A Behavioural risk perspective of Supply Chain Management: A General Overview

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Introduction

In the last years, the environment of supply chain management (SCM) have known many changes in technology, operations, information systems, methods and models (Poser, 1970). However, one component has not changed. From manufacturing and services to supply chains and R&D, people remain a critical element of the system.

This article is in general an overview of behavioral issues in SCM and how the behaviour of people, employees and managers influences the supply chain performance. As Hayes, Wheelwright and Clark (1988) stated, “Superior performance is ultimately based on the people in an organization. The right management principles, systems, and procedures play an essential role, but the capabilities that create a competitive advantage come from people, their skill, discipline, motivation, ability to solve problems, and their capacity for learning” (Hayes, Wheelwright, & Clark, 1988).

From that perspective, it appears that people are the critical component of the organizational system and that is essential, for improving supply chain performance, to develop models that correctly describe people’s behavior (Tokar, 2010). This paper reviews the adoption of the behavioral approach to study SCM and existing behavioral research related to supply chain risk management.

We will review some examples from literature on origins of behavioral economics, behavioral operations, and behavioral supply chain management. We discuss how behavioural research results can be relevant for supply chain related phenomena and how psychological dimensions in logistics can be interesting for future research. In addition, behavioral factors that may inhibit a decision-making will be explained in the following chapters.

By the end of this paper, we are making the link between the new concept of Behavioural Supply Chain Management (BSCM) and Supply Chain Risk Management (SCRM) in order to show how human behaviour presents an important factor of risk. Thus, a possible behavioural approach to risk management is further described, some of the most common approaches to risk management are discussed.
I- From Behavioural Economics to BSCM

1- Behavioral economics & Behavioral Operations

According to the theory of industrial organization, the branch of microeconomics that studies strategic behavior, rationality is illustrated by four behavioral hypotheses:

- Behavior is mostly motivated by self-interested and stable monetary concerns, or by the utility derived from amassing wealth;
- Behavior is based on conscious, cognitive, and deliberate decisions;
- Decisions are based on all available information; and
- Decisions optimize a given objective function.

A different human behavior beyond these hypotheses (for example the analysis of decisions through heuristic models), provides adequate evidence to invalidate or put into question the foundations of the theory of utility because the decision will in this case be influenced by behavioral elements. The cause of these deviations may be traced to specific decision biases, cognitive limitations, bounded rationality, social preferences, motivational issues, or other behavioral factors. They are therefore elements for a behavioural research framework. (DONOHUE & SIEMSEN, 2010).

To set the scope of this behavioural research framework, economic researchers started to gain an overarching view of existing debates in this area leading to the creation of the behavioural economy field driving towards theories and models that accurately account for human behaviour (Bendoly et al., 2006). He explained that most models employed by neoclassical economists to predict economic behaviour assume that people remain completely rational in their decision-making. Although empirical researches, these models have been validated in few studies but proved inaccurate in others. The results have shown that the predictions of researchers do not correspond to the empirical results. As a result, researchers began to develop a new theory that supports both previously supported results from the existing theory and the new anomalies. The current transition from economics to behavioral economics goes exactly in range with this research perspective. In purpose to resolve the gaps between the theory initially developed and these results through the discipline of behavioral economics was created (Tokar, 2010). Behavioral economists generalize existing neoclassical economic theory by integrating psychological or behavioral factors (Bendoly and al, 2006).

Although studies related to behavioral issues have been studied extensively in several areas including economics, accounting, marketing and management, its study remains relatively limited on operations management field Bendoly et al. (2006). As Boudreau and al (2003) stated, operations management and human behaviour had been initially considered as two separate fields.

The interest behind the research in behavioral operations is studying the influence of human behaviour in operations. It shows how the human component in operations significantly influences operating systems’ work, performance and management interventions’ response (Loch & Wu, 2007). It is a complicated task to study the human behaviour.
From one hand, behavior’s deviation influences the outcome of the operational systems. For this reason, understanding these inconsistencies for overall operational efficiency has become a key field of interest for researchers (Sood & Sharma, 2015). On the other hand, the study of human behavior is the heart of research in behavioral operations. To improve operational functions and systems, special attention is given to understanding and analyzing cognitive and behavioral factors (Sood & Sharma, 2015).

As Bendoly and al (2006) outlined “ A common factor in this breakdown is people. When it comes to implementation, the success of operations management tools and techniques, and the accuracy of its theories, relies heavily on our understanding of human behavior. Lack of trust between supply chain partners, incentive misalignment, and natural risk aversion are but three behavioral issues that can negatively impact operational success. “.

