

An Evaluation of Scenario Planning for Supply Chain design

by

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ABSTRACT

When trying to envision what the future might look like, different methods of forecasting are often used. However, there is a growing consensus that discontinuity and abrupt change are inherent to the very nature of the future and should be incorporated into futurist studies. This paper reviews the future-studies method of Scenario Planning and evaluates its applicability supply chain design.

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1. Foreword

“The future is like heaven; everyone exalts it, but no one wants to go there now.”

James Baldwin

This paper describes and evaluates an approach to generating possible future scenarios. The impetus for this work was my engagement in a new and exciting project at the MIT Center for Transportation and Logistics, which aims to look at the way leading supply chains might look in the year 2020. As this project is a future-oriented one, I will try to show how the scenario planning discipline can fit into it and how scenario planning integrates with other planning/forecasting concepts throughout the different phases of the project. As this project is the driving force behind this paper, some introductory notes about the scope and nature of the SC2020 project are appropriate.

“SC2020 is a multi-year research initiative set to explore critical success factors and concerns for supply chains in the future. The projects aim is to gain an understanding of the interactions between company/inter-company behavior and exogenous macro-factors that lead to excellence. Ultimately, it aims to identify the innovations that will be the foundation of successful supply chains ten to fifteen years into the future.

The research objectives are two-fold in nature. The first objective is to understand current supply chain principles and trends including the identification of major macro-based factors, such as trends in customer demands, economics, trade regulations,

geopolitics, and labor and green laws, which might impact future global supply chains. For example, this will include how energy economics and trade regulations influence supply chain infrastructures. This will help to identify likely future macro scenarios and their impact on global supply chains of the future.

Leveraging what is learned during the first phase of the research, the second research objective is to project the future, ten to fifteen years out. This will include:

- The development of a model that incorporates the inter-relationships of the micro- and macro elements within and among supply chains and the best practice trends identified during the first phase of research.*
- The generation of likely future macro scenarios that will significantly alter the nature of supply chains.*
- The development of future supply chain scenarios. Using the macro scenarios as inputs to the model, future supply chain scenarios will be generated at a high level. For each future scenario the impact on supply chain design, organizations, and business processes, as well as the enabling technologies will be elaborated upon to support global supply chain decision-making.”*

As scenarios are a major part of this project, how they are to be generated seems to be a subject worth looking at. In addition, there are several publicly available scenarios, which were written by outside parties. However, these scenarios were not created with supply chain management issues in mind. This requires that we think specifically about the application of scenario planning within SCM context. This view was supported in a private conversation (during the 2004 Zaragoza Logistics Conference) by Prof. Martin Christopher of Cranfield University, who acknowledges that there seems

to have been no attempt to evaluate scenario planning as a tool for predicting supply chain formation and behavior. However, this paper is not a campaign for the use of one scenario generation method over another. It will rather provide an overview and a description of scenario planning that will establish a framework through which one might be able to look at issues through scenario planning perspective.

First, scenarios will be defined as well as their general purpose. Then, the paper describes the history and background of scenarios, following that with a literature review. Continuing with a “User Guide”, a general description of scenario generation methods and scenario applications, the general environment in which scenarios are being generated and used is described, as well as more detailed step-by-step instructions and pointers to scenario generation and use. In the last chapter, a possible use of this method in and its applicability to the new “Supply Chain 2020” project are described.

2. Scenarios – what are they?

“Prediction is very difficult, especially for the future.”

Niels Bohr

According to Global Business Networks, a consulting firm co-founded by Peter Schwartz, futurist, business strategist and former head of scenario planning at Royal Dutch/Shell in London, scenarios can be compared to stories (Schwartz, 1996). Beyond what we normally think of when we consider stories, teaching a lesson or a moral or entertaining listeners, stories are in a sense an old way of organizing knowledge. Scenarios resemble a set of such stories, written or spoken, built around carefully constructed plots. Stories can express multiple perspectives on complex events; scenarios give meaning to these events. Scenario planning is the art of storytelling applied to the future instead of the past or present. In this way it is not unlike science fiction—it’s about “remembering the future.” Unlike science fiction, though, the stories woven by a scenario planner revolve around a question or a decision. Although this is the formal definition of scenarios, this paper will later describe some differences in the way the SC2020 project might view scenarios, due to the projects structure and goals.

