Investigating Supply Chain Metrics of Alcohol and Liquor Industries: A Case Study

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***ABSTRACT*. Identifying the proper supply chain practices and metrics is highly essential to check and balance the normal health condition of any organization. This paper deals with the possible qualitative supply chain practices and metrics which are tested on 5 Ethiopian Alcohol and Liquor manufacturing supply chains. The practices and metrics are derived from literatures made by the authors. To further clarify the supply chain metrics, questionnaire is designed and distributed to different levels of managers of the companies to formulate hypothesis. Using the right metrics, the significance of hypothesis is tested using SPSS 16.0 and MINITAB 16.1 software. For item reliability, Cronbach's alpha test was calculated to all items arranged in a five point Likert scale, and the test result shows the reliability of the items. The results in between groups and within groups are compared using analysis of variances. The results show that the majority of the practices and metrics the companies differ among and within the companies and concluded that the supply chain practices and metrics are not uniform in Ethiopian supply chains. This paper has significant contribution to the supply chain management academicians and practitioners through identifying supply chain practices and measures to evaluate how well supply chain models fit with theoretical findings and suggestions.**

Keywords: *supply chain performance metrics; manufacturing supply chain; supply chain practices*

1. Introduction

Measures are required to obtain an understanding of how well the supply chain is performing and where to focus management attention to improve performance and plan competitive-enhancing efforts [1]. In today's competitive age, it is proven that many companies have not succeeded in maximising their supply chain's potential because they have often failed to develop the performance measures and metrics needed to fully integrate their supply chain to maximise effectiveness and efficiency [2]. The main problems in performance measurements are incompleteness and inconsistencies in performance measurement and metrics, failing to represent a set of financial and non-financial measures in a balanced framework as some concentrating on financials, others concentrating on operational measures, having a large number of metrics which makes it difficult to identify the critical few among trivial many, failing to connect the strategy and the measurement, having a biased focus on financial metrics and being too much inward looking [2,3]. The lack of proper metrics for a supply chain will result in failure to meet consumer/end user expectations, sub-optimization of departmental or company performance, missed opportunities to outperform the competition, and conflict within the supply chain [4]. Lambert and Pohlen [4] further argue that a major contributor to the lack of meaningful supply chain performance measures is the absence of an approach for developing and designing such measures.

According to Lin & Li [5], there are four challenges in supply chain (SC) performance measurement. These are: (i) the majority of articles are focused on the study of intra-organizational performance, (ii) the previous research did not consider the variation of measured values, (iii) no common metrics existed for evaluating different processes on the same scale and (iv) the process teams should have motivation, capacity, and authority to improve processes and their results. There are difficulties in measuring performance within organizations and even more difficulties arise in inter-organizational performance measurement [6]. The reasons for lack of systems to measure performance across organizations are multidimensional, including non-standardized data, poor technological integration, geographical and cultural differences, differences in organizational policy, lack of agreed upon metrics, or poor understanding of the need for inter-organizational performance measurement. Besides, the right choice of performance metrics and measures is critical to the

International Journal of Supply Chain Management
IJSCM, ISSN: 2050-7399 (Online), 2051-3771 (Print)
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success and competitiveness of the firms in the era of globalisation [7].

The importance of supply chain is well recognized in developed countries. Supply chain issues in developed countries are estimated to consume 10 percent of their Gross National Product. It is projected to be a greater proportion in the developing country like Ethiopia, where a large amount of capital is tied up in inventories and in transportation systems for moving materials. Ethiopia is one of the developing countries where more value is not given to increase customer service level and product expectation, which result in loss of customers that have large economical impact on the organization. So this problem can rectify using supply chain that can serve to increase customer service level. The study by Daniel and Abraham [8], for example, identified some problems associated with logistics and SCM in our country, Ethiopia. Those problems include (1) Low competitiveness with local and global markets; (2) low customer service level; (3) longer lead times; and (4) poor strategic alliance. Today all these problems are prevalent in our industries.

Even if the above chronic problems need the design and analysis of logistics and supply chain management, there is yet little framework to address supply chain practices and supply chain metrics to improve organizational performance and competitiveness. Most of the supply chain management practices and applications including performance metrics are studied in developed nations like in United States, European Union and Japan. No significant literatures are found for those developing countries. However, the supply chains of BRICS (Brazil, Russia, India, China and South Africa) countries gained some momentum from literature even though it is on an infant stage. No single paper in a reputed journals and white papers has revealed the practice of SCM and the SC metrics in the Ethiopian manufacturing and service industries supply chains. Ethiopia, one of the developing nations in East Africa, is now receiving attention from multi-national corporations and transnational corporations who are global supply chain leaders. Currently, Ethiopia has attracted foreign direct investments from European countries, China, India, USA and Egypt. Hence, it is imperative to study the SCM in general and SC practices and metrics in particular for the proper functioning and performing of individual companies toward common goal of satisfying customers with minimum cost. The paper is organized into six sections, the first of which is this introduction; section two covers literature review on supply chain practices and metrics, the third covers brief background of the alcohol and liquor SC, the fourth elaborate and justify research methodology; in section five results and discussions are presented. Finally, conclusions and future works are presented in section six.