In behalf of new investigations, leading to new observations, we bridge the gap between this traditional style on managing operations and new directions in operations management research. By incorporating behavioural factors into Operations Management work, Boudreau et al (2003) highlighted that while appraising performance of operating systems there must be analysis of both technical and human aspects. This includes both operations management factors and human resource management factors. He believed that people are irrational and have different decision-making abilities. They take different decisions in different contexts, which leads to differences in operating performance.

For more details about researches that reflect the wide range of current research activity in behavioral OM, Gans and Croson (2008) conducted a both deductive and inductive work that draws on multiple reference disciplines: experimental and behavioral economics, judgment and decision making from psychology, and organizational behavior and decision analysis from management.

2- From Behavioural Operations Management to BSCM

Behavioural operations imports knowledge from a number of fields like psychology, economics and other social and behavioural sciences. This knowledge is being used for taking various operations decisions. Some of the decisions can prove to be liabilities for system and some of these can be assets (Sood & Sharma, 2015).

For instance, Bendoly and al (2006) developed a framework where they identified and classified behavioural assumptions employed in existing models in operations management contexts (namely, product development, quality management, procurement and strategic sourcing, and supply chain management). It is useful to determine uncover areas for which behavioural research may be most beneficial. Likewise, researchers in logistics and SCM can easily use these frameworks in order to create a body of knowledge of behavioural research in this area.

Despite focusing on operations management, a limited number of publications helped to create the “BSCM” field. As can be seen in figure 1, Schorsch and al (2017), in their metatheory of BSCM, introduced the emergence of the research field and presented its structure. Based on their analysis from the behavioural perspective, they concluded that they are few contributions discussing the human side and notably the cognitive and social - psychological dimensions in supply chain management.
They exist several levels in studying the behavioral human dimension. This multi-level structure describes concretely what boosts people’s behavior inside organizations.

Behavior can be the result of interaction within actors (within individual, within team, within firm and within network). It may also be resulting from the interaction between actors (between individuals, between individuals and groups and between groups) (Schorsch and al., 2017).

It helps answering the question: “What are the factors that are responsible for the way individuals and groups in supply chains behave?” The psychological factors, of various actors or various types of relations in the behavioral context, are the major cause of any human behavior (Tokar, 2010). Researchers can adapt decision models assumptions or create new models by understanding how people respond to specific stimuli.

II- Body of empirical behavioral research in Supply Chain Management

Researchers in economics have shown more concerns in the field of human behaviour and the number of researches seems to be limited in the area of supply chain management. Current literature seems to have ignored the micro to macro impact of human behaviour in logistics (Donohue & Siemsen, 2010). In particular, it seems to be deficient considering the importance of the human aspect. Despite this, we will try to identify some empirical work conducted in logistics and SCM from a behavioral perspective.

1- Forecasting:

Judgmental forecasting (also called predicting) using time series is one of the trends of literature that analyses human reactions. Usually, researchers focus on studying the capacity of human in analyzing time series compared to computer algorithms. Today, the main objective is to answer the question: “How to improve the accuracy of judgmental forecasting?” More researches are devoted to analyze forecaster’s behaviour and
understand their biases relative to statistical methods under different conditions (DONOHUE & SIEMSEN, 2010). They are investigating, including provision of feedback, decomposition, combining and correction of human judgement (Lawrence and al , 2006).

2- Inventory management:

Mainly based on cognitive psychology, behavioral research in SCM offers the possibility of investigating decision-maker’s behavior (Gino and Pisano ,2008 ; Konstantinos and Katsikopoulos, 2010).

For example, in decision-making related to inventory management, such Bullwhip effect (Ancarani and al , 2013; Uthor & Özer, 2014; Schorsch et al., 2017;Tobergte & Curtis, 2013), Newsvendor problem(Su, 2008; Nagarajan & Shechter, 2014; Pournader and al , 2017) and Supply line underweighting (Wang et al., 2014;Croson and al , 2014), loss aversion and risk aversion bias, were mostly studied. It helped to further explain further the differences in efficiency that could not be described,only,from the operational point of view.

Since this is a research component in behavioral economics concerning decision-making under uncertainty, this focus on inventory planning is not surprising (Pournader et al., 2017). Behavioral factors are the main cause of inventory disruptions. It might be the inability to coordinate with others or other cognitive limitations, which makes it clear that behavioral factors have an imminent impact.

3- Product Development / Product Design:

In project management and product development, decision-making becomes a critical task giving its inter-temporal aspect. Similarly in supply chain management, decision makers face uncertain, complex and ambiguous planning and coordination tasks. In the development of new products and the management of R & D, ambiguity and complexity are prominent(Tobergte & Curtis, 2013).

The decision-makers' attitudes towards ambiguity as well as their perception of task’s complexity, problem selection and problem formulation clearly affect decision-making. It becomes more difficult to solve problems in a complex and ambiguous environment(Tobergte & Curtis, 2013). This can indeed be formally modeled in SCM settings. For example, Wu and al (2008) join ambiguity aversion in a model of fair process.

