Improving Supply Chain Performance Using

Volatility, Uncertainty, Complexity and Ambiguity (VUCA) Drivers

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Abstract

Volatility, Uncertainty, Complexity and Ambiguity (VUCA) Drivers are increasingly used in recent years to describe the current business environment and the impact it has on the supply chain performance. The VUCA term became increasingly interesting to the leaders who seek to operate their businesses efficiently and effectively. Hence, the purpose of this paper is to investigate how VUCA can be applied by companies to improve their supply chain performance.

Purpose

The purpose of this paper is to explore the VUCA concept and discuss the relationship amongst the four drivers of the concept (Volatility, Uncertainty, Complexity and Ambiguity) with the aim of understanding its significance and impact on the supply chain performance. Also, the paper aims to discuss how companies can adopt proper strategies for coping with the inevitable effect of the VUCA drivers, in order to gain a competitive advantage by running the business both efficiently and effectively. Thus, this paper has sought out to discuss the following problem: *How VUCA can be applied by companies to improve their supply chain performance?*

Methodology

This paper adopted a qualitative approach with the aim of exploring a phenomenon that has a lack of attention in the available literature, which subsequently can induce developing quantitative research approach in future based on this exploratory research. In section two, an overview of the VUCA Concept and its drivers are explained. In section Three, multiple case studies are discussed to highlight the importance of VUCA concept. In section Four, how VUCA concept can improve a supply chain performance is discussed. In section Five, the Conclusion and recommendations are underlined.

Literature Review

There is a significance of the supply chain synchronization approach and mentioned some possible reasons for the failure of the synchronization process, within such context. Miles (2011) proclaimed that Volatility, Uncertainty, Complexity and Ambiguity (VUCA) drivers are considered to provide an accurate description of the current business environment and it has a direct impact on managing the supply chains. From the business perspective, Kambil (2008) defined the four drivers of VUCA. Volatility refers to as the change in states per period across processes, while uncertainty refers to as the lack of information concerning the present or future states

of certain processes that most likely will impact the flows of cash and resource across processes. Complexity refers to as the amount of variety at and across processes, as processes may vary to the extent it is complex to coordinate among them. Ambiguity was referred to as the absence of clarity about available information and the suitable responses.

Sullivan (2012) identified VUCA as an acronym for an environment that is dominated by the fast change of things, in a non-predictable trend or repeatable pattern which is known as Volatility, the situation when major disruptive changes occur frequently which is known as Uncertainty, the existence of numerous causes which are difficult to understand and mitigating factors involved in a problem which is known as Complexity, and when the causes and the different circumstances behind the things that are happening are unclear and hard to ascertain which is known as Ambiguity. Turner (2012) identified the VUCA drivers collaboratively as " the a combination of the magnitude and speed of change, the lack of predictability and prospect of surprise, the multitude of forces and confounding issues, and the lack of 'one right answer' or single course of action".

From the leadership perspective, Volatility refers to the rapid rate of change experienced from the environment, ultimately imposing great pressure on leaders to respond urgently to such change. Uncertainty refers to how the leaders with a difficulty to manage and make decisions in a remarkably changing environment. Complexity refers to the situation where there are a wide range of factors that account for the situation encountered by leader, thus it is considered significantly difficult to diagnose a situation and to formulate effective response and actions. Ambiguity refers to lack of clarity in a way that interpreting or understanding the impact and meaning of events becomes quite difficult (Ambler, 2012).

From the financial perspective, Volatility refers to the equity, bond and currency market volatility; the lack of stability and predictability, Uncertainty refers to the potential change in the inflation index calculation; the lack of ability to foresee what major changes might come, Complexity refers to the state of understanding to increasing complexity of new financial instruments and regulation to deal with increasingly complex markets, and Ambiguity referred to the overall output resulted from the above mentioned drivers (Gardner, 2013).