2. Literature Review

Performance measurement systems are described as the overall set of metrics used to quantify both the effectiveness and efficiency of action [9]. Effectiveness is the extent to which a customer's requirements are met and efficiency measures how economically a firm's resources are utilized when providing a pre-specified level of customer satisfaction. Performance measurements are becoming more and more important when supply chain management (SCM) is coming into focus [10]. Supply chain performance measurement is a system that provides a formal definition of supply chain performance model based on mutually agreed upon goals, measures, measurement methods that specify procedures, responsibilities and accountability of supply chain participants and the regulation of the measurement system by supply chain participants [11]. Traditionally, the focus of performance measurement has been on process operations within the organizational boundaries of a firm. In the context of SCM, performance measurement involves not only the internal processes, but also requires an understanding of the performance expectation of other member firms in the supply chain, backward from the suppliers and forward to the customers [12].

Different researchers use different ways of determining the performance metrics and measures. Although many researchers used them synonymously, some authors used them differently. Chibba [13] defined metrics as "Metrics is thus the system of parameters or methods for the quantitative assessment of a process to be measured, as well as the procedure involved in carrying out such a measurement." An example of a supply chain performance measure could be delivery: "was the product delivered on time to the customer?" Metrics defines the items to be measured and is usually specifically related to a given subject area, in which case it is only valid within a certain domain and cannot be directly benchmarked or interpreted outside it. Companies use metrics as performance measurements to set standards or incentives for describing and achieving superior performance [14]. According to Shapiro [14], metrics are concerned with utilization (actual input/norm input), productivity (actual output/actual input) and effectiveness (actual output/norm output) with each units are similar in form.

Most of the companies realize that in order to evolve an efficient and effective supply chain, SCM needs to be assessed for its performance [12]. The lack of relevant performance measures has been recognized as one of the major problems in process management and the management of supply chain [15]. Many companies have not succeeded in maximizing their supply chain's potential because they have often failed to develop the performance measures and metrics needed to fully integrate their supply chain for maximizing effectiveness and efficiency. Thus, control of processes in a supply chain is crucial in improving performance and can be achieved through [2].

SCM practices are defined as the set of activities undertaken by an organization to promote effective management of its supply chain. The practices of SCM are proposed to be a multi-dimensional concept, including the downstream and upstream sides of the supply chain [16]. Besides, the SC practices explained by Donlon [17] and Lockamy and McCormick [18] had a good impression in identifying supply chain variables. The supply chain

practices are the values and experiences that are developed in the supply chains to keep the supply chain management moving forward to attain the goals. These practices are so dependent on management theories developed as relational systems, system theories, resource-based view, transaction cost analysis, knowledge-based view, institutional theory, etc.

In summary, previous frameworks related to supply chain performance possess some weaknesses. First, the majority of articles focused on the study of intra-organizational performance; they failed to grasp the idea of how the supply chain has performed as a whole [4]. Secondly, the previous research did not consider the variation of measured values. These values did not present the distribution and uncertainty. Thus, the decision makers found it difficult to find real performance values, identify weak areas, take corrective actions, and make continual improvements. Thirdly, there existed no common metrics for evaluating different processes on the same scale. Different characteristics of associated processes cannot be compared without using the correct metrics. Fourthly, the process teams should have motivation, capacity, and authority to improve processes and their results. This paper answers some of the problems dictated above through the qualitative supply chain measures and practices using questionnaire to convert to quantitative analysis used to infer conclusions.

Basically there are two types of metrics observed in the literature. These are qualitative and quantitative performance measures. The investigation and analyses of quantitative SC metrics are not considered in this paper. The research considers only the qualitative SC metrics which are difficult to quantify. Hence, the descriptive statistics is used to identify and investigate the SC metrics on Ethiopian Alcohol and liquor Supply Chains. From those common agreeable metrics, the qualitative data are identified and analyzed using the case study. In this typical research, the supply chain performance variables of the internal supply chain are analysed by using SPSS 16 and MINITAB 16 for the data output.

