathered for effective and efficient supply chain management practices.

Approved List of Suppliers (*ALS*): approved list of supplier's includes individuals and organisations which have being given the nod to supply a company based on their capabilities and competencies by meeting the requirement of the buying

company. The robustness of supplier selection, competencies and organisational capabilities are grounds for superior performance all things being equal. It is hypothesised that a supplier on the approved list will improve supply chain performance due to adherence to contract compliance and professionalism is positively related to effective communication through information gathered.

## 2.2. Ethical Issues

[31] the need to observe ethical considerations in a research study. The study observed ethical issues in the areas of procedural point of view where respondents were given sufficient time to make their mind on the issues in the questionnaire. Secondly respondents were fully informed about the study to get their assent to take part of the study. Thirdly on the questionnaire itself respondents were provided with comprehensive information to fill the questionnaire correctly and finally respondents were also given the assurance that any information given out would be treated with the highest level of confidentiality adding that any information given would be used for the purposes of this study only and nothing else.

## 3. Results and Discussions

### 3.1. Socio-demographic Characteristic of Respondents

Majority of the respondents were males representing (80%;  $n = 64$ ) while females had (20%;  $n = 16$ ) of the total sampled population of eighty (80). This is not surprising as there are male's dominance at the managerial and supervisory levels in most companies which the mining sector is of no exception according to [32] in a study on implementation challenges of the public procurement Act in the local government in Ghana. Significant majority of age range (38-57 years) representing eighty percent while (48%;  $n = 60$ ) had been with the company more than six years. The essence of this variable is an indication of the company human resource management practices and programmes which had helped to keep the respondents with the company. Those who had been with the company for more years might have a fair appreciation of the organisation culture which the respondents can transfer to potential or existing staff through on the job and induction training. The role level of the respondent's would helped in the appreciation of the supply chain related issues in the company as the person might be preview to certain information through meetings and other communications platforms. At the supervisory level, the respondents were (60%;  $n = 48$ ) and the Senior Staff accounted for (30%;  $n = 24$ ) while the Managerial level had (10%;  $n = 8$ ). The

result is in line with the practice where management staff numbers are always less than those at the supervisory level as indicated by [33] in a study on accounting on social and environmental reporting in the extractive industry of Ghana. The composition of the level of education was Higher National Diploma (HND) holders, First Degree holders and Second Degree Holders. The HND holders accounted for (35%; n = 28) while the First Degree holders had (45%; n = 36) and (20%; n = 16) was the contribution from the respondents from the Second Degree segment of the sample population. The level of education was important variable as it depicts the knowledge level and possible competencies of the respondents. This is also an indication that can influence the positional level of a respondent at job related level.

### 3.2. Sourcing Activities and Decisions

Seven themes were considered under the sourcing activities. Three of the themes had the highest mean of 4.19, 4.13 and 4.05 and these were different sources of suppliers, critical role of sourcing and supplier selection team as shown in Table 1. These themes had mean agreement scores that were significantly different from the point of indifference, which implies the themes were critical and are designed to be implemented to help achieve the objectives of the sourcing activities in a cost effective manner with the quest to achieve value for money. The average mean for the seven themes on the sourcing activities was 3.7 which is higher than scale mean of 2.5. It implies that the adherence to the company sourcing laid down procedures if follow will be a cost saving activity and will give the company leverage and competitive advantage.