It should be pointed out early on, that although scenario planning involves extensive and thorough research which enables the generated scenarios to be coherent and plausible; scenarios are not predictions about the future. Unlike traditional forecasting or market research, scenarios present alternative images instead of extrapolation of trends from the present. The result of scenario planning is not a more accurate picture of tomorrow but better thinking and an ongoing strategic conversation

about the future. The benefit of scenario planning is not prescience, but flexibility and adaptability. Stewart Brand, creator of the Whole Earth Catalogs, has said that what scenario planning means is that while you may not always be right about the future, you are almost never wrong (Schwartz, 1996). And being wrong about the future is the only way to be unprepared. Good scenarios are plausible and surprising and they have the power to break old stereotypes. Using scenarios is rehearsing the future. By recognizing the warning signs and the drama that is unfolding, one can avoid surprises, adapt, and act effectively. Decisions which have been pre-tested against a range of what fate may offer are more likely to stand the test of time, producing robust and resilient strategies.

The scenario method is based on the understanding that the future is unpredictable. This unpredictability is not some by-product of a shortcoming in our forecasting methods. It is rather an inherent part of the nature of the future, which not only should not be avoided, but in fact should be embraced and incorporated into our outlook. Furthermore, this understanding of uncertainty should serve as a basis for any discussion of the future and should underline our very perception of what “the future” is.

By creating relatively few (three or four, as will later be elaborated on), yet different, pathways into the future, which take the form of stories (scenarios), we strive to reduce the complexity of uncertainty into manageable proportions, while structurally incorporating it in our thinking. As Pierre Wack, founder and former head of the Royal Dutch/Shell Scenario Planning Group said, scenarios are an effective device for organizing a variety of much seemingly unrelated information, economic, technological, competitive, political, societal—some quantitative, some qualitative, and translating it into a framework for judgment (Wack, 1985).

Single line forecasts are a tool often used in trying to predict the future. These forecasts are generated using past data, finding a model which explains its behavior and extrapolating future behavior using that model. Single line forecasts work reasonably well during relatively stable periods. What makes forecasts so dangerous is that they are constructed on the assumption that tomorrow's world will be much the same as today's. Consequently, forecasts fail when they are needed most, namely as major changes suddenly occur (Wack, 1985). Not only is the world in which our forecast will play out might be entirely different than it is today, sometimes the convergence of two or more relatively smooth trends in several factors will lead to sharp discontinuities in other factors. It is partly due to this that forecasters as well as people who have to work with and rely on forecasts are often reluctant to look beyond the 5 year horizon. Instead of trying to perfect forecasting techniques, which aims at getting 'the right' forecast, a new assumption was adopted that led to the use of scenarios, first by Royal Dutch/Shell in the early 1970's, followed by others. This assumption is that the future is no longer stable; it is a moving target for which no single 'right' projection can be deduced from past behavior (Wack, 1985).

Looking at the way companies do their planning, it is sometimes difficult to distinguish between predictions, forecasts and scenarios. It would therefore serve us well to keep in mind the distinction between predictions and scenario planning. While predictions are designed to try and tell us what the future will look like, scenarios are designed to tell us something about the true nature of the environment in which we are operating, through stories of different possible futures. There are many fascinating examples of forecasting/prediction, which at the time they were issued were nothing more than science fiction. One interesting example of such a forecast could be the late

19th century 100 year forecast published by Charles Richet in 1892. In that forecast, Richet presented a statistical projection of the population growth 1982-1992. From that projection he concluded that in 1992, the two largest powers would be the United States and the Soviet Union, as a consequence of the decline in European birthrate. He forecasted that the combined population of the two nations would be about 600 million, which in retrospect seems remarkably accurate. Another interesting prediction was published the same year (1892) in Germany by Max Plessner in his book *The Great Discoveries of the 20th Century*. In this book, Plessner discusses electrical television, and gives a fairly accurate description of the way such an invention might operate. As there are many more Jules Verne examples like that, the difference between this sort of science fiction and scenario planning is clear.