3. Brief Background of Alcohol and Liquor Factories' Supply Chain in Ethiopia

Most of the factories own their own fermentation facilities. Using the raw materials all factories distilled themselves to produce pure and denatured alcohols. The secondary process (liquor production and packaging) is similar for most of the factories. Alcohol and liquor factories upstream supply chain has similar pattern in Ethiopia. Most of them purchase the majority of raw materials within the country. Some rugged sizes containing additives and flavors are purchased from abroad as seen. Downstream supply chains are similar in the distribution areas. Some are using different distribution mechanisms and some are more focused to agents throughout the country. The final outcome will be reaching differentiated customers through the distribution channels. The complete supply chain of the factories under study is shown in Figure 1.

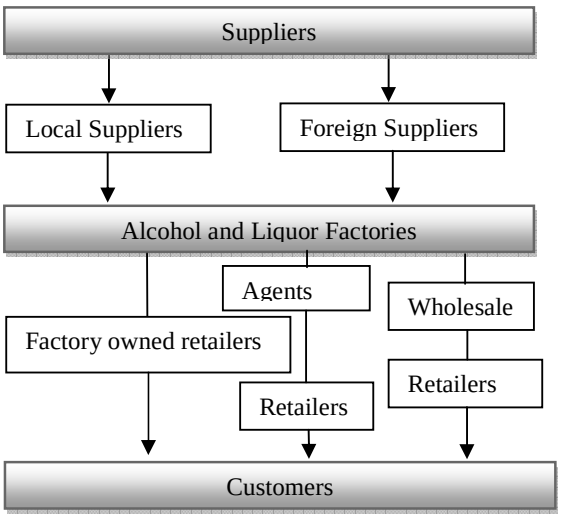

Figure 1. Alcohol and liquor factories supply chain

4. Methodology

The research strategy followed by the researcher was a case approach, which was conducted on five large size alcohol and liquor manufacturing firms located in Addis Ababa and surroundings. The instrument in the form of a questionnaire was designed based on the constructs previously described. Respondents were asked to indicate, using a five-point Likert scale (1 = very low, 2=low,3=average,4=high and 5 = very high), the extent of the 8 qualitative supply chain practices and Likert scale (1=Strongly disagree, 2= disagree,3=neutral, 4= agree and 5= strongly disagree), the extent of the 6 qualitative supply chain metrics. In line with previous research in the field of SCM, this study also measures firms' supply chain performance using the respondent's perception of performance in relation to major industry competitors.

4.1. Sample, Population and Participant

There are around 12 large enterprises of alcoholic beverages producing companies in Ethiopia. Among these, it can be classified in to Beer (5 establishments), Wine (2 establishments) and Alcohol and Liquor (9 establishments) manufacturing companies. Among those chains, the paper investigates the supply chain metrics of those the first five alcohol and liquor supply chains because of the maturity of their supply chains and the size of company. In this study the researcher tried to achieve reliable data by finding respondents who were well informed about the topics asked in their respective organizations. The target respondents within each company were managers whose work directly affects Supply Chain Management Practice. Thus, the survey instrument has been given to 45 middle line managers responsible for supply chain management in their organizations- including, operation managers, purchasing and supply managers, marketing managers, supply chain managers and product design and development managers. 9 questionnaires to each organization were distributed.

Middle-line managers were chosen for this study because they are the executors of strategic decisions. In terms of response rate, 33 out of 45 (Balezaf Liquor Factory (BALF) 8, Silvana Testa (ST) 6, National Alchohol and Liqquor Factory SC (NALFSC) 6, Maru Molla Liquor factory (MMLF) 7, and Kokeb Liquor factory (KLF) 6) responded which is nearer to 60% response rate. Hence the response rate here is considered as sufficient as also accepted by Forza [19]'s claim of 20% response rate.

4.2. Case Study

According to Yin [20], five research strategies for carrying out scientific research are possible and dictated that the case study is the preferred strategy in exploratory research, because: ``how'' questions are posed to identify operational links, which have to be traced over time; the investigator has little control over events (unlike in an experiment); and the focus is on a contemporary phenomenon within some real-life context. Case study research is regarded as a good research method when the research problem can be described with the help of questions how and why. The method is very useful when a researcher cannot control the target. Furthermore, it is useful when the focus is on concurrent events in a real time manner especially when the border between the event and context is not clear.

4.3. Data Source, Data Collection Instrument and Material

Ethiopia as one of the developing countries, lack infrastructure in all of its cities, so that the expansion of major companies are limited to the capital city, Addis Ababa and the surrounding towns in the radius of 110 kms from the city. Once the target city and surrounding towns were determined, we followed Li et al.'s [20] suggestion by focusing on those manufacturing firms with more than 100 employees because the manufacturers with less than 100 employees seldom engage in sophisticated supply chain management. Accordingly the numbers of employees of the case supply chains are above 150. Primary data was collected based on the perspective described in the main construct. Questionnaire was designed to collect information from middle level managers to understand the supply chain performance of each alcohol and liquor manufacturing firm selected for the study. A set of questions on each aspects of the SCM were derived from extensive literature as well as the researcher's discussion with Supply Chain professionals.

