Risk management in the Supply Chain: an approach to minimize uncertainty

1. Introduction

Currently we face an enormous worldwide crisis due to the covid-19 pandemic. Even before the COVID-19 crisis had erupted in Europe, European car factories had been shut down for weeks. The reason? In the Chinese province of Hubei, production had already been halted by the virus. The COVID-19 virus revealed how companies have been disrupted in their supply chain by a just-in-time strategy and single sourcing. It suddenly became clear how dependent we have become on companies in other parts of the world, be it auto parts, electric bicycle parts, medicines and face masks. An example: the electric bicycle production chain extends over 9 countries most of which were in total lockdown in recent months. So, factories were not able to produce bicycles. In the Netherlands, in the same period demand rose rapidly (up 25% in May compared to last year's sales), mainly due to fears of contamination on public transport and people planning a holiday in their own country. In bicycle shops, stock started to run out due to the high demand and the shortage of parts. We see the same trend across other countries in Europe. To get bicycle parts on time in June and July, the parts were flown in from Asia. This led to costs five times higher than per boat. How can you as a company ensure that production can continue to run and that no high price must be paid for this?

This white paper gives insights in how to deal with supply chain uncertainty and how to mitigate risks. The paper is based on Supply Chain programs that Purple Square has enjoyed participating in. The paper proceeds as follows. Firstly, we identify how to be prepared for uncertainties. Next, we explore different companies profile. In the framework section, the method of the nine-step approach to uncertainty which is based on a scenario planning approach will be discussed. The final section of the paper discusses the implications of the nine-step approach to uncertainty for managers. The white paper can be downloaded on www.purplesqr.com at the publication section.

2. How to be prepared for uncertainties?

Over the past decade, we have faced several uncertainties, such as the credit crunch, climate change, Brexit and more recently the COVID-19 pandemic, all of which had an impact on the supply chain.

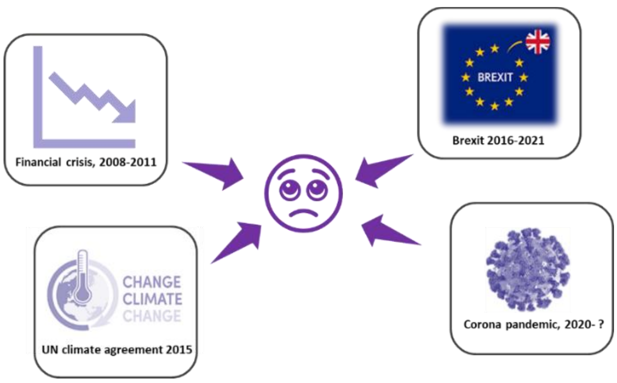

Figure 1: times of uncertainty

Supply chains also faced many other supply chain risks, such as natural disasters, supplier incidents and single supplier dependence in times of supply shortage. Research shows that companies do not, or only to a very limited extend, focus on supply chain uncertainties. The focus of companies is on the control mechanisms to measure the current effectiveness of the strategy. Unknown risks such as epidemics and supplier performance are having a huge impact on the supply chain. How to recognize, deal with and respond to these unknown or uncertain risks?

We can describe today's era as VUCA, Volatile, Uncertain, Complex and Ambiguous. Below we will explain the meaning of VUCA in more detail.

- Volatility of turbulent markets. We see a high and increasing rate of change (Clock speed), due to the rise of uncertainties as discussed above. The nature of change and the nature of the speed of change have also grown rapidly over the past decade.
- Uncertainty about the outcome of strategies. We also see that the present situation and future outcomes are unclear due to the lack of predictability, the prospects for surprise, and the sense of awareness and understanding of issues and events.
- Complexity has increased due to the multitude of important decision factors that surround a company. Examples of decision factors are increase in customers service demands, growing concern of customers regarding sustainability, shifting of economic power, scarcity of natural resources, rapid adoption of supply chain technology capabilities, impact of next generation information technologies.
- Ambiguity means lack of clarity about the meaning of an event. Many companies use their employees' empathy to assess risk by allowing their own beliefs and behavior to dominate. This leads to misinterpretations and the mixed meanings of conditions for cooperation. This also creates confusion in the implementation of processes and actions within and outside companies.