3. The history of scenario planning

“Many people believe that there can be no sort of certainty about the future. You can know no more about the future; I was recently assured by a friend, than you can know which way a kitten will jump next... It is our ignorance of the future and our persuasion that that ignorance is absolutely incurable that alone gives the past its enormous predominance in our thoughts. But through the ages, the long unbroken succession of fortune tellers - and they flourish still - witnesses to the perpetually smouldering feeling that after all there may be a better sort of knowledge - a more serviceable sort of knowledge than that we now possess.”

H. G. Wells

3.1 Military

Scenario planning in its modern form has been in military use since WWII and is still being extensively used by the military (the US Naval Academy is especially renowned for it). When considering military history, we oftentimes see instances of a military strategy which appears to have seen the future of a battle unfolding in extreme clarity, which allowed strategists to take full advantage of the resources at their disposal. In retrospect, we can not tell whether this was an example of precise planning using scenarios or not. However, some cases give off a distinct impression of scenario (or storytelling) being used as part of the planning effort. This view that humans have an innate capacity for building scenarios as part of their planning (which often causes the line between planning and scenario building to become blurry) is also mentioned by Peter

Schwartz (Schwartz, 1996), as well as by other researchers (Ingvar, 1985 and Calvin, 1989, 1991)

While we can never know whether scenarios were used in ancient times (unless there exists a specific account of it), we can certainly see examples of scenarios being put to use in modern times. One such example is Herman Kahns work from the 1960s. As part of an US Air Force effort, Kahn refined scenarios as a tool for business prognostication (Schwartz, 1996). When trying to anticipate how a situation or a drama might unfold, there are more factors to be taken into account than just the size, position and abilities of different army units as well as the physical properties of the environment in which they are operating (such as terrain, weather etc.). To better understand battlefield options and reality, one must also consider the mindset of the opponent, and the different courses of action the enemy might choose to follow. This can be done very effectively through scenario planning. Again, it is easy to understand why one would choose not to trust those scenarios (or to even perceive them) as forecasts, but rather as different possibilities against which to test different strategies. Different possibilities which not only should not be ignored, but which might even change the way in which one perceives the enemy, as well as the realities of the battle itself. It is therefore more than likely that the Greek went over several possible scenarios before taking the decision to go ahead with the horse plan.

3.2 Scenario planning for business

Unlike military scenario planning, scenario planning practices entered the business arena relatively recently. With a growing interest in the future, as well as a deepening understanding of the importance of preparedness for the future, the stage was being set for the introduction of scenario planning for quite a long period of time prior to the introduction of scenario planning by Royal Dutch/Shell in the 1970's.

3.2.1 Pre WWII

Although the corporate world and business in general are often likened to a battlefield, with conflicting interests, opponents, strategies and tactics etc., it was not until after WWII that the concept of using scenarios as we know them today has been introduced.

Still, even before WWII, some signs of the interest in the future for corporate and government planning could be seen. The Soviets for example have already worked with five year government planning, which was viewed by corporations as a preamble for gross government intervention in their affairs. In the US, where government intervention was frowned upon, things looked interesting as well.

After Franklin Roosevelt's 1932 election victory -- widely viewed as a mandate for government intervention and national planning, the National Resource Committee published a report in 1937 on Technological Trends and National Policy (Ogburn, 1937). One of the leading roles in that committee was played by the Committee's Director of Research William F. Ogburn, a sociologist and one of the leading students of social

change. The preamble to the report states that the report was “the first major attempt to show the kinds of new inventions which may affect living and working conditions in America in the next 10 to 25 years. It indicates some of the problems.... It emphasizes the importance of national efforts to bring about the prompt adjustment to these changing situations.” It should be emphasized that although the report dealt with scientific and technical progress, it was really the implications of progress as far as social and economic change goes that were really what interested the report’s writers as well as its audience.

3.2.2 Post WWII

It is widely agreed upon that Royal Dutch/Shell were the ones to introduce and develop scenario planning (Senge, 1990), therefore making the Royal Dutch/Shell company history worth following to better understand the history of scenario planning.