**Table 1.** One Sample Statistics on the sourcing activities.

Theme	N	Mean	SD	Std Error Mean
Critical role of sourcing	80	4.13	.603	.067
Existence of framework	80	3.06	1.286	.144
Assessment of suppliers	80	3.88	.537	.060
Score analysis	80	3.13	1.118	.125
Supplier selection team	80	4.05	.501	.056
Different sources of suppliers	80	4.19	.956	.107
Vendor list priority	80	3.46	1.030	.115

Source: Author's Computation, 2017

In terms of degree of consensus under the standard deviation, existence of framework (SD = 1.286), score analysis and (SD = 1.118) and vendor analysis (SD = 1.030). This indicates that the existence of framework contributes to the sourcing activities and its decisions as it helps to select the right supplier with the aid of score analysis for effective and efficient sourcing strategy. It can be concluded that the existence of framework and score analysis are prominent sourcing strategy by Tarkwa Goldfields Limited to select suppliers in the vendor list first before considering those

suppliers outside the vendor list. This creates a transparent and sound sourcing practice to select the right supplier for value for money. [20] stressed that holistic approach to sourcing is critical which aligns with the result. [19] stated that it will not be out of order to argue that selecting the right source of supply is one of the most important decisions concerning procurement of goods and services. The author view strengthens the importance of the vendor list and selecting the right supplier for the right project.

**Table 2.** One Sample Test on sourcing activities.

Test Value = 0							
Theme	t	df	Sig (2-tailed)	Mean Difference	95% confidence interval of the difference		Ranking
					Lower	Upper	
Critical role of sourcing	61.159	79	0.000	4.125	3.99	4.26	2 <sup>nd</sup>
Existence of framework	21.297	79	0.000	3.063	2.78	3.35	6 <sup>th</sup>
Assessment of suppliers	64.586	79	0.000	3.875	3.76	3.99	4 <sup>th</sup>
Score analysis	25.000	79	0.000	3.125	2.88	3.37	7 <sup>th</sup>
Supplier selection team	72.357	79	0.000	4.050	3.94	4.16	3 <sup>rd</sup>
Different sources of suppliers	39.182	79	0.000	4.188	3.97	4.40	1 <sup>st</sup>
Vendor list priority	30.054	79	0.000	3.463	3.23	3.69	5 <sup>th</sup>

Source: Author's Computation, 2017 Note: (*W*) = 0.499 (49.9%), Cronbach's Alpha = 0.940 (94%)

The study identified seven themes contributing to cost

effective sourcing strategy of Tarkwa Goldfields as shown in

Table 2 using One Sample t-Test to analyse it. The positive  $t$  value of all the themes are (61.159, 21.297, 64.386, 25.000, 72.357, 39.182 and 30.054) respectively for critical role of sourcing in the supply chain, different sources of suppliers, committee for supplier selection and contracts, assessing suppliers, priority is given to supplier location in the vendor list, framework for sourcing a supplier and a score analysis used by the company.

The  $p$ -value from this statistic is 0.000 and that is less than 0.05 (the level of significance for the test). Since  $p < 0.05$ , the result reject the null hypothesis that the sample mean is equal to the hypothesis population mean and conclude that all the seven themes are statistically significantly different from the average.

The result shows that Tarkwa Goldfields Limited has a rigorous and practical approach to its sourcing activities which inform the company in its decision making and taking to benefit from availability of information for better performance at the company level to get value for money. The results agree with [3] stressing the importance of the entire sourcing process to achieve value for money. In addition [9] confirm that strategic sourcing should and must embrace all activities within the procurement cycle. The result aligned to this as it considers all the relevant themes under sourcing to benefit from it.

The ranking indicates the respondent's perceived importance on the themes under the sourcing related issues through the Coefficient of Concordance. The respondents agreed with  $F$  test for concordance ( $W$ ) between the rankings of the themes on sourcing decisions is (49.90%) which is acceptable in research study which implied almost 50% in concordance with the result. The ranking is critical as indicated in Table 2 but all the themes matter and this is in alignment with [21] where the authors suggested that

senior managers must apply advanced strategic sourcing so as to significantly improve supply chain's efficiency, effectiveness and sustainability.