In this white paper, we describe our approach to uncertainty to give your company better insights in order to survive in a VUCA environment. To survive in a VUCA environment a company needs Vision, Understanding, Clarity and Agility.

- Vision we mean that companies need to have a clear intent in order to create a future state.
- Understanding, companies need to look at, listen to and understand the system they are in.
- Clarity we mean understanding the (apparent) chaos. One way to do this is to recognize the events and elements that cause chaos. Later in this article - in the section "the nine-step uncertainty approach" - we will describe how events and elements can be recognized.
- Agility is the critical factor for competitiveness in turbulent markets. To make optimal use of agility, an organizational structure is needed that is described by Husband (2013) as privilege wirearchy[1].

To build a VUCA style framework, the following elements are important to be successful:

- Flexible, decentralized empowered networks with a structure of strategic intents;
- Learning through extensive experiences, building scenarios for uncertainties and rapid plan do check act (PDCA) cycles in order to cope with the environment;
- Strategic sense-making beyond operational problem-solving.

To summarize the VUCA era (on the left) and how to deal with the uncertainty elements (on the right), the figure on the next page provides a good overview.

[1] *Wirearchy is a dynamic flow of power and authority based on: knowledge, trust, credibility, focus on results enabled by interconnected people and technology"   (Jon Husband, 2013)*

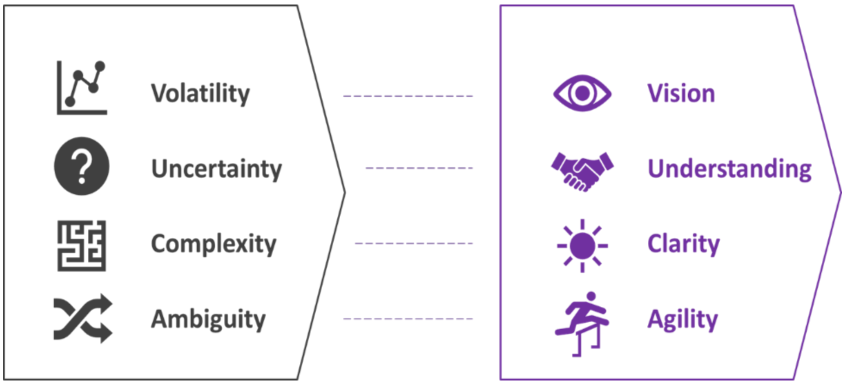

Figure 2: uncertainty framework in VUCA environments

As it has already discussed in this paragraph earlier, more strategic focus is needed for managing uncertainty. However, the effectiveness of uncertainty management is difficult to quantify and managers have a tendency to focus on activities with a measurable relationship between effort and result. The best approach for companies to address the strategic focus gap is to identify uncertainties early in the process to minimize the impact on your supply chain strategy. Nassim Nicholas Taleb calls uncertainties, that are not predictable, black swans (Taleb, 2010). Black swans are events that have never happened before or that are extremely rare, that surprise companies and have a huge transformation impact. Examples of Black Swan events include the rise of the computer, the Internet, World War I, 9/11 terrorist attacks in the US, and more recently Iceland's volcano eruption in 2010, which had a huge impact on European air traffic. No one can predict the future, so don't try to predict events that are unpredictable. Instead, build robustness and resilience to negative events to face black swans.

However, many uncertainties are predictable. The fact that these uncertainties happen is related to lack of focus or lack of attention as these uncertain events are unlikely to happen. The COVID-19 pandemic, was predicted many times by many people, not just virologists. It was not known which virus would hit the world when, but the fact that it would happen was simply ignored. And no countermeasures were taken.