Supply Chain Architecture and VUCA Drivers

Volatility Formulation and Bullwhip Effect

The literature shows that the type of the volatility inherited within supply chains may be represented by economic or macroeconomic volatility, and by demand volatility. The supply chains of companies across industries have increasingly affected by the level of economic volatility. There are a wide range of factors that have contributed to such disruption occurring and moreover placing unexpected pressure on the way these companies source, manufacture and distribute their products. These factors include rapid change in the availability and price of key commodities, major currency fluctuations, disruptive geopolitical events and continued development of customer channels on a global basis.

In this dynamic environment, such economic volatility can be used as a competitive advantage (Russell et. al, 2009). It becomes clear that the main attributes that accounts for internal supply chain volatility include both shifts in demand and supply. In other words, the volatile market that companies are deemed to face nowadays, is forcing executives to consider the ability of their firms to be more agile in a way that will turn volatility into an opportunity rather than a threat. And they will have to find those areas where this economic volatility creates opportunities for their business to survive in markets. There are few strategies that can aid in managing volatile demand efficiently in supply chains:

a) Gangadharan (2007) claimed that companies traditionally used to maintain high levels of buffer inventory in order to meet with any fluctuations in demand which may occur. However, this is no longer feasible as high level of inventory would drain the supply chain resources, cost and time. There are two options for companies have to consider; firstly is the evaluation of the tradeoff between the cost of using the capacity buffer strategy and the cost associated with the lost sales due to missed service targets. Secondly, if the companies decide to follow that strategy of capacity buffer they have to maintain reliable relationships with their subcontractors.
b) A strategy of reduction in the total supply chain cycle time is an essential ingredient to increase the pace of the flow of information across the supply chain. Consequently, a firms can respond faster to changes. Gangadharan (2007) defined total supply chain cycle time as the cumulative sum of the physical cycle time (production time and transportation time) and planning cycle time across supply chain.
c) Postponement strategy can be applied to enable companies to dramatically reduce inventory while improving customer service (Muzumdar et al., 2003). It entails companies to shift from Make-to-Stock production to Assemble-to-Order production Gangadharan (2007).
d) Collaborative processes strategy aims to cope with fluctuations in demand. It refers to information sharing among supply chain partners. The ability of responding quickly and effectively to continuously changing demands requires an accurate and fast flow of information among the supply chain players. Such visibility can be attained through collaboration between the supply chain players and most importantly with the suppliers and customers.

In a supply chain context, demand volatility refers to unpredictable rate of changes affecting the demand side of supply chains, and consequently it is focusing on the demand variability and the bullwhip concept. A bullwhip effect is defined as the amplification of demand variability from a downstream site to an upstream site, where Cachon et al. (2007) defined it as the phenomenon of increasing demand variability in the supply chain from downstream echelons (retail) to upstream echelons (manufacturing). One of the tools to deal with bullwhip effect is using a production smoothing Model. This where it is assumed that by using inventory as a buffer a firm can smooth its production relative to its sales. However, production is more variable than sales in most industries. Hence, negative findings on the production-smoothing model were reported (Kahn, 1992; Krane and Braun, 1991; Mosser, 1991; Rossana, 1998).

Moreover, bullwhip that refers to the upstream amplification of order variability driven by changing retailer demand is the exogenous supply chain volatility that is referring to the amplification of steady- state. While, temporary cyclical oscillations in orders and inventory levels at the retailer and its upstream suppliers generated by non-cyclical and non-random retailer demand is known as endogenous supply chain volatility (Springer and Kim, 2010). These endogenous and exogenous supply chain volatilities present an introduction of two metrics for evaluating supply chain performance. The first metric is the presence and nature of any oscillations in on-hand and pipeline inventory levels. A supply chain architecture design is thereby considered to be volatile if it is possess tendency to respond to oscillations within the system. The second metric is the factor of time. A supply chain is exposed to demand shocks while operating, where the ability of rapid converging to its new equilibrium will enable the supply chain to be more stable and less volatile.