4.4. Research Instrument

Figure 2 shows the overall instrument development process that will be used in the paper according to the problem constructs. The variables under each of the constructs are identified from literatures and evaluated to use in developing the initial instruments to measure the constructs. After the initial instruments are identified, pre-testing them, developing content/face validity and refined, the inclusive data will be gathered depending on the instruments (instruments will be included in the structured and unstructured questionnaires). Finally the data is tested for construct validity, uni-dimensionality, consistency and reliability using the software and threshold values set by different researchers.

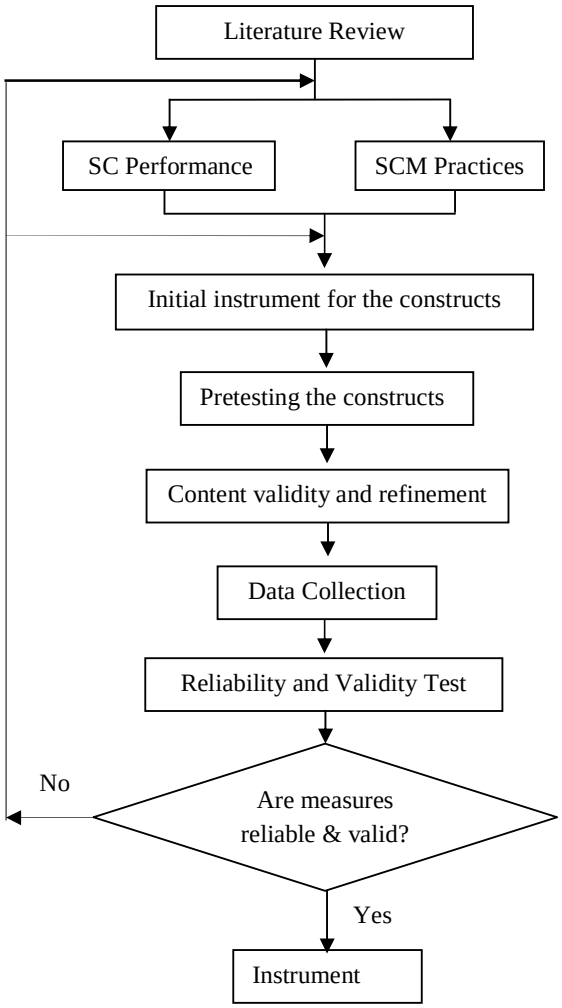

Figure 2. The Instrument Development Process

4.5. Data Analysis, Validity and Reliability

Since the questions are derived from an extensive literature review the measures are generally considered to have content validity. The data obtained through questionnaire is presented and analyzed using descriptive statistics. For the purpose of descriptive analysis, for each and every item the mean value was calculated for each firm under study. Thus, the result has been considered as the performance of a given firm in that particular practice. In addition, Analysis of Variance (ANOVA) was applied

to compare the mean SCM Performance differences among the case firms. In the analysis, the term group was used to represent firm. Thus, five groups indicate five firms selected for the study. In the analysis of variance, respondents in each firm were included to obtain degree of freedom within group.

Using ANOVA, the variation (Sum of Squares), the degrees of freedom (df), and the variance (Mean Square) are given for the within and the between firms, as well as the F value (F) and the significance of the F (Sig.). Significance level indicates whether the null hypothesis-there is no mean difference in supply chain performance among selected firms – has to be rejected or accepted. The *F*-test was used to draw inferences about differences among the firms supply chain performance means. When this is not significant, we may conclude that there is no evidence to say, the performance of firms is different in their respective supply chain. Alpha value is determined by the researcher to be 5% ($\alpha = 0.05$), the researcher declared that events with probabilities under 5% (i.e., $p < \alpha$) are considered rare. These events are not likely to occur by chance and indicate that the null hypothesis (there is no difference among case firms in their supply chain performance) is false; that is, the means performance of firms are not equal. When we reject the null hypothesis, there is, at most, a 5% chance that this decision will be wrong. The researcher has retained (accepted) the null hypothesis when $p > \alpha$ (P>0.05), as there is not enough evidence in the data to reject it. For item reliability, Cronbach's alpha test was calculated to all items arranged in a five point Likert scale, and the test result shows the reliability of the items.