To deal with uncertainties, a company must develop and build capabilities to provide resilience in complex dynamic environments. To be prepared for future opportunities, your company must anticipate, feel, analyze and respond and eventually adapt and evolve to the changing environment. What steps should a company take? It is important to know which company profile a company has, in order to identify how a company is affected and which actions must be taken to prevent. The categorization of profiles of a company is discussed in the next section.

3. What's your company profile?

How does your company act in times of uncertainty, risk and danger?

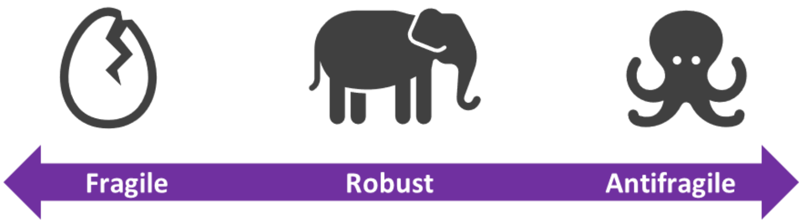

Figure 3: three types of company profile

In his book 'Antifragile' (Taleb, Antifragile- Things That Gain from Disorder, 2012), Nassim Taleb recognizes 3 types of profiles:

1) Fragile- companies that can cope with the current environment. If the environment changes, they cannot handle the changes. These companies can play well within their own bandwidth. If this bandwidth changes, for example due to technological changes, these companies cannot change and suffer significantly from the impact of the change. Examples are: while being the leading brand in mobile phones, Nokia lost market share due to the upcoming smartphone and not being able to cope with Apple's game-changing iPhone. Another classic example is Kodak which lost market share due to the rise of the digital camera and their lack of vision that the digital camera would disrupt the marketplace.

2) Robust- companies that have the ability to absorb uncertainty or that are unaffected by changing environments. Companies can be robust by using an agility or resilience approach. The two approaches are explained below with an example.

a) Agility- companies that can see into the future and leave a changing environment. When the environment changes, they can change businesses by selling products or divisions. An example is Philips, which has reinvented itself several times. Some fifteen years ago they stepped out of the electronic consumer business (TV, audio, etc.), when price erosion caused a significant drop margins due to heavy competitions. Over the past years Philips realized that the shrinking lighting market became less attractive due to the decrease in margins on lighting products and the longer life of the LED lamps. In this case, Philips distanced itself from the lighting industry and focused on medical devices with better margins. And also, Signify (the new company name of Philips Lighting) is changing its portfolio from producing light bulbs to delivering lighting solutions which increases recurring revenue flows.

b) Resilience- companies that do not suffer from uncertainties. A good example is the supermarket sector, which has not experienced an economic downturn in both the credit and COVID-19 crisis and has benefited from both recessions.

3) Anti-fragility- companies that can reform their businesses to overcome challenges and crises. An example is the Dokkumer Vlaggen Centrale, which has made festival flags in recent years, but due to the COVID-19 crises, all festivals are postponed. As a result, a large part of their turnover has now disappeared. The Dokkumer Vlaggen Centrale is now responding to the changing market because of the COVID-19 measures with an updated business model and an extended product portfolio, and is now making masks, (RIVM) stickers, prevention screens and room dividers, while the demand for flags has dropped significantly. Without too much effort, they can re-use the current machines and supply chain to produce and sell mouth masks, prevention screens and room dividers. The skills and knowledge of the employees are also prepared for the business switch. We can therefore speak of an anti-fragile approach by the Dokkumer Vlaggen Centrale.

A key element in this concept is, that companies need to realize that they do not have the same profile forever. Changing market conditions require change of a company's strategy, product portfolio and so characteristics of a company. Kodak seemed to be a robust company for years. If Philips would have stick to their original product portfolio and service offering, most likely the company would not exist anymore, for sure not in its current profile. Changing environments can have big impact on the value proposition of a company. New technology, geopolitical changes, natural disasters and any other such risk can have an impact on a company. Oil companies have been resilient to risks in the past decades, but the growing attention of climate change worldwide will have a big impact on the position of oil companies. Oil companies which are not able to adapt changes and act more agile to the new reality, will get in big trouble in the next decades.

