

# **Guide to a Strategic Procurement Planning Approach on Regulated Commodity Markets**

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**Abstract.** The access of Virtual Organizations to raw materials normally requires external resources. In many cases, the market for raw materials is regulated and the VO principles of trust, customer orientation etc. are not applicable. In consequence, the VO needs to provide reliable solutions for the customer while being dependent on the access to the required raw materials. The objective of the proposed paper is to present a guide to a strategic procurement planning for the manufacturing industry on regulated commodity markets. This guide can be used to evaluate specific sourcing options. The main goal of this guide is to identify the negative effects of market regulation at an early stage and reduce them by developing strategic alternatives. The successful application of this guide is demonstrated by the practical example of the refractory industry and one of their commodities, refractory grade bauxite.

**Keywords:** Raw materials, regulated markets, virtual organizations, converters

## **1 Introduction**

Today's business environment is a global one. The ever-faster globalization and the increasingly open worldwide marketplace provide a wide variety of suppliers and potential partners to establish order specific, customer driven networks. In this environment companies reach their individual attractiveness as business partner through reducing their manufacturing penetration and focusing on their core competencies [1]. The single company/entity in the network, the virtual organization, is getting leaner. The virtual organization on the other hand is getting more flexible [2] in order to fulfill the customer demands. To achieve this goal, the single, lean and efficient, companies have to work closer together and develop a working relationship to succeed and be competitive. In general, it is not possible anymore for a single entity to achieve market success nowadays. Market success is a collaborative issue, risks and benefits shall be distributed among the participating partners. The chance to reach the goal of fulfilling customer needs depends largely on the companies' capability to commit to the appropriate partners for a specific product line-up and to design these relations in the most effective way [3]. The strength and competitiveness of these relationships is mostly based on factors like reliability, responsiveness, resilience [4], [5], reliance and trust [2]. Responsiveness describes the need for agile

cooperation in virtual organizations and towards customers, whereas reliability, reliance and trust point out the need for a trustful relationship facing the uncertainties of a complex and turbulent business environment. The same challenges increase the need for resilience to build strong and competitive structures. In this era of „Supply Chain Competition“ [5] complex constructs of interrelated partners try to attract global customers [5], [6].

The outward boundaries of a collaborative network are hard to define. But at least two entities with interfaces to the outside business environment can be identified: one towards the consumer and one towards the supply side, the converter, who has to run the commodity procurement to provide the network with the right resources. Raw material suppliers themselves are mostly not part of the network. This article focuses on the converter, as he is the first stage of value creation inside the collaborative network and has to take care of the supply of necessary raw materials for the whole production process. All value added processes of the collaborative network begin with the procurement [7], [8] of raw materials. Without a reliable access to the needed raw materials, the customer needs cannot be fully fulfilled and the competitiveness of the whole collaborative network is in danger.

United to achieve the common purpose of customer orientation and the ability to react quickly to market needs, theoretical and applied science developed various approaches to integrate production structures [9], [10]. The latest papers on partnership-design are often based on the collaboration approach as the whole concept of virtual organizations/collaborative networks are based on that. Collaboration bases on the assumption that companies' involved have a desire to be reliable partners trusting each other and to agree on a common goal and that there is the possibility to successfully reach that goal. Hence, they recommend methods and tools, which support and boost a cooperative target achievement [11], [12]. The converter, on the one hand is part of such a virtual organization/collaborative network and as such, is committed to the goals of the virtual organization to achieve customers satisfaction. On the other hand, the converter he has to deal with parties, who have no stake in the collaborative network themselves and are not committed to the goals of the virtual organization. These outside parties, mostly raw material producers, do not care much about the principles like reliability, trust and reliance which are so important for the relationship of the partners inside the network. They primarily focus on their own progress and profits. As the whole virtual organization depends largely on a secure, reliable and steady supply with specific raw materials the question is, how the virtual organization can fulfill the common goal of satisfying customer expectations under these circumstances? The converters, as the link between the virtual organization and the outside parties with no stake in the network, have to deal with these uncooperative raw material producers on the one hand and with cooperative partners who expect a trustful and reliable relationship on the other hand. So the widely discussed tools focusing on a cooperative target achievement, are not or just partly applicable in such a case. Therefore, there is a need to describe the problems of the parties of the network who have to interface with uncooperative players in addition to the various available frameworks focusing on cooperative thinking partners. This topic is of increasing importance, as the supply of various raw materials will become more restricted, in terms of availability, price and many more.