### 3.3. Management of Supply Chain Risks

As indicated in Table 3, the adjusted  $R^2$  is .480 which is 48%; this is the percentage of the variance in the dependent variable that explained the independent variables (supplier performance measurement system, training programs and using an approved list of suppliers). This means that 48% of the changes in the management of supply risk are explained by the changes in the independent variables and control variables in the model. The remaining 52% of the changes in the management of supply chain risk are explained by other factors not in the model. The fitness of the model is highlighted by the adjusted  $R^2$  figure of the model. The F-test is the null hypothesis that there is no linear relationship between the variables (in other words,  $R^2 = 0$ ). The regression model is statistically significant,  $F = 25.295$ ,  $p = 0.000$ , hence supporting the fact that supplier performance measurement system, training programs and using an approved list of suppliers used in the model are crucial factors explaining the management of supply chain risk by Tarkwa Goldfields Limited. The Durbin-Watson statistics was used to check for auto-correlation while collinearity diagnostics in the form of Tolerance level and VIF were used to check for multicollinearity. The Durbin-Watson  $d = 0.230$ , which is between the two critical values of  $1.5 < d < 2.5$  and therefore can assume that there is no first order linear auto-correlation in the study's multiple linear regression. To check for multicollinearity in the multiple linear regression model, the Tolerance should be  $> 0.1$  (or  $VIF < 10$ ) for all variables, from Table 3 the collinearity statistics by the figures of the Tolerance and VIF indicate that there is no multicollinearity, which makes the model more reliable.

**Table 3.** Data output from estimation of multiple regression on managing supply risk.

Model	B	Standard Error	Beta	t-value	p-value	Collinearity statistics	
						Tolerance	VIF
Constant	3.061	.272		11.270	.000		
Supplier performance measurement systems (SPM)	.282*	.172	.400	1.636	.106	.110	9.089
Training program (TPM)	.327*	.191	.723	.818	3.576	.161	6.211
Approved list of suppliers (ALS)	-.268**	.137	-.477	-1.951	.055	.126	7.965

R Square = 0.500, Adjusted R Square = 0.480, F value = 25.295, F significance = 0.000, \* $p < 0.1$ , \*\* $p < 0.05$ , Durbin-Watson statistics = 0.230  
Source: Author's Computation, 2017

The regression result showed that supplier performance measurement systems as indicated in Table 3 have a t-value of 1.636 and a coefficient value of .282 with a significant value of 10%. This signified that supplier performance measurement systems (SPM) had a positive, weak and significant impact on information gathering on supply chain

risk management. This implies that information gathered on supply chain risk management will increase by 28.2 unit in mitigating the related risk. This provided an evidence for rejecting the null hypothesis that supplier performance measurement system has an insignificant impact on information gathering.

Supplier performance measurement systems had to do with key performance indicators to assess supplier performance before a contract or post contract analysis. Stricter adherence to the measurement systems has the potential to be transparent for effective supply chain management activities which does not only mitigate risk but also create value through efficient and objective framework for Tarkwa Goldfields Limited. This finding agrees with [4] suggestion that value creation must be the focus of supply chain management. There is the need to review performance measurement to ensure its relevancy by focusing on what is important. Furthermore, [11] affirmed that the complexity of the business environment can influence the supply chain risk exposure to an organization. It is important to stress that forward-looking companies evaluate their supply chain activities based on value creation from revenue generation to brand equity enhancement and not just cost reduction.

Training programs (*TPM*) has a t-value of .818 and a coefficient value of .372 with a significant value of 10%. This signifies that training programs (*TPM*) has a positive, weak and significant impact on information gathering on supply chain risk management. This implies that information gathered on supply chain risk management will increase by 32.7 unit in mitigating the related risk. This provided an evidence for rejecting the null hypothesis that training programs on the management of supply chain risks to the staff has an insignificant impact on information gathering. The training programs which indicate what the company wants their staff to know in the area of supply chain risk management which will directly help them to mitigate the risk and its exposure in terms of proactive approach rather than reactive approach. The positive coefficient indicated that the more training programs increases the better is the risk awareness level in terms of exposures and its management. This to a larger extent will aid the staff to find new ways of dealing with supply chain risks. The finding seems to align with [10] who indicated that risk to a large extent is not avoidable even with a robust system. This implies management of supply chain risk must be on-going as part of a company life. The result confirmed [8] suggestion that for organisations to have a competitive edge over competitors then there is the need for training and development, creativity and innovation in their value chain activities to meet customer's requirement and satisfaction.