Now that the capabilities that are needed to deal with uncertainties have been discussed, we can combine the various elements to arrive at an uncertainty approach. This uncertainty approach will be discussed in the next section.

4. 9-step Uncertainty Approach

For your quest for the ultimate mix, to handle uncertainty in your supply chain, Purple Square has developed a nine-step approach. This nine-step approach is based on the scenario planning methodology. The use of scenario planning is not new. During the oil crisis in the 1970s, Royal Dutch Shell already implemented scenario planning. Scenario planning is not intended to create an "ideal" situation for your company. The intent is to arrive at strategic choices that apply within all possible future scenarios. Scenario planning is not about extrapolating data from the past, but discovering new connections that interact with your company. Assumptions can be formed by a bottom-up or a top-down method. In a top-down method, top management determines the vision and strategy based on assumptions. A risk here is that the strategic vision is often not a robust strategy. In a bottom-up method, the knowledge and experiences of employees are also taken into account in order to arrive at a joint shared vision of the future. The big advantage of this is that the shared vision usually leads to more flexibility and adaptability to arrive at a more robust or anti-fragile company profile. However, the disadvantage is that the strategic vision is perceived as less directional. Assuming that each company has assumptions, a strategic vision, long-term goals and a strategy, we immediately dive deep into the nine steps of our uncertainty approach.

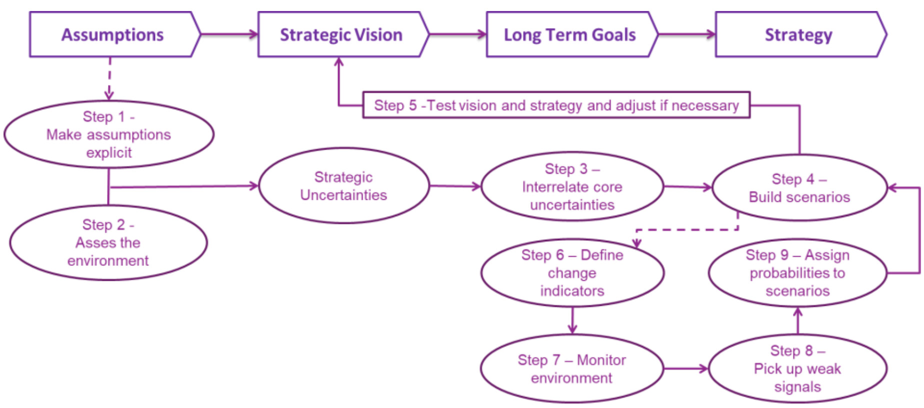

Figure 4: nine step uncertainty approach

This nine-step approach will be explained in detail below:

1. Make assumptions explicit. Create a joint business idea and visualize it in a root-cause analysis. Examples of common business ideas include analyzing customers' needs and expectations for competitive advantage. In this step, the scenarios must be made explicit so that they can be measured over time.

2. Asses the external environment. The external analysis results in an overview of strategic uncertainties that have an impact on the validity of the strategic vision of the company. To arrive at scenarios that visualize the impact of strategic uncertainties, it is important to distinguish the core uncertainties. This can change or sharpen your business idea. Methods to sharpen your business idea are setting up panel discussions, interviews or do desk research.

3. Interrelate core uncertainties. The result of the first two steps is a clear insight into the strategic vision of the company, the strategic assumptions that support this vision, and the main uncertainties that can affect this vision. The core of working with scenarios is that core uncertainties are not considered in isolation, but that a representation is made of the occurrence of combinations. Uncertainties are related, can strengthen or weaken each other and together determine the future context in which the company must function. When composing a scenario frame, it is first of all important to determine the extreme values (the poles) of the two main core uncertainties.