## **2 Commodity Markets and Regulations**

In order to understand the procurement processes for raw materials, knowledge of commodity markets and their driving mechanisms is necessary. It has to be noticed, that there is no commodity market in general, depending on the individual raw material the basic market conditions may strongly vary. Raw materials have an inner value and are not unique; they can be easily substituted among each other [13]. In general, availability of some specific raw materials plays a decisive role for the economic power of a community [14]. The worldwide raw material deposits are limited and they are not equally allocated around the globe. Increased worldwide usage of various raw materials, like copper, iron ore and bauxite [15] add to the limited availability. The spreading of the deposits is a major reason for the global nature of the commodity markets, as suppliers and customers are often stationed different continents. Therefore, raw materials are mostly traded worldwide with global pricing. This price is influenced by various factors. One of these factors is stock jobbing [16]. Others, like substitution- and recycling-processes are directly connected to supply and demand, as these factors increase or decrease the global availability. Furthermore, price developments depend on currency fluctuations, as raw materials are largely priced in US\$, and the geographical location [17], first influencing the prices due to logistic costs and, maybe even more important, local customs like corruption and security situation. Characteristic for the commodity market is also the size and market power of the raw material producers. The need for huge capital investments and the potential economies-of-scale led to a consolidation process among the major players [14]. Thus, the market power of the commodity suppliers is elevated by their size and their control of the deposits. Hence, the few available options for alternative sourcing becomes even more constricted [18], [19].

With this background knowledge about commodity markets and their basic mechanisms, there can be certain regulatory mechanisms identified. A narrow definition of regulation is the direct interference of a government in the free market conditions [20], [21]. In this article the regulation concept is interpreted wider and the essential points will be structured in natural and artificial categories. In this scenario, natural regulations compromises regulatory mechanisms, which cannot be directly influenced to reach a certain goal. Whereas, artificial regulations include practices to influence the market conditions or the free trade on purpose with a specific goal in mind. The mapping of the different regulations to the two categories can be retraced in figure 1.



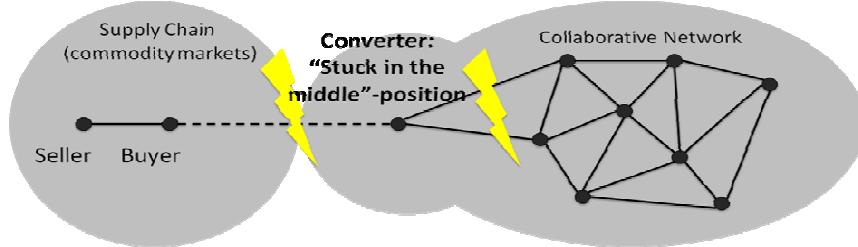
**Fig. 1.** Regulations with strong influence on the commodity market

The **natural regulations** are interconnected, as exploitation of the limited worldwide resources is additionally limited by economical and sustainability considerations. Furthermore, as a major part of the deposits is located in political unstable areas or areas with a high corruption and/or crime rate, where security considerations can be also seen as a natural regulation factor with some artificial fractions. The **artificial regulations** on the other side are mostly based on decisions of the importing or exporting country/state in order to protect their own economy, for strategic considerations or even as a punishment for others. Even so organizations like the World Trade Organization (WTO) limit the administrative discretion, there are various regulative laws and rules in place. Furthermore, non- or part-governmental groups actively influence the market in many ways too. And, as mentioned before, the monopolistic nature of the commodity market with just a few players having control over the majority of the deposits can regulate the market by an increase or decrease of the worldwide production.