Usage of approved list of suppliers (*ALS*) has a t-value of -1.951 and a coefficient value of -.268 with a significant value of 5%. This signified that usage of approved list of suppliers (*ALS*) had a negative, weak and significant impact on information gathering on supply chain risk management. This implies that information gathered on supply chain risk

management will decrease by 26.8 unit in mitigating the related risk. This provided an evidence for rejecting the null hypothesis that usage of approved list of suppliers has an insignificant impact on information gathering. The negative coefficient indicates that an increase in the usage of the approved list of suppliers will have an inverse relationship with the management of supply chain risk. This is an indication of the over reliance of the approved list when by looking outside as a company might have helped and brings about competition and the potential to benefit from value for money. Over reliance of the vendor approve list comes short on the views of [7] indicating that the corporate strategy is nothing without the basic knowledge that it is a company's supply chain activities that helps to translate their strategy into daily interactions with those in the company and beyond the company. There is the need for approved list of vendors but must be used to create value and mitigate risk, the products and services purchased by a company are not all the same in terms of value and volume. Some products are more important and require greater procurement attention. [2] were of the view that value enhancement and a firm's ability to maintain a competitive advantage in the marketplace must influence supplier selection. The result aligns to this suggestion as the need to select the right supplier irrespective whether a supplier is in the vendor list or not.

### 3.4. Coordination in Supply Chain Management

Coordination is critical to the success of any organisation in terms of cooperation and management of conflicts among the team members. Supply chain coordination is no exception and its effect is huge considering internal and external players within the supply chain activities.

#### 3.4.1. Obstacles to Coordination in Supply Chain

Any impediment that occurs at any stage of the supply chain can be termed as supply chain obstacle. Respondent's views on obstacles are shown in Figure 1. All the respondents were of the view that operational obstacle is a major issue in their defense indicated that it has both internal and external implications to the organization. Operational obstacles occur where there is increase in variability due to placing and filling orders for requisition and supplies. This is so when order stream may be far more erratic than the demand stream. Another obstacle which received the nod of all the respondents was incentive obstacle. The incentive obstacle is basically a situation where participants from the different stages of the supply chain actions can lead to increase variability and reduce total supply profits.