After WWII, Royal Dutch/Shell had to grow, along with the rest of the world. Hence, for a period of about ten years it was concentrating on managing and scheduling physical growth, especially the construction of new refineries, pipelines, tankers, depots and all other facilities which are required to enable the expansion of production capacity. After completing this ten-year long phase, Royal Dutch/Shell moved into the next ten-year phase and from 1955 to 1965 concentrated more on financial considerations.

It was in 1965 that Royal Dutch/Shell introduced the Unified Planning Machinery system (UPM). The system was designed to provide logistics planning for Royal Dutch/Shell’s entire chain of operation, from the time the oil is removed from the ground till it reaches the local gas station. The system provided Royal Dutch/Shell with a six-year planning horizon; the first year in detail, and the following five years in broader

lines. Unconsciously, Royal Dutch/Shell managers designed the system with a “more of the same” world in mind, which was familiar as well as predictable.

There were other limitations inherent in this system. One of those limitations resulted from the fact that oil companies’ projects often have lead times which are much longer than the six-year time horizon the UPM system was able to support. It was when Royal Dutch/Shell executives realized this, that they took the initiative of looking farther ahead into the future (still, not using scenarios). Several experimental studies were initiated by different business units at Royal Dutch/Shell during the early 1970’s, with the common aim of looking ahead to the year 2000. One of the studies indicated that current state would not last forever, and predicted the switch from a buyers’ to a sellers’ market, with major price shifts and inter fuel competition. The study also indicated that while the market was heading towards “rapids” with change and discontinuity as major defining characters, major oil companies were turning into huge, heavily committed, slow to react corporate giants that may be likened to dinosaurs: poor at adapting to rapid environmental change.

Another of these studies was conducted in collaboration with the Massachusetts Institute of Technology (MIT). In the summer of 1970, a group of industry leaders and policy makers as well as professionals, politicians and scientists (The Club of Rome) contacted Jay Forrester of the MIT System Dynamics Group asking for an insight into what the year 2000 might look like. In response to that request, Forrester and his team developed the World3 computer simulation, which was a system dynamics model involving more than 120 different variables. After crunching all those variables the system came up with a response. The world would unavoidably run out of oil, within 20 years. Another by-product of this study was a bestseller – “The Limit to Growth”. That

prediction turned out to be wrong, mainly due to the oil crisis of 1973, which changed the way the energy market looked and behaved; a disruption which the model did not incorporate into its calculations.

It was mainly those two studies, as well as other studies that made Royal Dutch/Shell realize they needed to take a new look at the very way they planned.

3.3 The introduction of scenario planning – Royal Dutch/Shell

While MIT's World3 model was crunching those 120 variables, Pierre Wack of Royal Dutch/Shell took a different approach, which yielded insight into the imminent crisis, at the time perceived to be the possibility of the world running out of oil. Royal Dutch/Shell responded to the need they felt to change the way they do their planning by asking twelve of their largest companies and operating sectors to look fifteen years ahead, in what they called "the Horizon Year Planning Exercise".

At the time, Pierre Wack was working for Shell France. Influenced by mystic thought and familiar the late Herman Kahn and his scenario approach (Kahn, 1962), Pierre Wack put together a team and started working on better understanding the business environment in which Shell was operating, through the use of scenarios. They took a deep look into the French economy and although the details of their study are not material to this paper, the insight they gained into scenario generation is. Wack realized that simply combining obvious uncertainties only yielded obvious, simplistic and often conflicting strategies. Specifically, it caused simple quantification of obvious uncertainties (like focusing on oil prices), and did not contribute to an understanding of the interplay between different variables, such as the interplay between oil prices,

shipping prices, diplomatic instability and environmental issues. It was that realization which drove Wack and his teams understanding of scenarios to the next level.

By only looking at uncertainties, one could get “first generation scenarios”, which are only useful in gaining insight into the environment in which one is operating (first and second generation scenarios will be discussed later). To go beyond that point and develop second generation scenarios, which answer specific questions and help in decision making, one should take into account what Wack called “predetermined elements”. By this term he basically referred to things that have already happened, but the effects of which still remain to be seen. This can be likened to a flood, which one knows is coming once the rain had fallen uphill.