In supply chain management, the use of cross-functional teams help to accelerate and better integrate the necessary flow of information. It is an essential element in the development of new products (DONOHUE & SIEMSEN, 2010). As mentioned before, behavior can be the result of interaction within actors (Teams included). In the same vein, many researches analyze the behavioral implications of such teams, such as the factors in which they create innovation for new products development.

4- Interactions in the supply chain:

One of the common issues in the SCM is to understand, design and better manage interactions between the supply chain partners. Whether it is a supply contracts, a data-sharing system or collaborative forecasting programs, these different interaction’s forms are part of a theoretical dynamic game. In this dynamic, each actor tries to maximize its own profit, and as a result,
this behavior would influence the performance of the global supply chain (DONOHUE & SIEMSEN, 2010; Tobergte & Curtis, 2013).

The breadth of previous research shows that behavioral problems can affect the efficiency of supply networks, whether at the level of individual decision-makers or their interactions with other individuals, groups or even organizations (Schorsch and al., 2017, Pournader and al., 2017).

5- Altruistic behaviour in SCM:

The concept altruistic behaviour’s interpretation in the supply chain refers, according to Boute & Lambrecht, (2007)to the idea that the optimal overall performance is not obtained by the optimal behavior (profit maximization) of each actor individually or independently of other actors in the supply chain. The idea is oneself sacrifice for the benefit of others. The coordination mechanisms within the supply chain translate this altruistic behavior through buy-back contracts, revenue sharing contracts, and quantity flexibility contracts, information sharing and collaborative forecasts and other forms of member’s interactions(Boute & Lambrecht, 2007).

For example, and in the same logic of interactions explained above, the producer as a leader in the game, should be responsible for the supply chain. This implies that it must take into account not only its own profit, but also the profit of the retailer, that is, the profit of the entire supply chain. As explained by Smith's theory on the invisible hand of market, manufacturer behaves like a government that takes into account the total social utility of the nation while retailer decisions are significantly influenced not only by its own type but also by manufacturer’s type (Ge & Hu, 2012). As Ge & Hu (2012) concluded : “A manufacturer, as a leader, should find an egoistic retailer, while a retailer, as a follower, should find a manufacturer with altruistic liability, to form a good chain.”

6- Trust:

As previously, discussed, the assumption of economic theories is that each economic actor seeks to maximize its own profit. It is therefore normal to contract relations. When writing contracts, partners often spend time describing how to manage value gaps. The partner in a position of strength seeks to impose the most favorable operational modefor him. In order to be protected against risks, the partner transfer them to the other one when concluding the contract(Chain, n.d.). It is precisely in the context of this growth that logistics partnership occupies a major place. For this reason, it is crucial to look at the characteristics are associated with partnership’s success. Therefore, researchers a little apprehended the role of trust. (Morana, 2000, & 2002, n.d.)(Brulhart, 2014).

In this regard, trust reduces the risks of opportunistic behavior and allows the implementation of specific investments to improve the effectiveness of the relationship and increase the economic benefits. The trust therefore appears to have a positive effect on the success of the partnership. In the logistics context, the authors emphasize also that trust will reduce the perception of risk related to uncertainty about expected future earnings and behavior anticooperative of the other party(Brulhart, 2014).

7- Information Sharing:

Coordination policy consists in structuring and managing the exchange of information between the different supply chain members. In fact, some companies may have more or better information than other members of the supply chain. Thus, supply chain partners will
not generally all have the same level of knowledge about final market demand. It depends on their position in the chain (Dupont, 2013). For example, a retailer has the opportunity to obtain information about the application through their points of sale. He can then refuse to share this information with his supplier or decide to modify it. The supplier in this case will need to develop its capacity requirements and production plans based on the retailer's orders placed.

This situation can then lead to bullwhip effect described previously. In addition, each company also does not have access to local information such as the stock level of partners, or the internal cost structures of other actors, and therefore do not know the exact expression of their utility function.

There is a large body of literature that studies the value of information sharing in the supply chain practices (Uthor & Özer, 2014). Existing work is differentiated in many ways, such as the level of information sharing, shared information and the meaning of sharing. The indicators for assessing the value of this sharing as well as the approaches and applications being implemented place to concretize the information sharing phenomenon (Li and al, 2006).

### III- BSCM within a SCRM perspective

Olson (2008) defines the concept of risk in the supply chain as the exposure to risk events from the external environment and the internal organizational processes that negatively affects the supply chain. But, in the existing literature, it is generally difficult to overcome the confusion between the risk and the uncertainty (Tang & Musa, 2011). Both risk and uncertainty share a lack of knowledge about a future outcome, but the two concepts are not exactly the same. In particular, it is not clear to distinguish risk and uncertainty in supply chain operations.