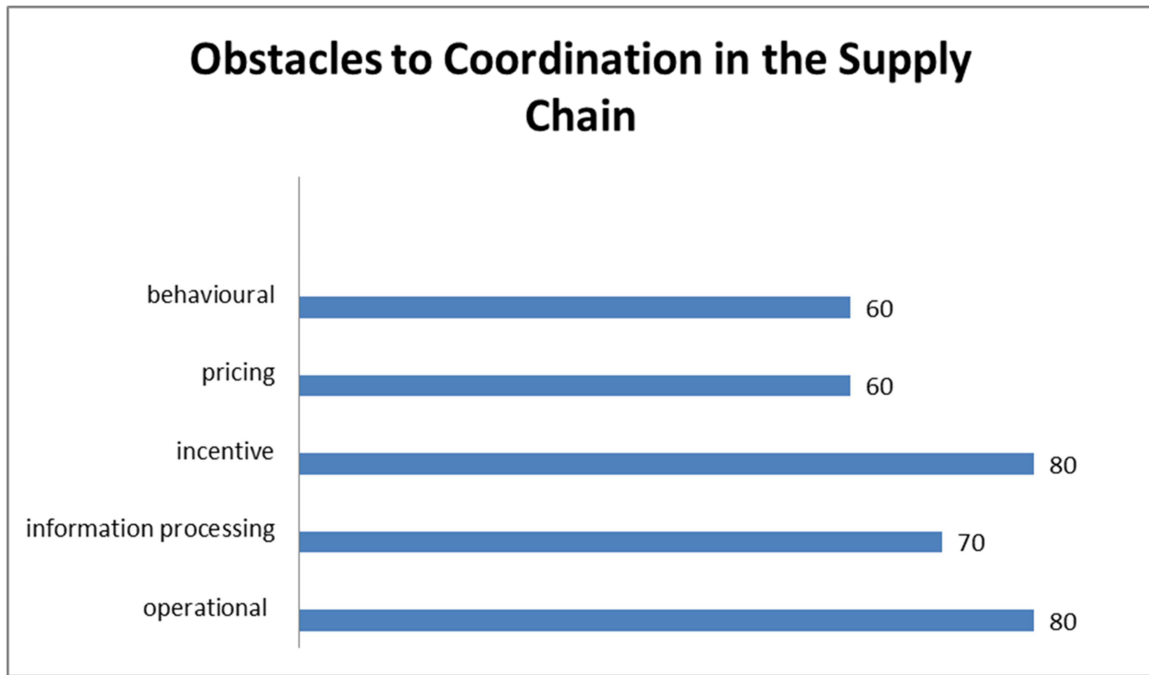


Figure 1. Obstacles to Coordination in the Supply Chain.

Information processing as an obstacle to supply chain management activities accounted for 88% of the respondents who indicated that it is very critical. Information processing obstacle is likely to happen where there is information distortion in demand from one stage of the supply chain to another stage; this has the possibility of leading to increased or decreased in variability in orders within the supply chain. The sixty respondents representing 75% were of the view that pricing obstacles and behavioural obstacles come next after operational, incentive and information processes obstacles. Pricing obstacles refers to situations in which the pricing policies for a product can lead to an increase in variability of orders placed whereas behavioural obstacles are possible in a scenario where problems in organizational learning can contribute to the bullwhip effect.

The result aligns with [3] stressing the effects of lack of coordination on performance and its related issues to cost and relationships across the supply chain. Moreover the authors indicated that any factor that leads to either local optimization by different stages of the supply chain, or an increase in information delay, distortion, and variability within the supply chain, is an obstacle to coordination. In addition, [13] affirms the need for effective coordination to control the organization of flow of materials to the end-to-end of the supply chain. [6] said it all by affirming that supply chain is so critical that even the very best companies are trying to find ways to evolve and reinvent their supply chains, even if they have already a leading position in their industry.

### 3.4.2. Achieving Coordination in Supply Chain

Achieving coordination helps to address obstacles to supply chain management activities in practice. Management actions in the day-to-day of the supply chain issues can increase or decrease the profits levels of an organisation and has the effect to moderate the bullwhip effect. A key benefit of coordination for an organisation is the alignment of goals and incentives among the supply chain players which has the potential to improve operational performance through partnerships and trust.

Respondents were of the view that without top management commitment to supply chain management coordination its success cannot be realized. This accounted for 45% of the sampled population who agrees that an organizational supply chain management is dependent on management commitment since they are the resource allocators and deploy those resources in line with management aspiration and the direction of the organization. The finding is in support of [18] indicating that supply chain can improve significantly if all participants in the supply chain are able to align their objectives and planning processes through an effective collaboration. In addition, [6] caution that even market leaders from several industries have come to realized that their supply chain activities are crucial to their businesses.