4. Build scenarios. The scenario frame is the starting point for constructing future scenarios, which express the potential consequences of existing uncertainties in an informative and inspiring way. You can use the SMART principle (Specific, Measurable, Accessible, Relevant and Time-bound) to make scenarios time-bound. A scenario is a future story that is easier to understand and remember when the essence is captured in a catchy label. By using labels, this lingers within the company. For example, use labels like: “happy go lucky” or “big exodus”. To give an example regarding the labels in combination with scenarios. Imagine a hard Brexit could lead to a major exodus strategy from UK pharmaceutical companies. This has to do with compliance issues (UK GMP certificates are no longer valid in the EU). In this case, medicines cannot be supplied to EU Member States without new regulations.

5. Test your vision and strategy and adjust it if necessary. Combine strategic uncertainties with change indicators and test your vision and strategy if it is robust enough. As already discussed in the paragraph of what’s your companies profile, there are different profiles possible (robust with the flavors agile and resilience and antifragile).

6. Define the change indicators for your company. This could be a change in unemployment, a change in the oil price or the spread of the COVID-19 virus. It is important that scenario planning is integrated into your company culture (DNA) and that the right capabilities are available within the company. The most important thing is that you collect bottom-up and top-down insights throughout the company. To gather insights bottom-up and top-down in your company, it is recommended to set up a multidisciplinary team around the topics to prioritize and score the items. After combining steps 5 and 6, the following overview on the next page can be made for companies within the utility market (as an example):

Indicator	Value	Consequence	Relevant scenario	Option/ risk
Ambition UN climate agreement (2015)	High	Pressure on industry	-Happy go lucky -Big exodus	- Deterioration of the business environment - Relocation of facilities
	Low	Opportunities for industry	-Location of choice -Courage to lead	- Improvement of the investment climate - Options for optimal knowledge infrastructure

Table 1: combination of step 5 and 6

7. Monitor the external environment. Collect external data via big data collection and align it with internal insights. Often, companies know a lot about their own industry but little beyond the fringes, from which the innovations may come. So, you may wish to study new technologies that are not yet in the mainstream of your industry but maybe someday in the nearby future.

8. Pick up weak signals. Examples of signals are change in unemployment, change in exchange rate or change in oil price. These examples have an impact on the change indicators of an organization. This is an important task for managing departments in order to collect weak signals. In addition to the financial and operational key figures that arise from other control systems, the controlling department must periodically provide the management team with an estimate of the direction in which the context of the company is developing. Environmental noise that is detected but difficult to interpret must also be recorded and reported. When picking up the weak signals that most influence your company, you need to check if the weak signals fit your timeline and trend.

9. Assign probabilities to scenarios. A Cross Impact Matrix (CIM) matrix can be used for the outcome. In this case, it is important that all scenarios are archetypal. Below is an example of a CIM matrix for a company within the utility sector. In this example, the outcome under step 6 is scored on impact and dependence.

Cross Impact Matrix (CIM)

	increase in customers service demands	Scarcity of natural resources	Change of regulations	Increased competition	Technology capabilities	Next gen information technology	shifting of economic power	Total
increase in customers service demands		2	0	1	3	3	1	10
Scarcity of natural resources	2		1	1	0	3	1	8
Change of regulations	3	3		2	2	2	3	15
Increased competition	2	2	0		3	2	0	9
Technology capabilities	1	1	0	3		1	0	6
Next gen information technology	2	1	1	2	1		0	7
shifting of economic power	3	2	0	2	3	3		13
Total	13	10	2	11	12	14	5	