Uncertainty Management

Supply chain uncertainty can be viewed in different forms, including situations in the supply chain in which the decision makers lack information about or understanding of the supply chain system (Van der Vorst and Beulens, 2002), as the state of total absence of information or awareness of an upcoming event potentially occurring, irrespective of whether the outcome will have a positive or negative impact (Ritchie and Brindley, 2007), as the lack of information concerning the present or future states of certain processes that most likely will impact the flows of cash and resource across processes (Kambil, 2008; Adamson, 2012). In 1993, Davis proposed an identification of three sources of supply chain uncertainty, including demand, manufacturing process, and supply uncertainty. Trkman and McCormack (2009) classified uncertainty into endogenous uncertainty and exogenous uncertainty. Endogenous uncertainty refers to the source of uncertainty/risk that initiated internally from the inside of the supply chain and can propagate into changing the relationships between focal firm and suppliers. Exogenous uncertainty refers to the source of uncertainty/risk that initiated externally from the outside of the supply chain and it was further divided to include discrete events and continuous risks.

For managing uncertainty, Mason-Jones and Towill (1998) developed the uncertainty circle model which classified supply chain uncertainty into four levels: process, supply, demand, and control. For process uncertainties, it refers to the internal reliability of the analysis of a specific process within the supply chain. For supply uncertainty, it arises as a result of unreliable suppliers and it occurs due to the poor performance of the organization's suppliers who can't meet the organization's requirements. For demand uncertainty, it refers to the gap between the actual end-marketplace demand and the customers' orders placed to the organization. For control uncertainty, it impacts the supply chain capability to transform customer orders into satisfactory deliveries and requests for raw materials from suppliers.

Davis (1993) proposed three strategies to reduce the supply chain uncertainty, including total quality control, new product design, and supply chain redesign. Geary *et al.* (2002) and Gerwin (1993) argued that the strategies of total quality control and new product design can be utilized in attempt to reduce process uncertainty and the supply chain redesign strategy to achieve supply uncertainty reduction. Jones and Towil (2000) recommended that uncertainty reduction can be achieved through implementing two basic decisions. The first decision is to improve the performance of

the value added process through lead time reduction and the application of lean thinking to significantly improve quality levels. The second decision is to coordinate work closely with the suppliers which will improve supplier quality, reduce supplier lead times and promote for much more consistent delivery patterns. Jones and Towil (2000) proposed that uncertainty reduction ought to involve strategies that manages the uncertainty sources in both the material flow and the order information pipelines. Simangunsong (2012) proposed different ways for coping with different sources of uncertainties, including postponement, volume/delivery flexibility, process flexibility, customer flexibility, multiple suppliers, strategic stocks, collaboration, Information and Communication Technology (ICT) system, lead time management, financial risk management, and quantitative techniques.

Complexity Management

Ivanov and Sokolov (2009) argued that the global supply chains systems are regarded as a representation of complex adaptive systems that possess no distinct boundaries. Hence, complexity was viewed as a coherent feature of supply chains. Accordingly, complexity management is a crucial aspect in order to avoid any exacerbated uncertainty, risk or unnecessary cost (Christopher, 2011). Bozarth et. al (2008) claimed that the Supply Chain Complexity (SCC) can be classified into two types of complexity detail complexity and dynamic complexity, where detail complexity referred to the exact number components or parts composing a system and dynamic complexity referred to the lack of predictability in the system's response towards a given set of inputs, driven by the interconnectedness of the many parts that compose a system.

In a supply chain context, complexity has many aspects that need to be managed in order to improve a supply chain performance. First aspect is diversity where it is related with the homogeneity or heterogeneity of a system. A high or low level of diversity of any component of the supply chain leads to the system`s heterogeneity or homogeneity and results a high or low level of complexity. Second aspect is interdependency. It refers to the extent to which the states within the supply chain system are interdependent. Thus, complexity increases directly proportional to the increase of interdependence (Isik, 2011). Third aspect is variability: and it represents the rapid change of elements over a period of time. Variety is the fourth aspect where it represents the dynamic behaviour of a system, as variety refers to the state of being various. The causes of the SCC can be classified as inbound and outbound logistics, sales processes, production engineering production process and new product development (Perona and Miragliotta, 2004). Another approach classified the SCC into three aspects including, downstream complexity, internal manufacturing, and upstream complexity (Bozarth et al., 2009). Blecker et al. (2005) elucidated that the SCC complexity classification can be between structural complexity and dynamic (operative) complexity. However, most of researches classified supply chain complexity according to its origin: internal and external/environmental SCC (Mason-Jones and Towill, 1998; Wildemann, 2000; Childerhouse and Towill, 2004; Blecker et al., 2005; Isik, 2011).