5. Results and Discussions

5.1. Internal Operation Practices and Flexibility

In terms of frequent introduction of new product and improvement of existing model, the case firms were asked to rate their performance level in new product development practice that they implemented, overall lower mean of 3.09 was reported, which shows unsatisfactory level of the practice. However, to rank firms performance level in the practice requested, ST was better in its experience related to new product introduction with a mean of 3.83, followed by KLF whose mean was 3.67, MMLF with a mean of 3.29 and BALF was average with overall mean of 3.13. However, NALFSC is in a lower level in its new product development practices with a mean of 1.50 which affected the overall mean. The complete statistical analysis is given in Table 1.

Table 1. Statistical significance of supply chain practice and flexibility

Supply Chain Internal Practice		**N**	**Mean**	**Std. Dev.**	**Std. Error**	**95% Confidence for Mean**	
						Lower Bound	**Upper Bound**
1)frequent introduction of new product and improve models of existing one	NALF	6	1.5	1.23	0.5	0.21	2.79
	BALF	8	3.13	0.99	0.35	2.3	3.95
	ST	6	3.83	1.33	0.54	2.44	5.23
	MMLF	7	3.29	0.76	0.29	2.59	3.98
	KLF	6	3.67	0.82	0.33	2.81	4.52
	Total	33	3.09	1.26	0.22	2.64	3.54
2) up-to-datedness of production process	NALF	6	2.33	0.82	0.33	1.48	3.19
	BALF	8	2.63	0.52	0.18	2.19	3.06
	ST	6	3.33	0.82	0.33	2.48	4.19
	MMLF	7	3.71	0.95	0.36	2.83	4.59
	KLF	6	3.67	0.82	0.33	2.81	4.52
	Total	33	3.12	0.93	0.16	2.79	3.45
3) internal material and product flow management for main product	NALF	6	3	0	0	3	3
	BALF	8	3.38	0.74	0.26	2.75	4
	ST	6	3.83	0.41	0.17	3.4	4.26
	MMLF	7	3.71	0.49	0.18	3.26	4.17
	KLF	6	3.5	0.55	0.22	2.93	4.07
	Total	33	3.48	0.57	0.1	3.28	3.69

4) flexibility of production system to handle order pattern	NALF	6	3	0	0	3	3
	BALF	8	3.88	1.25	0.44	2.83	4.92
	ST	6	4.17	0.75	0.31	3.38	4.96
	MMLF	7	4.29	0.76	0.29	3.59	4.98
	KLF	6	2.83	0.41	0.17	2.4	3.26
	Total	33	3.67	0.96	0.17	3.33	4.01
5)the extent of made to stock production	NALF	6	3	0	0	3	3
	BALF	8	3.63	1.51	0.53	2.37	4.88
	ST	6	2.5	0.55	0.22	1.93	3.07
	MMLF	7	3.57	0.79	0.3	2.84	4.3
	KLF	6	3.5	0.55	0.22	2.93	4.07
	Total	33	3.27	0.94	0.16	2.94	3.61
6) the extent of made to order production	NALF	6	3	0	0	3	3
	BALF	8	4.13	0.99	0.35	3.3	4.95
	ST	6	4.83	0.41	0.17	4.4	5.26
	MMLF	7	4.71	0.49	0.18	4.26	5.17
	KLF	6	3.5	0.55	0.22	2.93	4.07
	Total	33	4.06	0.9	0.16	3.74	4.38
7) the extent of production automation for main product	NALF	6	3	0	0	3	3
	BALF	8	2.75	0.71	0.25	2.16	3.34
	ST	6	2.67	1.51	0.62	1.09	4.25
	MMLF	7	4.14	0.38	0.14	3.79	4.49
	KLF	6	3	0.63	0.26	2.34	3.66
	Total	33	3.12	0.93	0.16	2.79	3.45
8) the extent of modular system application for production	NALF	6	3.17	0.41	0.17	2.74	3.6
	BALF	8	3.25	1.04	0.37	2.38	4.12
	ST	6	2.67	1.51	0.62	1.09	4.25
	MMLF	7	3.86	0.9	0.34	3.03	4.69
	KLF	6	3.67	0.82	0.33	2.81	4.52
	Total	33	3.33	1.02	0.18	2.97	3.7

Table 2. ANOVA among surveyed firms in relation to internal operations

Hypothesis HO: There is no performance difference among the selected five alcohol and liquor manufacturing organizations in the Following Internal Operation practices	**ANOVA Among Firms**		
	Significance	**-Calculated**	**Decision**
HO : frequent introduction of new product and improve models of existing one	0.004	4.848	Rejected
HO : up-to-datedness of production	0.009	4.131	Rejected
HO :internal material and product flow management for main product	0.075	2.388	Accepted

HO : flexibility of production system to handle order pattern	0.007	4.426	Rejected
HO : the extent of made to stock production	0.148	1.846	Accepted
HO : the extent of made to order production	0	10.03	Rejected
HO : the extent of production process automation for main product	0.012	3.888	Rejected
HO : the extent of modular system application for production	0.267	1.376	Accepted

Significance level for alpha=0.05

Referring Table 1, respondents were asked to rate their production process up-to-datedness, they indicated a slightly more than average level at a mean of 3.12 which is not satisfactory for organizations who operate in a dynamic business environment. However, it was rated higher by MMLF with a mean value of 3.71, followed by KLF and ST with overall mean of 3.67 and 3.33 respectively; while, BALF and NALFSC take the least in this practice with a mean value of 2.63 and 2.33 respectively as shown in Table 1.