Armed with this insight, Wack went on to produce the 1970 scenarios, which predicted the 1973 oil crisis, albeit without putting a definite date on it. Wack’s team analyzed the driving forces behind the oil producing countries behavior, resulting in an understanding of OPEC strategies. While this scenario has been very successful in predicting the market behavior and enabling Royal Dutch/Shell to not be as surprised as other companies were once the crisis arrived, which allowed them to react quickly to it, it failed in changing management perspectives and world views. It was this failure that prompted Wack to realize that scenarios will either help decision makers or be of little use to them, depending on the way the scenarios were constructed and presented. His predictive success has however driven scenario planning into the Royal Dutch/Shell planning methods mainstream, which was manifested by the creation of the Royal Dutch/Shell Scenario planning unit, later named Global Business Environments unit (GBE).

During the 1980's, GBE was headed by Peter Schwartz, and was producing a set of three scenarios every year. In their 1980 scenarios, they took a look at the USSR, and went as far as identifying Mikhail Gorbachev, not even a politburo member at the time, as a potential reformer who could lead the Soviet Union through changes, which were also described in the scenario (a scenario which has actually materialized in 1989). However stunning the accuracy of the scenario might have been, its importance may be in the signposts it set up. By not only identifying Gorbachev, but also by identifying signals that would indicate Gorbachev was indeed going to behave as GBE thought he would, they enabled the positive identification of this scenario materializing. Namely, they suggested (back in 1983) Abel Agenbegyan of the Institute of Economics in Novosibersk might be an example of a person who might contribute to a change in the Soviet Union, based on his previous writings. When in 1985 Gorbachev introduced Agenbegyan as his chief economic adviser, it signaled the change was relatively certain.

As scenarios were being developed over the years, more and more refinements were added to the scenario planning method. For example, during the 1990's, Royal Dutch/Shell's GBE unit was headed by Roger Rainbow, who came up with the TINA concept, standing for "There Is No Alternative". TINA was a way to concentrate on those predetermined elements and forces and emphasizing them, in a way that engaged people emotionally, especially since people always like to think that "there is always an alternative". This concept of underlining the elements which can not be escaped evolved into "TINA Above", which works at the level of markets, financial systems, governments and other wide-reaching institutions; and "TINA Below", which takes a look at individuals and their wants and needs, as well as their abilities and traits. In each of these

levels, the TINA system concentrates on elements which appear in all scenarios and which should therefore be incorporated into any strategic decision to be taken henceforth.

3.4 Scenarios in action – GBN

Nowadays, scenarios are used by many companies, organizations, governments and individuals for strategic planning purposes. One such example of an organization dedicated to scenario planning is GBN. In 1987, The head of the Royal Dutch/Shell GBE unit during the 1980's, Peter Schwartz founded Global Business Networks (GBN) along with his colleagues from Royal Dutch/Shell as well as others, including Seven Tomorrows co-author Jay Ogilvy and Whole Earth Catalog founder Stewart Brand. This consulting company has been to scenario planning pretty much what the RAND Corporation has been to future studies. Schwartz realized that creating proper coherent scenarios required many different expertises, which no single individual or even a single organization could possess. Schwartz created a network of clients, as well as remarkable people that would benefit from focused, directed and filtered information flow. GBN clients wanted to reorganize their perceptions through scenario planning and integrate their understandings with those of other companies from around the world, since they could not handle the complexity of all the different fields and disciplines required to view the environment in which they had to operate as accurately as they needed to. Using insights gained, GBN has also produced many books, articles and scenarios, many of which are considered to be the foundation on which many companies build their own scenario planning efforts.

4. Literature and available resources

While reading and learning about scenarios, one might get the distinct feeling of Alice falling through the rabbit hole. As I read more and more about the subject, it became increasingly difficult not to notice the ripples sent to and from other disciplines, such as future studies (of which scenario planning is but a part), philosophy, sociology, ethics, scientific method, politics, economics and many more. However, for the literature review I chose to focus on but a few books and articles, dealing specifically with scenario planning.

