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Evaluation of the Supply Chain for Coloured Gemstones: The Case of Sri Lanka

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1. Introduction

Every product has a Supply Chain (SC) consisting of several integrated processes, extending from raw materials to end products and beyond end use. Supply chain management is important in any industry. Attention to SC concepts was especially vital in manufacturing industries due to industrial changes such as rising costs and shrinking product life-cycles which made reduction of overall cost and enhancement of profitability imperative. Mining industries have also begun to adopt SC practices, not only for aforementioned reasons but also for sustainable and ethical purposes too. This is the trigger for the SC application in gemstone industry [1].

Generally, gemstones are defined as rare and hard materials used for adornment or decoration, and these include diamonds, rubies, sapphires and emeralds. Even though diamonds are gemstones, the industry maintains a scientifically illogical distinction between diamonds and other gemstones. Gemstones which are not diamonds are denoted as “coloured” gemstones [2].

A gemstone SC consists processes such as extraction, rough gemstone trading, cutting and polishing, polished gemstone trading, jewellery manufacture, wholesale and retail, and participants such as miners, rough gemstone sellers, buyers for cartels and collectors, gemstone dealers and retailers [3]. In a traditional industry, gemstones are passed through these participants to retailers with low-profit margins, compared to wholesale companies like De Beers who uses their own mines to extract gemstones. There are other SC structures practised in between these two extremes with a varying number of intermediaries and performance.

From ancient times to the present, Sri Lanka holds a prominent position for coloured gemstones. In 2014 gemstone exports were accounted for 1.3% of total export value which is approximately 18.65 billion rupees. This shows a great value created by the local gemstone industry and yet it is a secretive industry due to community-based, informal and traditional market practices. More than 50 varieties of gemstones are mined in Sri Lanka and some other varieties are imported, and go through a series of processes, triggering the gemstone SC. There has been very little research on the

gemstone SC in Sri Lanka and this assessment identifies and maps existing SC structures.

2. Research Objective

The Sri Lankan coloured gemstone industry as a whole faces intense competition from global players. Implementing SC practices can improve the position of the country but the lack of scientific studies in this area make it hard for researchers to analyse and recommend best practices. Therefore, this study aims to fill this gap. The objectives of this research are

1) to identify and map existing coloured gemstone SC structures
2) to identify factors affecting SC performance and
3) to evaluate the performance of existing coloured gemstone SC in Sri Lanka.

3. Methodology

This research employed a mixed approach where both interviews and survey was carried out. Data were collected from SC stakeholders using interviews in order to identify SC structures. Interviews were conducted until saturation point where nothing new comes from SC participants. The researcher visited the Ratnapura, Beruwala and Gintota, and Colombo areas to interview gemstone miners, rough and polished gemstone dealers, and gemstone exporters respectively. Using collected data and Value Mapping Tool, the researchers identified different SC structures existing in Sri Lanka. Also, the researchers used online surveys to collect data to evaluate the performance of coloured gemstone industry and to prioritise performance measures. Respondents were from gemstone business background, consisting miners (12.9%), rough gemstone dealers (16.1%), polished gemstone dealers (29%), gemstone brokers (12.9%), gemstone exporters (22.6%) and interested parties who are willing do business in future, who already did business and gemstone enthusiasts (38.7%). Data collected were further analysed using Analytical Hierarchy Process techniques.

4. Data Analysis

Data collected through interviews was used to construct coloured gemstone SC structures in Sri Lanka. It is considered that the end users of coloured gemstone SC of Sri Lanka are jewellery retailers, wholesalers and manufacturers, and gemstone collectors. The following SC structures were identified.