### 3 Assessment of Improvement Possibilities

The procurement processes of the converter, as the interface of the integrated supply network to the uncooperative raw material producers, are strongly influenced by the regulations on the commodity market. Due to these regulations and the often unpredictable and unstable supply, the converter has a hard time fulfilling expectations of its fellow partners further down the integrated network. These

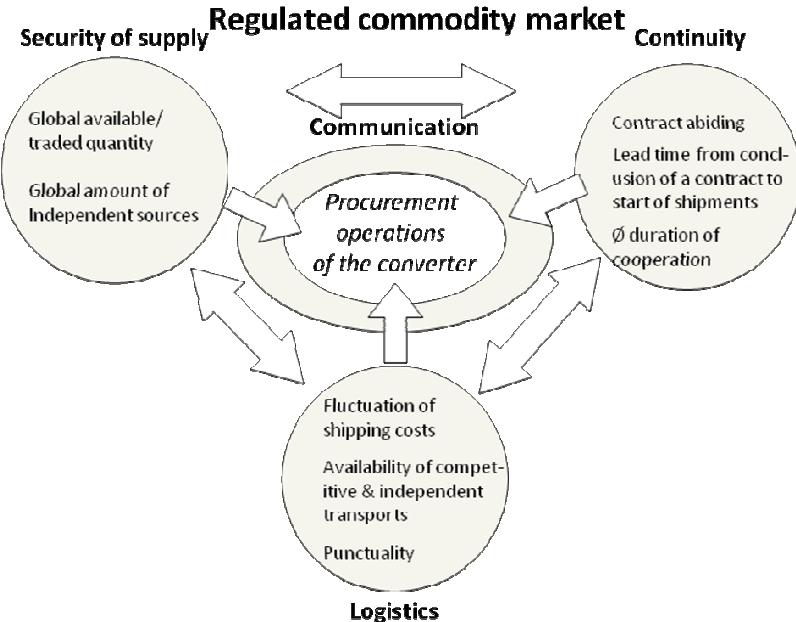
Expectations can include providing flexible and reliable high quality supplies [5] at a competitive price in the right quantity the right time [16]. Most production processes of the network are based on a reliable and steady supply from the converter. When the converter cannot fulfill this demand because of the difficult procurement situation on the commodity market, he will get in trouble with its partners, who are mostly large companies with a strong buying power. In this situation, the converter faces an unsteady, unpredictable situation with uncooperative players on the supply side and powerful partners with high expectations on flexibility and reliability on the customer side (see figure 2).



**Fig. 2.** Stuck in the middle position of the converter between raw material suppliers outside and customers inside the virtual organisation

The whole virtual organization, especially the converter, has to improve its procurement processes to satisfy its customer needs inside the collaborative network. In order to define strategic procurement strategies to strengthen the position of the virtual organization, it is necessary to assess the current situation individually. The assessment of the individual procurement situation is based on four factors, which allow describing the performance qualitatively as a starting point for a later selection of promising actions. The factors of choice match the special requirements of a regulated commodity market and are supposed to be crucial measures for the performance [22]. They are based on procurement requirements, which are generally seen as premises in a working collaborative network, but are still essential in the area of raw materials procurement.