4.1 Literature

In "The Art of the Long View" (Schwartz, 1996) Peter Schwartz introduces the concepts of scenario planning. This book is probably the best known and most quoted on the subject. The book describes the process of scenario building, as well as tools and methods to help in the process. The new version also includes a "user guide" (Schwartz, 1996, pp. 227-240) which sets a framework to holding strategic conversations. A very interesting part of the book is past scenarios, which by now (in retrospect) can demonstrate how the future is made of a combination of different scenarios and does not just follow one scenario or another.

"Inevitable Surprises" (Schwartz, 2003), which was published after the 9/11 attacks on the World Trade Center includes different possible future scenarios, covering a wide range of topics, from aging population to immigration, politics, technology and ecology. Each of the scenarios in the book is an independent description of a possible

future and is not part of a set of scenarios aimed at providing the reader with mutually exclusive alternatives. Although this book is a fascinating and engaging read, it also serves other important purposes. First, it serves as a window to what scenarios are and what they look like. Although professional scenarios are almost never stand-alone scenarios like the ones presented in this book (for reasons which will be elaborated on later), these scenarios were generated by professionals, with all the necessary research and rigorous methodology required. Another use for these scenarios is to check our preconceptions about the environment in which supply chains operate. By looking at different types of drama unfolding, we can ask ourselves how supply chains might be affected even without modifying the scenarios to fit our scope of interest. The book holds even more meaning when read after reading “the Art of the Long View”, which enables us to read scenarios while thinking about the way in which they were constructed, the research they required, and the meaning they hold.

In a group of articles (Wack, 1985), Pierre Wack gives insights gained through his years in scenario planning. Coupled with other articles about the man and his times one can construct a picture of the forces that shaped scenario planning as we know it, as well as its evolution in Royal/Dutch Shell. Besides insight into what Mr. Wack thinks and believes, these articles describe the way scenario planning evolved to include very important elements such as incorporating consideration of target audience into the scenario building process for effective perspective change with management.

4.2 Other resources

There are many other scenarios available. Scenarios were and are being developed by many groups around the world, from futurist societies, to academia and business. Most of the scenarios are available on the World Wide Web and are not included in any hard copy publication. Some of these scenarios are worth looking into, and perhaps even being used as a baseline for the SC2020 project scenario generation effort. Out of these scenarios, Royal Dutch/Shell's deserve special mention. Royal Dutch/Shell posted their past and present scenarios on their website, free to download. These scenarios not only provide insight into the possible futures as viewed by Royal Dutch/Shell, but also into the way their past scenarios (generated during the 1990's) viewed the world. Specifically, there are scenarios on the website designed with the year 2020 in mind, which would deserve special attention at a future stage of the SC2020 project.

Other insights into scenario planning as well as into other futuristic disciplines can be gleaned through academic institutions which have future studies programs, such as the Australian Foresight Institute at the Swinburne University of Technology (<http://www.swin.edu.au/afi/welcome.htm>), The University of Houston Clear Lake M.S program (<http://www.cl.uh.edu/futureweb/>) and the Wharton web resource on the subject (<http://hops.wharton.upenn.edu/forecast/>). These programs pride themselves in producing professional M.S. and PhDs who specialize in looking strategically into the future. Some of the projects done by these departments resemble to some degree the SC2020 project; hence their outcome may be used as reference. Last but not least, futuristic societies provide a pool of resources in current future research, as well as facilitate access to fringe thinkers, as will be elaborated on later.

5. User Guide - How to generate Scenarios

“Learn the past, watch the present and create the future.”

Jesse Conrad

As discussed earlier, scenarios can be likened to stories. When we think of stories, we usually think about writers expressing their thoughts on paper, with the story itself flowing out of the writers’ imagination, with varying degree of resemblance to reality. However, this is not the case with scenarios. Scenario planning in its modern form is a well structured process. This process was built and refined over many years by experts who not only had deep insight, but who have also made some mistakes along the way. When approaching the task of scenario planning, learning what to do and how to do it is a non-trivial task.