Communication is an essential platform for effective and efficient supply chain activities; the value of coordination is most seen in good communication with and among other participants from the different stages of the supply chain. In

practice most companies will not be willing to share information to other players in the supply chain due to many reasons which can be frustrated, indeed regular communication between parties are healthier and brings about transparency, trust and cooperation. It is not surprising that twenty-four (24) respondents accounted for 30% indicates that effective communication among the players in the supply chain is one of the top three factors that enhances coordination within the supply chain activities. The result agrees with [2] suggestion that today's supply chain relationships are most effective when collaboration occurs among the participants who are involved. The alignment is based on information sharing and resources by the individual organizations for the benefit of all the supply chain participants through effective collaboration.

The respondent's views on resources for coordination had a representation of twenty (20) respondents of the total sampled population which accounted for 25% indicating the importance of supply chain coordination. Even top management commitment to coordination cannot achieve much without significant devotion of managerial resources to all parties as a team effort from intra- and inter-functional areas of an organization. The result supports the suggestion by [3] on the requirements of each stage of the supply chain and its effects on the other stages to ensure efficient and effective coordination. On the other hand, [5] affirms that satisfying market needs and wants is one of the major goals of supply chain which is attained through collaboration and cooperation among all players in the chain

## 4. Conclusions and Recommendation

Supply chain management practices consist of several activities of events to achieve its desired goals and performance. The thematic areas for the study were supply chain risk, sourcing issues within the supply chain and coordination related issues on supply chain management. Realization of the need for effective management of supply chain risk is high among the respondents of the study due to the fact that its impact on the organizational performance is enormous. It is a fact that risk exposure is part and parcel of organization life and often cannot be avoided so its management and proactive way of minimizing its effects is the sensible approach going forward. It must be stated here that management of risk must have an organizational-wide perspective.

Sourcing activities in terms of the seven thematic areas from the respondents view revealed that multiple sourcing of suppliers, the criticality of the role of sourcing to the company performance, the appointment of supplier selection

team and assessment of suppliers based on the existence benchmark on supplier selection were the prominent practices in the company's sourcing activities. It can be concluded that the company appreciate the importance of sourcing in the management of supply chain. The evidence of multiple sourcing practices ranking number one means the company has put a mechanism in place to avoid sourcing related issues to lower the dependency on single suppliers, single technologies and flexible change of supplier and most importantly lower prices due to higher competition. This approach avoids over dependency which can be asymmetrically located.

The results of the multiple regression analysis indicate that about 48% of the variability in the supply chain risk based on information gathering on various risks associated with supply chain management was explained by the factors included in the model. That is, these factors have significant effects on the company's supply chain management performance. Two out of the three factors included in the model were significant at 10%, these are supplier performance measurement systems and training programs on supply chain related risks for staff while usage of approved list of suppliers was significant at 5%. This means that these factors must be given utmost consideration in any decision aimed at improving the supply chain management via information gathering on the supply related risks. It can be concluded that efficient management of risk provide value to the various stakeholders of the company as it affects performance positively.

Obstacles to coordination in the company's supply chain indicates that operational and incentive related issues are the major obstacles among the top five in the company's operations. Irrespective of the impact of the coordination obstacle it has to be dealt with due to its consequences on the company operations. In the area of coordination enhancers on supply chain management it was revealed in the order of importance that management commitment on coordination related issues, effective communication and its management and resources for coordination are the bedrock to achieve synchronization across the supply chain. The study concludes that the management of supply chain must be seen as a core competence that the company must possess to deliver profit and return on investment through capabilities that will help the company to consistently keep delivering promises and its commitments to its stakeholders.

The paper suggests that since risk is not static and evolves from supply chains networks and procedures it must be recognized and subsequently manage it. Managers must be made to understand the risks and the potential impact associated with their areas of responsibilities for contingency plans to be put in place with adequate deployment of resources to manage risks in all aspects of supply chain

management activities. The study further prescribes a holistic platform for all communication needs through enhanced technology for monitoring and effective feedback for all the players within the supply chain. Finally, the internal operations must be strengthened through integration of inter-functional and cross-functional activities to enhance effective coordination that can positively affect the organizational performance through the agility and leanness of its activities.

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