A four stage of complexity management model is proposed to manage complexity in supply chains effectively and efficiently which covers identifying, measuring, analyzing and controlling of complexity. It is worth mentioning that although high complexity indicates high unnecessary costs to the company, however in some situations it can add value to the company, as complexity may result in excess

inventory which can be useful if sudden change in demand occurred at such a time (Isik, 2011). Wilding (1998) proposed a 'supply chain complexity triangle' for managing SCC where the SCC complexity was classified through the combination of three independent variables, namely deterministic chaos, parallel interactions and demand amplification.

Ambiguity Management

In the context of risk or decision-making, ambiguity is viewed as the unknown possible outcomes. While in an economic context, ambiguity is defined as the lack of understanding considering the fundamental principles that drive risk (Grant, 2013). Also, it can be defined as the lack of clarity about the meaning of an event (Caron, 2009). Ambiguity can also be defined as the inability to accurately conceptualize threats and opportunities before they become lethal.

The relationship between ambiguity and information sharing is illustrated throughout the context of the definition of the ambiguity driver. Watts (2006) described that ambiguity represented the lack of knowledge of the decision makers not the lack of information, capturing both the uncertainty involved in the roles of individuals in a distributed problem solving activity and the environmental uncertainty. Hence, the importance of sharing information to enhance the supply chain performance has been widely acknowledged in literature.

Christopher (2011) as well, argued that the amount of data flowing in all directions across the supply chain is immense which can prone to misinterpretation by players as the visibility of accurate relevant data can be interrupted through unnecessary modification of information as it passes from entity or level to another.

Managing ambiguity requires sharing accurate and correct interpretations across processes. Some of the key responses to tackle ambiguity other than information systems are: coordinators who are aware of the languages and systems across processes; jointly reviewing unexpected variances or information across processes and ensuring that both sides have a common interpretation of events through proposed decision frameworks; verifying hypotheses and achieving clarity in ambiguous situations by implementing joint planning and coordination across processes that challenges joint assumptions (Kambil, 2008).

Conclusion

The significance of the VUCA term in businesses was elaborated through the literature gathered and how it greatly affected the supply chain management aspect. The VUCA drivers best described the challenging environment within which businesses operates. It was observed by the researcher that, some of the VUCA drivers were studied by a wide range of researchers; however these studies interpreted the impact of each driver on the supply chain management independently, where more recent studies, analyzed the correlated aspects amongst two of the drivers. Hence, this conceptual paper aims at exploring the VUCA term and its drivers and how can the drivers of the VUCA concept affect the overall supply chain performance. This paper

has focused on the relationship amongst the four VUCA drivers and how these drivers affect the supply chain performance. It was found that businesses have adopted the concept of agility in their supply chains to cope with the VUCA drivers. However, additional aspects needed to be considered in order to master managing the VUCA drivers and moreover enable businesses to convert the challenges imposed by the VUCA drivers into a competitive advantage.

Findings

First, the VUCA term became a competitive requirement for companies, who had to be fully aware of its drivers in order to survive in such a scary environment. Second, integrating the Volatility, Uncertainty, Complexity and Ambiguity drivers in a supply chain architecture in order to be able to sustain profitably in this challenging environment. Third, VUCA drivers helps to gain a competitive advantage in the supply chain. Fourth, VUCA can be used by leaders and managers as a method for altering the traditional supply chain models.

Paper Value

Such combination became vital in the current situation of the global world; as companies used to address each force separately with different strategies while neglecting the interdependence between some of the forces. Hence, this research aims to design a Supply Chain Architecture based on the VUCA concept in order to enhance the supply chain performance, to assist the companies to create an 'end to end agile supply chain' to cope with the inevitable effect of the VUCA drivers, and moreover to gain a competitive advantage by running the business both efficiently and effectively.

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