Impact

Dependency

Table 2: example of a CIM matrix

Let's look at the example of the utility sector again. The value of this indicator will be high due to pressure on business investment. In this case, a relevant scenario is "Great Exodus". With the option as discussed under step 6 - Relocation of facilities. The last step is to score the elements on dependence and impact. On the x-axis and the y-axis the uncertainties in the supply chain are described as variables. The interdependency of development is determined on a scale of 0-3. In the example, the third development (for example, a change in regulations) influences the fourth development (increased competition) to the extent of 2. In a CIM the interdependence of all developments in the complex is determined, a total score for each development is created for both the degree of impact as the degree of dependence on a development. The total impact per development is shown on the right side of the table. The score for dependency is shown at the bottom of the table. Developments with high impact and high dependence are so-called "links", they are influenced on the one hand and influence other developments on the other. Developments with above-average impact and below-average dependence are potential core uncertainties. They strongly influence the complex development but are themselves only influenced to a limited extent. A first exercise that can be performed using a CIM is to remove trends with below average impact. The average impact in this example is 10, which excludes developments with a score lower than 10. When the most influential developments have been determined by means of a CIM, the uncertainty or unpredictability can be determined.

5. Implications for managers

Now that the framework has been discussed, we will look at its practical use. In one of our webinars on this topic, a participant asked how this framework can be managed in a company? Well, if the right mechanism regarding multidisciplinary teams consisting of business controllers and business analysts, scenario frameworks and the external and internal data sources are in place, the foundation is there. After all, business controllers and data analysts are active in almost every company with the task of collecting and analyzing the internal and external data. You can analyze this data via Excel or data analysis tools. Most importantly, the data analysts know which indicators and trends to look for. Scenario planning is not intended to create an "ideal" situation for the company. The intention is to prepare strategic choices that apply to all possible future scenarios. Scenario planning is not about extrapolating data from the past, but discovering new connections that interact with your company. It is difficult to express in time, it depends on the maturity of the company with regard to being able to read and process data. The monitoring of the scenarios should be part of the continuous improvement cycle in your company. In order to be able to give a more concrete estimate of time, it is important to do a quick scan of the existing processes and systems around a company's scenario planning via Purple Square. Let's prevent becoming a Thanksgiving Turkey at your company!

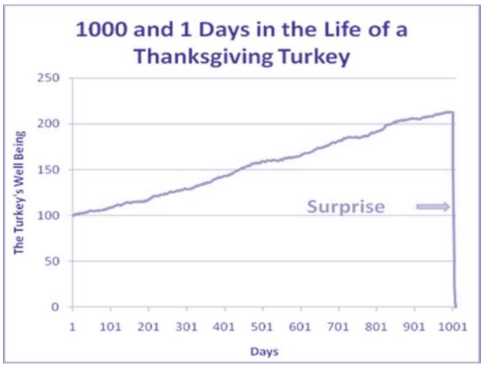

Figure 5: let's prevent becoming a Thanksgiving Turkey

Summary

To enable your company to deal with uncertainty in the supply chain, keep below advice in mind:

- Recognize black swan events, do not try to predict events that are unpredictable. It is also important to know that your company's profile is effective in case of uncertainties. This profile can be fragile, robust or anti-fragile.
- Build capabilities to deal with those black swan events. Every market is different so different supply chains require different uncertainty approaches to be successful.
- Use strategic scenario planning to deal with uncertainty risks via a structured approach. It can be stated that scenarios are a good basis for a strategic control system, as they provide an excellent framework for monitoring fully continuous environmental developments and for quickly understanding their possible consequences.
- By linking probabilities to scenarios, the effect of opportunities and risks can be quantified over time. In addition, it can be determined when a scenario set no longer covers sufficient uncertainty and needs to be replaced.
- The importance of the input of a broad and diverse group of employees in feeding the system should not be underestimated. It is equally important to act effectively based on the system. To this end, it is crucial that managers play an important role in constructing the scenarios. By consistently filling in the model, a path is created towards solutions that respond to future needs.

Figure 6: recognizing the black swans

References

- Husband, J. (2013). What is Wirearchy?
- Taleb, N. N. (2010). The Black Swan- the impact of the highly improbable. Random House Publishing Group.
- Taleb, N. N. (2012). Antifragile- Things That Gain from Disorder. Random House Trade.