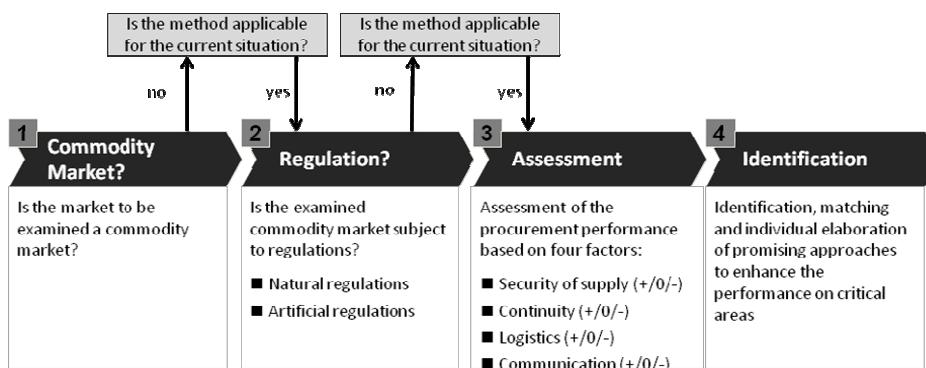
Figure 3 shows the four factors, security of supply, continuity, logistics and communication, and their interconnections including a brief explanation to each of them. The factor communication stands out, as it can have alleviative or cumulative implications on the performance of each of the other factors due to its generic nature. Once the assessment of the current procurement situation is completed and the result is available in a qualitative form (+/0/-) for each factor, the next step is to identify promising procurement strategies, which suit the result best. First, the possible approaches have to be cumulated.



**Fig. 3.** Factors to assess the qualitative performance of the virtual organisation's procurement processes

A good way to generate various approaches is to check best practice methods from other industries or known creative methods like brainstorming within a group of experts. The assumed impact of every one of these approaches on the four factors, based on the individual situation, has to be estimated. The resulting list of the approaches and the need for improvement, gathered during the assessment, can be matched now. That way the approaches with the most impact on the identified critical areas can be found and elaborated in detail.

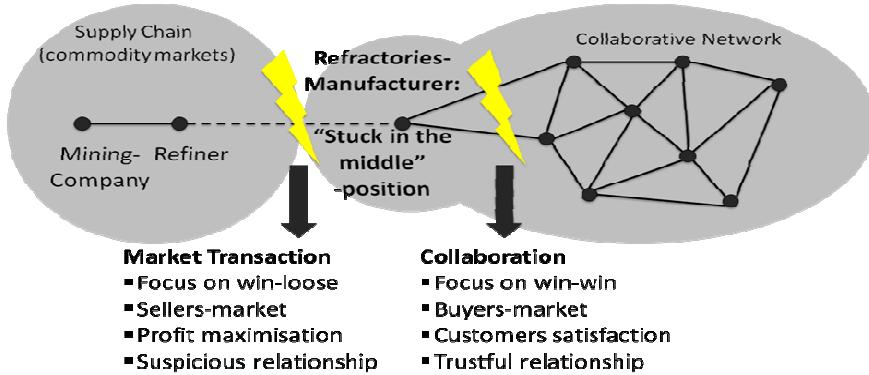
Figure 4 gives an overview and a framework of the presented model:



**Fig. 4.** Enhance the procurement performance of VOs facing raw material suppliers

#### 4 Practical Example: Procurement Situation for Refractory Grade Bauxite

In order to demonstrate the application of the presented model, the framework will be used to analyze the procurement situation of a refractories manufacturer in the field of refractory grade bauxite. The collaborative network involved is a very demanding one. The refractory manufacturers secure the supply of high quality refractories to for example the steel industry. The steel industry then produces high quality steel for the automotive industry, known as a very demanding industry in terms of expectation in deadlines and quality. Without a reliable, steady supply of high quality raw materials for the converter, here the refractories manufacturer, the whole virtual organization faces major problems through all stages of the manufacturing process.



**Fig. 5.** Challenges faced by refractories manufacturers (converters) stuck in the middle between raw material suppliers outside and customers inside the virtual organisation

As described, does the situation in the market for refractory grade bauxite contain all above discussed challenges, which are summarized in figure 5. This example will be analyzed according to the presented framework (see figure 4) in the following:

**Commodity Market and Regulation:** The raw material refractory grade bauxite is a specific quality of bauxite and is the basic material for industrial refractories. These refractories are used by various industries, like the iron- and steel-industry, which is the major consumer. The raw material supply of refractory grade bauxite is regulated in many different ways, both natural and artificial, what makes it a good and coherent example. Especially, since the regulations directly influenced the price development and the availability of certain qualities.