In regard to material and product flow management, participants were asked to rate their performance level and the overall mean of 3.48 was revealed, which shows a slightly better internal material flow management for main products; where, ST was rating it in higher level with a mean of 3.88, followed by MMLF a mean of 3.71 and KLF a mean of 3.50. In addition, BALF was slightly better than average a mean of 3.38, while NALFSC reported average level of it with a mean of 3.00. From the overall mean we can understand that, these case firms are better in internal material flow management.

Regarding flexibility of production system to handle order pattern, although the overall mean value of 3.67 was revealed, it was rated in a higher level by MMLF at a mean of 4.29, which indicate its production system flexibility to serve any kind of order from customers. ST and BALF are second and third in their level of flexibility with 4.17 and 3.88 respectively. However, NALFSC was rating it a mean at an average level; while, lower practice level was reported by KLF at a mean of 2.83, which shows that, there is a low level of flexibility in firms reported below average, which can reduce their capacity to address different order pattern.

In terms of innovation, these firms under study were asked to score the level of innovation occurring in relation to their main product, the overall mean of slightly better than average was reported at a mean of 3.21. However, to rank based on the level of the performance of firms, MMLF was better in its innovation with regard to creating new design as well as adopting the existing design with a modification. And it was indicated at a mean of 3.71, KLF was second in this practice with a mean of 3.50, followed by ST a mean of 3.33 and BALF a mean value of 3.25; whereas, NALFSC rated on this practices as low than the rest of surveyed firms with a mean of 2.17.

In terms of Made-to-Stock production, although the overall mean identified was 3.27, there were firms whose average mean exceeds the overall mean. To rank them, BALF was rating this practice in a better than average level at a mean of 3.63 followed by MMLF with a mean of 3.57, and KLF with a mean of 3.50. It was also indicated that NALFSC is at an average level in its Made-to-stock production a mean of 3.00; in addition, ST was in a lower level at a mean of 2.5. The result from the overall mean revealed that firms did not give sufficient attention to Made-To-Stock production which is related with producing standardized product for inventory and customer will be served from the available inventory.

MTO production performance is rated in the overall higher mean of 4.06, however, these five firms are scored different level; where, ST was in a very high level of MTO production with a mean of 4.83 which can be interpreted as they are able to serve customers individualized need when ordered, it was followed by MMLF a mean of 4.71, and BALF with a mean of 4.13. However, KLF and NALFSC were not scored a higher level as the other firms are, with a mean of 3.50 and 3.00 respectively.

In regard to production process automation, the overall mean of 3.12 was reported, which has shown us the low level of computerized equipment utilization in the production process of the case firms. However, MMLF has a higher level of automation in its production process with a mean of 4.14, followed by NALFSC and KLF whose practice level is at an average level with a mean of 3.00, while, BALF and ST reported a lower level of process automation with a mean of 2.75 and 2.63 respectively. We can understand from the result that, except MMLF all firms are not good at implementing production process automation.

In terms of modular system application, the overall mean of slightly better than average was reported. In addition, it was shown that, MMLF was good in its modular system application for production with a mean of 3.86, it was considered as good practices for firms like MMLF to concentrate on modular design if they preferred an MTO production system, in order to reduce cost of production. And it was followed by KLF with a mean of 3.67 and BALF with a mean value of 3.25 while NALFSC reported a slightly better than average mean value of 3.17. However, ST is in a lower level of this practice with a mean value of 2.67, which wouldn't be favourable for firms who rely on MTO production such as ST, to set modular system aside, since the cost of producing each design will be aggravated.