5.1 The need for discipline

Scenarios are used for a specific purpose: to answer questions and facilitate strategic discussion. Therefore, scenario planning requires structure and training. As Ged Davis, current VP of Royal Dutch/Shell GBE says, “At times, the world can look so complex and unpredictable that it becomes hard to make decisions. Scenario building is a discipline for breaking through this barrier” (Davis, 2002). As Davis refers to scenario planning as a discipline, we can use Peter Senge’s definition of discipline: “...a body of

theory and technique that must be studied and mastered to be put into practice” (Senge, 1990).

There are two kinds of scenarios, which were named by Pierre Wack as First Generation Scenarios, also known as Learning Scenarios, and Second Generation Scenarios, also known as Decision Scenarios.

Learning Scenarios are used to gain insight into the system in which we are interested. These scenarios are not used for decision making. Decision scenarios are used to answer specific questions and aid in decision making. The following aspects of scenario generating are applicable to both types of scenarios, albeit in different forms, intensities and project timing.

5.1.1 Research

“We drive into the future using only our rearview mirror.”

Marshall McLuhan

Scenarios should be internally consistent and rooted in reality. This serves a double purpose, both forward looking and considering the background of the audience. When we discuss a possible future, it stands to reason it can not have contradicting elements. Rather, it should be a plausible, coherent description (although the definition of internal consistency may vary, depending on the readers’ concepts of what’s important and what’s not, as well as of the interconnections between different variables). On the other hand, when we wish to have a receptive audience for our scenario, we should consider the audiences background. The story told should resonate in some way with

what the audience already knows. For example, the assumptions made when constructing the story can not contradict events that had already happened.

This concern is addressed by research. Research into the past helps us in avoiding inaccuracies in our assumptions, as well as errors in describing events which have already happened. Research is also crucial in understanding the nature of the environment we are trying to describe; a nature which is often manifested in the way past events have occurred. For example, such would be the case in biological evolution (and some would argue in any kind of evolutionary process), where the players in the scene are a product of a “survival of the fittest” selection process. However, to understand what “fittest” means, we have to consider the way the environment was when the selection process took place, namely the conditions to which “the fittest” had to adapt to. When looking at a business situation, one should understand what is often referred to as “the mythology” (Schwartz, 1996) as to enable treating the audience with respect, and have maximum effectiveness. However, as detailed as we would like our research to be, it is not preliminary research alone which serves as a prelude to scenario generation. It is rather a constant research effort throughout all project phases which is directed at gaining insight into the workings of the system which we are looking at; constantly modifying our research and redefining it as we redefine the questions we are asking. Research should be also focused on looking for contradicting evidence to our assumptions, as well as for elements and facts which would disprove our theories (Popper, 1989). Although this seems like standard scientific method, it is somewhat different; as in the case of scenario planning it refers to trying to refute our pre assumptions, which are often informal and embedded in the very way we phrase the questions we are asking. Scenario planning research is often directed towards the re-examination of these assumptions (Schwartz,

1996). The research is not only past-oriented to educate us in the field in which we are working. It is dynamic and thought provoking.

When looking into the future, research is crucial as well, but for different reasons. Perhaps the most obvious reason for research is looking for information. Such information might be new emerging technologies. In that case, new technologies and new ways of thought, as well as new scientific paradigms are often found on the edges of the main accepted body of scientific activity, if not outside of it altogether. Scientific progress is not necessarily incremental and fluid, but is rather made in leaps, known as paradigm shifts. This understanding of the nature of science is best described in Thomas S. Kuhns “The Structure of Scientific Revolutions” (Kuhn, 1996) and will not be elaborated on in this paper. As far as scenario research is concerned, the bottom line might be the need to look at the fringes. People and organizations often organize what they know in concentric circles, the center of which being the current paradigm, which is made of the main body of knowledge and belief, which are the most cherished and vital values. On the outmost edge are the ideas which are rejected by the majority. However, in between those two are the fringes, which are not legitimized and accepted into the core, but not totally rejected either. It is often the nature of the center, which is very structured, powerful and inertia driven to inhibit innovation. Innovators and free thinkers often find themselves less constrained at the fringes and are practically driven there. There they find new stimuli, nevertheless with the support of current reality. However, being “fringy” as it is, the fringe is less accessible than the mainstream and although many times the deep thinkers might be found there, they should be actively sought for and “chased”, which requires effort. A chase of thinkers from fringes of all disciplines is not implied. Rather, a

broad-view discussion about where to look for such thinkers should take place at the initial stages of the project.