The market for refractory grade bauxite is regulated by all the presented natural regulations. The natural occurrences are limited to three locations worldwide, China, Guyana and Brazil, but just the Guyana and China deposits are currently exploited. As if not enough, the deposits in Guyana are exploited by governmentally owned Chinese

companies. That is the direct link to the artificial regulations in place. China introduced various export-taxes, -duties and –quotas and the global customers have no alternative due to the monopolistic structures of the market. Bottom line is, the converter has to face an unsteady, unstable supply with increasing prices and on the other hand, with the big steel producers, powerful and demanding customers. The first two requirements of the framework, being a commodity market with regulations are fulfilled here. In the following the critical areas with a need for improvement will be identified using the introduced model. Later on, some examples of promising approaches will be presented.

**Assessment:** The factor security of supply rates very low in this case, as there is practically just one source for the raw material worldwide and the globally traded volume is considerably below the global demand. A similar negative performance can be noted for the factor continuity. Contracts are often not fulfilled and they are mostly signed shortly before the shipment. The result of the factor logistics is also negative, as the shipping rates vary heavily and the upstream processes are unreliable too. The last factor communications completes the negative performance evaluation as the cultural differences and language barriers add to the problems.

**Identification:** The result of the assessments indicates that an improvement in every area is needed. So in the end, an identification of a mix of different approaches targeting the specific needs for improvement is indicated. Examples for such approaches are the exploitation of alternative deposits outside of the area of influence of China, advanced materials preparation techniques in order to have a wider choice of supply qualities and a close cooperation between the new raw material producer of the alternative source. These are just examples of how promising approaches may look like, but there is no limitation on the creativity to target the challenges on improving the critical performance issues.

## 5 Conclusions

The global need for raw materials is increasing erratically as developing economies, like the BRIC-countries, are demanding their share [15], [23]. This trend will increase further in the future and more and more raw materials will be involved. This represents an eminent threat for almost all producing companies. Even so, virtual organizations are supposed to include all stages of a manufacturing process, in the case of basic supply with raw materials it might not be possible to convince raw material producers of the advantages for him to join the virtual organization with the common goal to satisfy customers expectations. In such a case the success and competitiveness of the whole virtual organization depends on a possibly very opportunistic party with strong selling power.

In that situation, the procurement of raw materials becomes the key factor for success for every producing virtual organisation. The commodity market distinguishes itself in various parts from other markets. A major attribute is the global nature, the unwillingness of the suppliers to integrate into collaborative structures and

the many regulations. These attributes are all limiting the free trade and endangering the ones who do rely on a reliable and steady supply. Especially the role of the converter and how it handles its procurement process under these circumstances is in the focus of this article. The converter, as a part of an integrated and collaborative virtual organisation has to interact directly with the uncooperative and powerful raw material producers whilst, at the same time, satisfying its partners expectations and needs. Hence, the success of the whole collaborative network depends on the performance of the procurement processes of the converter and how well it handles the thread of natural and artificial regulations. Every virtual organization has to evaluate the possible future threat concerning limited worldwide supply of raw materials and increased dependencies of raw material producers.

In order to identify an easy to use way for affected firms to face the challenge, this article describes a framework including a model to identify first the critical areas with a strong need for improvement and approaches to sustainably enhance the procurement performance. The procurement situation of refractory grade bauxite, the basic raw material for various refractories, represents an ideal example for a commodity market with strict regulations in place. At the same time, the converter, in this case the producer of refractories for the iron and steel industry faces powerful customers with high expectations, its cooperation partners, the steel companies (see practical example). The execution of the presented framework and the identified approaches to enhance the performance of the procurement situation highlight the effectiveness and the applicability of the model.

The occurrence of the limited global natural resources and the increasing demand is of great importance for every producing company, every country/government and, in the end, every single customer worldwide. With this background further research is needed to identify raw materials, which are facing the described challenges in short notice. Furthermore, the implications on society and economy of single countries as well as on the relationship between countries have to be explored in detail. Last but not least, transferability of these concepts to other industries, with strong regulations, for example military technology, can be examined.

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