ANOVA is used to identify and differentiate the practices and metrics used by the supply chains within the chain and among the chain. The complete formulations of hypothesis test and significance calculation are shown in

Table 2 for internal practices and flexibility measures. It is shown that, with a 5% significance level, null hypothesis one and two are rejected, since, these five firms are significantly differ with the practices related to frequent introduction of new product and improvement of existing design, F (4, 28)=4.848, P=0.004. In addition, practices with related to up-to-datedness of production system significantly differ among these five firms, F (4, 28) =4.131, P=0.009. However, null hypothesis three is accepted because there is no significant difference identified among firms in regard to internal material flow management F (4, 28) =2.388, P=0.075. Nevertheless, hypothesis four is rejected due to the fact that firms significantly differ in their flexibility of production system to handle order pattern, F (4, 28) =4.426, P=0.007. With 5% significance level hypothesis five is accepted because there is no significance difference identified among firms with respect to; made-to-stock production F (4, 28) =1.846, P=0.148 and modular system application F (4, 28) =1.376, P=0.267. However, surveyed firms significantly differ in their; made-to-order production F (4, 28) = 10.030, P=0.00 and with regard to production process automation for main products F (4, 28) =3.888, P=0.012. Thus, hypothesis eleven is rejected and twelve is accepted as can be clearly seen in Table 2.

5.2. Supply Chain Performance Metrics

Again referring Table 3, with regard to faster delivery of products and service to customers in comparison with competitors reported the overall mean of 3.52 for all groups. MMLF performed better in its faster delivery performance compared with its competitors and indicated it at a mean of 3.71. The second in faster delivery performance was ST with a mean of 3.67 followed by BALF and KLF with a mean value of 3.63 and 3.5 respectively. However, the performance of NALFSC was moderate at a mean of 3.00.

In regard to on-time delivery performance, overall mean of 3.70 was revealed. Furthermore, MMLF was in a higher on-time delivery performance with a mean of 4.29, followed by ST and KLF equally at a mean of 3.67 and BALF at a mean of 3.63, whereas, NALFSC was slightly better than average with a mean of 3.17 as shown in Table 4 . In terms of product and service quality, it is shown that ST has a very higher level of quality performance with a mean of 4.83 followed by NALFSC who performed well in its quality at a mean of 4.00. BALF was in a third position at a mean of 3.88, while MMLF and KLF performed at a mean of 3.71 and 3.67 respectively.

A higher cost reduction performance were reported by NALFSC with a mean of 4.00 followed by MMLF whose performance mean was 3.86. In addition, KLF was in a better position at a mean of 3.83 in cost reduction performance although it was surpassed by the above two companies. However the lower performance was also indicated by BALF and ST at a mean of 2.63 and 2.17 respectively. In terms of damage reduction, it was shown that, ST was in a better position at a mean of 4.17 at reducing damage in the order to customers followed by MMLF at a mean of 4.14 and BALF a mean of 3.88. NALFSC reported a mean (3.17) slightly better than average, while a lower performance level was reported by KLF.

Regarding responsiveness to customer order, both ST and MMLF reported a higher level of performance with a mean value of 4.00. It was also indicated that BALF was better in its performance related to responsiveness to customer order at a mean of 3.88, while KLF reported a mean of 3.50. However, NALFSC performed a lower level of responsiveness at a mean of 2.17.

Table 3. Statistical significance of SC metrics

Supply Chain Metrics		N	Mean	Std. Dev.	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
1) we deliver our products and services faster than our competitors	NALF	6	3	0	0	3	3
	BALF	8	3.63	0.52	0.18	3.19	4.06
	ST	6	3.67	0.52	0.21	3.12	4.21
	MMLF	7	3.71	0.76	0.29	3.02	4.41
	KLF	6	3.5	0.55	0.22	2.93	4.07
	Total	33	3.52	0.57	0.1	3.31	3.72
2) our on-time delivery performance is better than our	NALF	6	3.17	0.41	0.17	2.74	3.6
	BALF	8	3.63	0.52	0.18	3.19	4.06

competitor	ST	6	3.67	0.52	0.21	3.12	4.21
	MMLF	7	4.29	0.49	0.18	3.83	4.74
	KLF	6	3.67	0.52	0.21	3.12	4.21
	Total	33	3.7	0.59	0.1	3.49	3.9
3) our product and service quality is better than our competitors	NALF	6	4	0	0	4	4
	BLF	8	3.88	0.35	0.13	3.58	4.17
	ST	6	4.83	0.41	0.17	4.4	5.26
	MMLF	7	3.71	1.11	0.42	2.69	4.74
	KLF	6	3.67	0.52	0.21	3.12	4.21
	Total	33	4	0.71	0.12	3.75	4.25
4) our operating costs are lower than our competitors	NALF	6	4	0	0	4	4
	BALF	8	2.63	0.52	0.18	2.19	3.06
	ST	6	2.17	0.41	0.17	1.74	2.6
	MMLF	7	3.86	1.07	0.4	2.87	4.85
	KLF	6	3.83	0.41	0.17	3.4	4.26
	Total	33	3.27	0.94	0.16	2.94	3.61
5) no damage in the order to the customer	NALF	6	3.17	0.41	0.17	2.74	3.6
	BALF	8	3.88	0.35	0.13	3.58	4.17
	ST	6	4.17	0.41	0.17	3.74	4.6
	MMLF	7	4.14	1.22	0.46	3.02	5.27
	KLF	6	2.83	0.41	0.17	2.4	3.26
	Total	33	3.67	0.82	0.14	3.38	3.96
6) responsiveness to the customer orders	NALF	6	2.17	0.41	0.17	1.74	2.6
	BALF	8	3.88	0.35	0.13	3.58	4.17
	ST	6	4	0	0	4	4
	MMLF	7	4	0.82	0.31	3.24	4.76
	KLF	6	3.5	0.55	0.22	2.93	4.07
	Total	33	3.55	0.83	0.15	3.25	3.84

