Resilience in the Extracting Mining Industry

LogDynamics
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Globalization increased the interdependence of companies amplifying the effects of disruptions within the global value chain. Disruptions are unplanned or unexpected events interrupting the normal flow of material, products, and information within a supply chain (SC). Examples are natural disasters, human-made disasters, political crises, financial crises, strikes. Disruptions in a SC are inevitable. They may produce a negative impact on the SC performance affecting operations, processes, plans, goals, revenues, and strategies of firms. Resilience is a new approach in SC management research, ensuring a high level of responsiveness during and after a disruption.

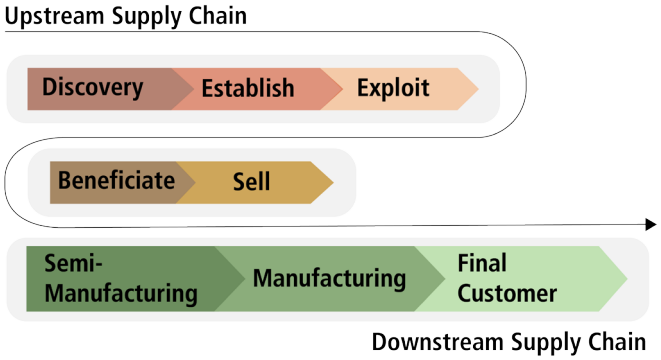
Resilience in the Supply Chain

In the last decades, the concept of resilience has been researched with different scientific perspectives in several disciplines, namely ecology, psychology, material science, engineering, among others. Researchers have stated several definitions and properties of this subject. Adaptive capacity, preparation, response, and recovery to a healthy state are some of the keywords.

In the SC management, resilience has been defined as the ability of the SC to protecting itself against disruptions as well as minimizing the impact once these have occurred. The supply chain resilience (SCRes) has been a subject of interest for scholars, practitioners, and researches. Research in this field has carried out different frameworks, models, and strategies. However, most of them have been developed in large manufacturing companies and leaving aside other industrial contexts as the extractive mining (EM) industry or mining industry in general.

Extractive Mining is an Atypical Industry

The EM industry is at the beginning of almost all global value chains, providing mineral raw materials that are key to produce a wide range of manufactured goods. Its role is to find, delineate, and develop mineral deposits firstly and to extract, process, and sell (supply) the raw materials derived from these deposits later.



Due to its nature, most of the operations of the EM industry are carried out in extreme conditions – high altitude (2,500 - 4,000 masl), weather conditions (rain, snow, and hail), wide temperatures range (between -8° C to 35° C), etc. – making it vulnerable to natural disturbances.

The mining industry differs significantly from the manufacturing industry in the way of obtaining the primary raw material and the quality of it. Firstly, the EM industry gets its primary raw material – the ore – from an internal nature source, the geological deposit – the mine –. Moreover, to extract this resource, complex processes have to be performed: mining exploration, engineering design, access construction, among others. The manufacturing industry gets its raw material from its warehouses or, directly, from suppliers after the purchase process.

Secondly, mineral deposit quality is one of the competitive advantages of mining firms. Due to its inherent nature, there exist levels of uncertainty in the ore quality parameters. This characteristic directly impacts the quality of the final product (commodity), which must achieve the highest grade of purity, for instance, above 99.99% in the copper cathode case. In contrast, the manufacturing industry obtains its raw material with quality parameters known before purchasing it.

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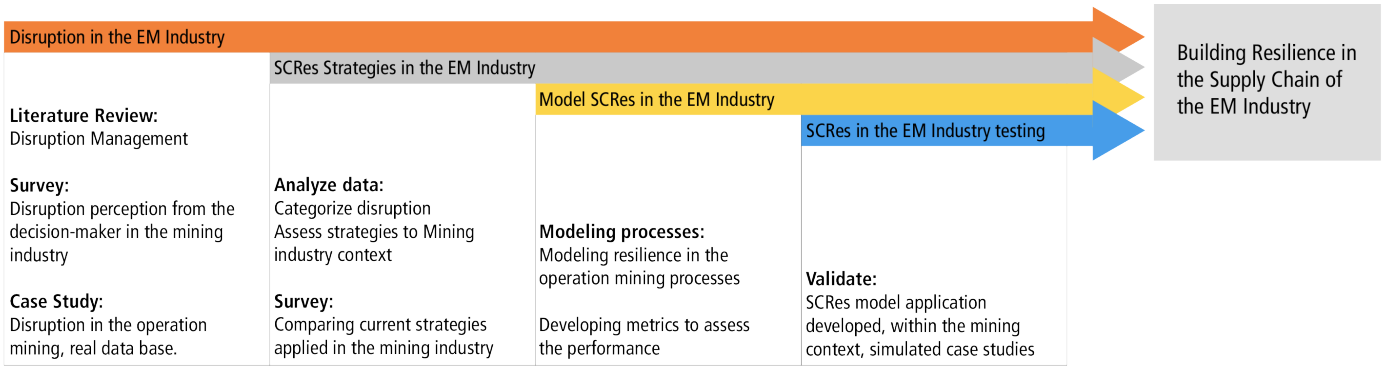

Research Question

The uncertainties and complexities of the EM industry have a high likelihood of suffering disruptions within its SC. Studies propose varying SCRes strategies to face a disruption in the SC. A suggested strategy is the redundancy, which states to increase the number of suppliers to have the capacity to resist to face disruption. This strategy is not applicable in the EM industry since there is only one supplier, the mine. Although there are further SCRes examples, it is necessary to get a better understanding of what happens in the EM industry when it suffers a disruption in this very first part of the global value chain. Therefore, this research will focus on an in-depth understanding of the supply chain resilience concept in the mining industry and will answer the question

How to achieve resilience in the SC of the EM industry?

Research Approach

By now, there are no formal SCRes models developed for the mining industry; hence it is necessary to extend the SCRes domain by theory-building methodologies. For this, an inductive research approach will explain SCRes' phenomena in mining. The research process will follow four steps:

- Data Collection: It is necessary to understand how the mining firm considers the disturbances and what they deploy to cope with the disruption. For this, a case study research method will use.
- Describe the phenomenon: An explanatory framework will be developed, which describes the main variables of resilience in the mining context and provides parameters on how it could implement resilience in the mining industry supply chain.
- Building a SCRes theory extension: A resilience process model of the mining SC will be developed, which describes the relationships of variables that capture the dynamic nature of the phenomenon.
- Validating the mining SCRes extension model with a simulated case study in the copper mining industry.

Possible Contribution

The result of the suggested research will be a new model of the SCRes in the mining industry that can be used as a supporting tool for decision-making on different business levels of the EM industry to cope with disruptions. Comprehending the impact of a disruption will help the stakeholder downstream to make resilience decisions to maintain an adequate performance level of the global value chain. Finally, to deep in the resilience domain in the earliest part of a supply chain will provide support for the development of future research with this approach in different industries of raw materials.