SCRM is a cross-section of supply chains management sets and risk management. In the past few years, the attention towards this concept has significantly increased (Wagner and Bode, 2006). The idea is to adopt risk management approaches with the ultimate goal of ensuring the continuity and efficiency of the supply chain operations. Companies are required to monitor various impacts on multiple levels in order to be and stand proactive. Only this way, companies will provide themselves with a chance to work in an increasingly uncertain business environment, especially that today's supply chains become more complex than before.

From a logistic outlook, the interaction between members (either between the supply chain and its environment or between individual members of the same supply chain) becomes more complex and harder to manage since uncertainty is expanding and new models are built in SCM contexts (van der Vaart and van Donk, 2008).

We remind that Peter Drucker, in linking competitive strategies with human resource management practices, stated that people’s dimension holds the primary place within any system (Schuler and Jackson, 1987). Consequently, we notice that member’s interactions bring out a noticeable impact on resulting supply chain behaviour.

While speaking about the human resource in general, the human nature is supposed to be the primary factor of uncertainty in any project (Măzăreanu, V. P., 2012). On his side; Ancarani (2011); quoting Wilding (1998); states that in risk management, certain tangible and intangible elements become part of the equation where “intangible elements refers to
psychological effects tied to individual cognition and emotions, social interactions, and organizational culture”.

According to Ruel and al (2017), in their investigation about uncertainties linked to information systems in the supply chain, researches in SCM tried to classify the typologies of risks and the uncertainties within the supply chains, but the list can never be exhaustive. They noticed that in the majority of the studies; the researchers show more interest in risks rather than both risk and uncertainty factors. They claimed that, quoting Tang and Nurmarya Musa (2011), few studies really focus on the causes of the risks since “most mention the sources without discussing the causes”. For example, we study human errors causing accidents failure without discussing the major cause of these failures, which are stress on crew, lack of training and long working times (For details, see Tuncel and Alpan, 2010).

The application of risk management concept in business organizations generally and in the supply chain, particularly started in the middle of the last century (Živković and Komatina, 2017). The concept is recent and covers usually the operational and financial aspects of the decision-making process. It depends on reactions to internal and external environment (Blos and al, 2009). In his definition, Bredell (2008) states that SCM repose essentially on three strategies: risk taking, avoiding risk and risk transfer.

Generally, the optimal management of material flows and associated information flows generate risks in supply chain. Yet, it is important to mention that risks can occur in different forms and at any stage of the supply chain “from initial suppliers to final customers. They can interrupt the supply of materials or the demand for products; they can cause sudden peaks in demand or collapses. They can range in scope from a minor delay through to a natural disaster; their effects can range from short-term and lasting only a few minutes through to permanent damage (Waters, 2011)”.

Within a SCRM perspective, some researchers focus on information risks (Rao & Goldsby, 2009), control risks (Christopher & Peck, 2004), statutory risks (Harland and al, 2003), information Systems risks (Ruel and al, 2017). Only few studies (Tokar, 2010; Ancarani & Di Mauro, 2011; Schorsch and al., 2017; Thornton and al., 2017; Wieland and Wallenburg, 2012; Croson and al., 2008) focus more on studying human behaviour uncertainties.

In that way, many companies started to realize the fact that in addition to the "traditional" risks arising from their business activities, another kind of behavioural risks have their sources in closer cooperation and the interdependence of members within the supply chain(Kersten and al, 2007).

Today, considering globalization and the growing complexity of logistics networks and supply chains, risks associated with the supply chain are trending upwards. This, often have negative effects on the decision-making process of logistics managers. The example of decision making relating to the improvement of logistics costs in a Lean management context is recurrent.

Empirical researches in SCRM has proved that it is difficult to work in conditions where the level of risk is relatively high. Therefore, managers tend to reduce their perception of risk and may expose biased behavior. For example, being overconfident may bias perceptions about future operations, future risks, and therefore about future results (Ancarani et al., 2013; Aren et al., 2016).

John J. Brown, the director of SCRM at the multinational company Coca-Cola confirmed that psychological factors affects risk perception and how companies become more aware about
these factors in improving risk management. “Psychology plays a much larger role in risk assessment and risk management than most people realize”, he says.

Conclusion

As first line of research, it is important to clarify the different aspects related to the human component in logistics and supply chain management since the theme still little explored.

We provided, through this paper, a basic overview about this research area. In this concern, researches remain insufficient to meet the challenges of the dynamic nature of risks and the complexity of supply chains. One of the lines of research consists of considering possible relationship between work-related psychosocial risks in SCM context and the outcome (or performance) of the employees.

Studies should handle this concern by focusing on new research paths that cover the other aspects of human behaviour and integrating cognitive and social psychological research into supply chain performance models and supply chain models for risks assessment.

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