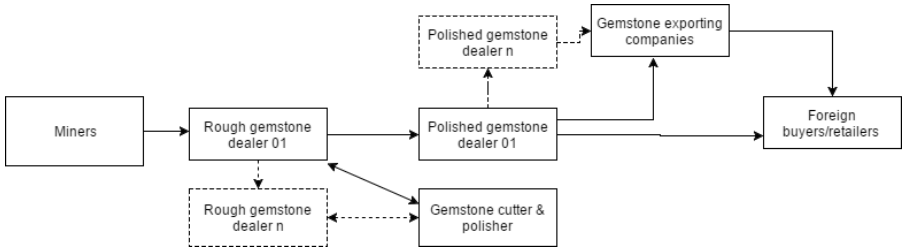

Figure 1: SC Structure without brokers

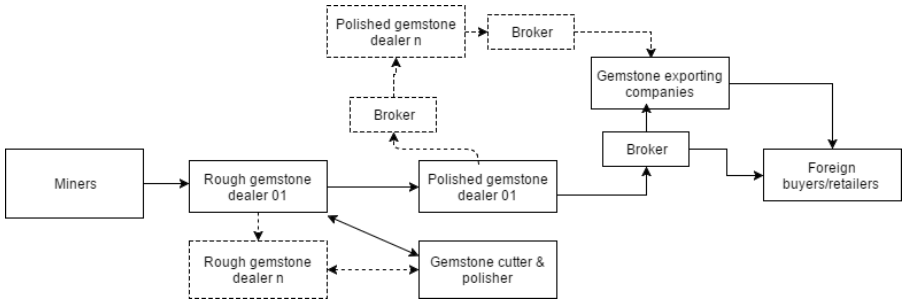

Figure 2: SC Structure with brokers

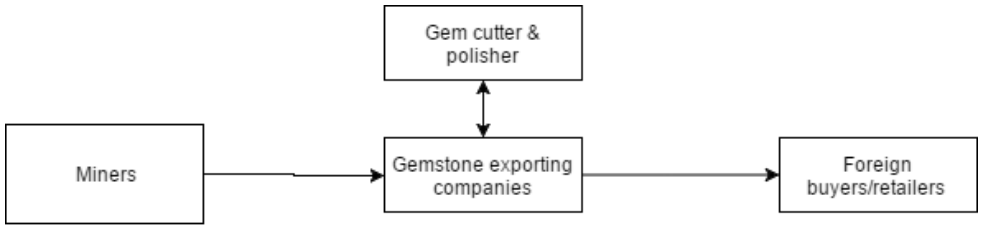

Figure 3: Direct buying from miners

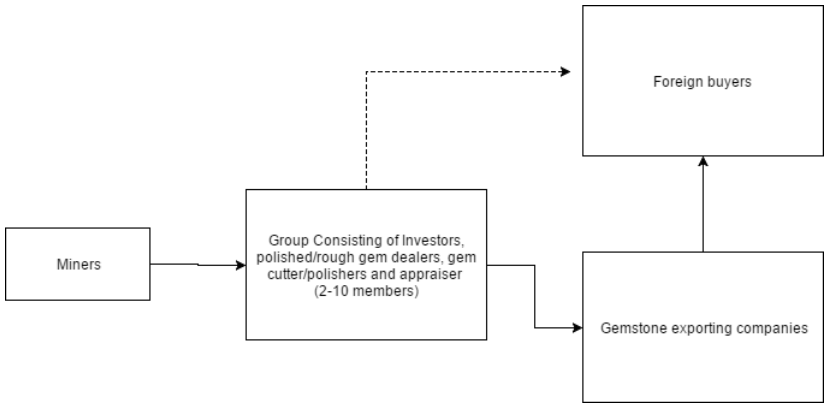

Figure 4: Group purchasing

Since there is no previous published research on this subject area, the researchers has used the understanding of general industry practices and the work done by Gunasekaran [4] to identify measures related to coloured gemstone SC performance. It is identified that selling price of gemstones to end users is the main factor affecting SC performance and that selling price depends on the following performance measures: level of perceived value of the gemstone, quality of a gemstone, cash flow time, return on investment (ROI) and buyer-supplier relationship. First, the perceived impact of performance measures on increasing selling price is identified. Figure 5 shows the frequency distribution of respondents on five performance measures.

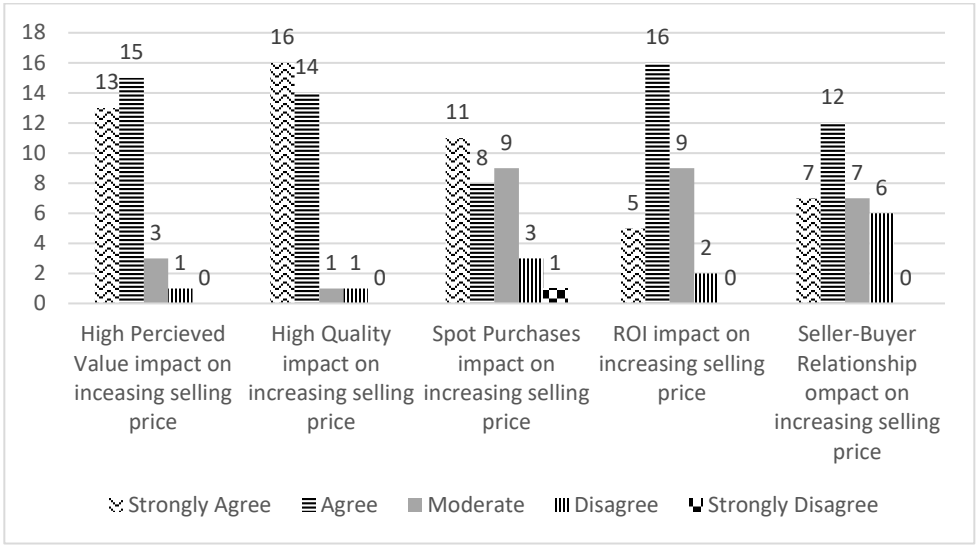

Figure 5: Perceived Impact of Performance Measures on Increasing Selling Price

Analytical Hierarchy Process is then used to prioritise performance measures impact on increasing the selling price of coloured gemstones. Table 1 shows the results of analytical hierarchy process for 32 respondents.

Table 1: Pairwise Comparison of Performance Measures

Performance Measures	Perceived Value	Quality	Spot Purchase	ROI	Supplier-Buyer Relationship	Priority Vector	Rank
Perceived Value	1	0.763	2.304	1.686	1.374	0.251	1
Quality	1.311	1	1.784	1.410	0.968	0.250	2
Spot Purchase	0.434	0.561	1	0.564	0.480	0.113	5
ROI	0.602	0.709	1.773	1	0.692	0.163	4
Supplier - Buyer Relationship	0.728	1.033	2.083	1.445	1	0.223	3
CI	0.01			Inconsistency is acceptable			

As per the AHP analysis, it was observed that the perceived value of the gemstone is the most important determining factor for selling price, where it is followed by the quality of the product. The supplier-buyer relationship also has a significant impact on selling price.

5. Conclusion

This research has identified four different types of gemstone SC structures in Sri Lanka. The performance of SC is mainly reflected through the selling price of the gemstone, and as to analytical hierarchy process it is identified that selling price is mainly decided by the perceived value and quality of gemstone which are approximately equal (25%) in priority vectors. Though quality of a gemstone is high, most of the buyers and sellers in Sri Lanka also depend on perceived value of gemstone to determine the price. Moreover, there is a considerable impact of supplier-buyer relationship in increasing selling price. Buyers are more willing to buy from known suppliers for higher prices. ROI and spot purchases are least important.

6. References

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Keywords*: gemstone supply chain, supply chain structure, supply chain performance, evaluation, Sri Lanka*