Table 4. ANOVA among surveyed firms in relation to SC performance

Hypothesis	**ANOVA Among Firms**		
HO: There is no difference among these five Large and Medium size alcohol and liquor manufacturing organizations in the Following Supply chain performances	**Significance**	**F-calculated**	**Decision**
HO : we deliver our products and services faster than our competitors	0.155	1.811	Accepted
HO : our on-time delivery performance is better than our competitor	0.008	4.286	Rejected
HO : our product and service quality is better than our competitors	0.015	3.697	Rejected
HO : our operating costs are lower than our competitors	0	12.215	Rejected
HO : no damage in the order to the customer	0.003	5.208	Rejected
HO : responsiveness to customer order	0	14.541	Rejected

Significance level for alpha α =0.05

ANOVA with regard to supply chain performance, it is identified that with a 5% significance level, except the first null hypothesis all are rejected. There is no significant difference among surveyed firms with respect to delivery of products faster than own competitors, F (4, 28) =1.811, P=0.155. However, in terms of on-time delivery to customer in comparison to competitors, these firms significantly show a different as shown in Table 4. F (4, 28) =4.286, P=0.008. In addition, these five firms are significantly differ in their product and service quality compared with their competitors F (4, 28) = 3.697, P=0.015. It is also revealed that, the case firms are significantly different in their operating cost reduction in comparison with their competitors with a 95% confidence interval, F (4, 28) =12.215, P=0.000 as been calculated and tabulated. In addition, there is a significant difference in reducing damage among surveyed firms. F (4, 28) =5.208, P=0.003. In regard to responsiveness, these five alcohol and liquor manufacturing firms significantly differ with performances related to responsiveness to customer order F (4, 28) =14.541, P=0.00.

6. Conclusions and Future Work

Different literature conducted under SCM shows the importance of Supply Chain Management practice to firms' competitive advantage as well as performance. This study like other research in the area found out, the level SCM practices in selected large alcohol and liquor firms. As revealed in the study, each firm's has had different performance level in implementing those supply chain management practices and metrics. In addition, the result revealed that, one supply chain practice is implemented better than the other in the selected alcohol and liquor firms.

The results also indicated that, with 5% significance level firms significantly vary in their new product development, flexibility of production process, innovation, the extent of made to order production and production process automation. Due to this fact, the null hypotheses for the above practices are rejected. Whereas null hypotheses related to; internal material flow management, made to stock production and modular system application for production are accepted because of the non significance difference identified among surveyed firms. It was also discovered that, these five alcohol and liquor firms are significantly differ in all supply chain performance practice except, the first hypothesis which claims, faster delivery service to customer in comparison with their competitors, thus all null hypotheses except the first one were rejected. Regarding the best performance of firms under study, the researcher finally arrived at the following conclusion from the analysis.

It can be also concluded that NALFSC is good at supply chain performance related to customer aspects and delivering products on-time to customers. MMLF's efforts exerted to develop new products, to improvements of existing design and innovation occurring is good including the flexibility of their production process to handle order pattern is also appreciable. ST's production process they implemented is up-to-date which help them to better adopt with the changing business environment. BALF performed well in its flexibility to handle order pattern is good. Finally, KLF' new product development function and the flexibility of its production process to handle different order from customers are among the performance that can better express the supply chain.

While the research is done on one of the developing countries, it has significant contribution to the supply chain management academicians and practitioners. It has also advantage for Ethiopian and foreign companies. For Ethiopian companies, it helps to identify supply chain practices and measures to compete effectively and to evaluate how well supply chain models fit with theoretical findings and suggestions. For foreign companies, it shows the position of Ethiopian manufacturers towards supply chain management for further collaboration and entry in to the country using the companies as a partner.

The aim of the authors in the near future is to evaluate the supply chain metrics of Ethiopian manufacturing supply chains in adding leather and leather products, garment and textile products and agro-industries supply chain together with beverage supply chains. The other focus is will be incorporating both quantitative and qualitative supply chain metrics in order to evaluate the Ethiopian supply chain.

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