Research is of course crucial in the conventional sense. For example, we can not identify and describe current trends without accurate numbers. This is of course not surprising and is very similar to conventional forecasting. However, we can add to that another layer, by understanding that sometimes we need to consider relevant trends and data which is outside what we are trying to describe. To be more specific, a technology scenario must include an understanding the relevant social, economic and political trends, which are driving this innovation, as well as driven by it. For example, when looking at a new emerging technology such as RFID (Radio Frequency Identification), political and sociological issues stemming from privacy issues should be considered as well, as these might cause a shift in consumer behavior.

5.1.2 Defining the question

To be able to generate useful scenarios, we should first consider and understand the purpose of the scenario, which is to answer a question. These questions can be broad, like “what will future financial ethics look like”, or focused, like “should we build a bridge” or “should we invest in Indonesia”. However, identifying the question in which we should be interested in not trivial. We often have our own blind spots and our own way of viewing the world, which drive us to ask the wrong questions. To help us better overcome those obstacles, several steps can be taken. Nevertheless, sometimes we seem to have no specific question in mind, and we would like just to get a better understanding of what the future might look like. Still, defining an area of interest and elements which

changing forces might influence is essential for us to be able to construct a well focused scenario.

By bringing into the scenario generation process people from the outside, we can better understand our own assumptions and better locate our blind spots. For example, conversations with industry leaders often yield information about new projects run by industry, about which information had not reached academia before. Furthermore, even within academia there are different disciplines such as system dynamics, which enable practitioners to view complex issues in a way much different than other people do. Outside participants often contribute a fresh outlook on things and can also explain to us how a person from the outside perceives the way we see the environment in which we are interested. The next step is usually facilitating some sort of strategic discussion between all participating parties, which is aimed at defining the questions in which we are interested. This can be done through brainstorming, using the Delphi method, conducting interviews or other forms of guided conversation.

5.1.3 Driving Forces, Predetermined Elements and Critical Uncertainties

To reduce complexity, it is useful to cluster the information and ideas that come up during research and strategic conversations into smaller groups, with a common thematic denominator, or which relate to each other. During the formation and consideration of these clusters, we should think about the driving forces behind them, which are characteristic of the system we are dealing with. Kees van der Heijden defines a driving force as “a variable which has a relatively high level of explanatory power in

relation to the data displayed in the cluster” (van der Heijden, 1996, p.189). Driving forces “are the elements that move the plot of a scenario.” (Schwartz, 1991, p.101). These driving forces are usually outside our control and can be political, demographic or technologic trends, as well as large scale environmental degradation and the likes. As these driving forces essentially make and define the environment in which we are operating, their understanding is crucial to our decision making.

For example, when considering the future consumer market, a major driving force behind it would be the size of the population. This size depends on a number of variables, some of which are predetermined, while others are uncertain. Among the predetermined elements which would determine the size of the population is the number of people which would be considered consumers at the time we are interested in. This number is derived from demography, with people who would be in their early twenties already born today (say we exclude the possibility of a major plague). Other variables which would affect the size of the population might be things like immigration patterns, which are uncertain and are therefore termed Critical Uncertainties. By looking into our assumptions about which elements are predetermined and which are uncertain, we might decide that things we considered to be certain are not so certain after all, which would cause us to change our mental model of how the world works. Even if we decide not to change our perception of the world, when things we thought impossible actually happen, we should be able to look back on our assumptions and make the appropriate corrections to our mental models by re-labeling elements as uncertain, instead of predetermined. These Driving Forces, Predetermined Elements and Critical Uncertainties were considered Scenario Building Blocks by Peter Schwartz. Schwartz claims that working with driving forces often helps seeing deeper more fundamental and powerful trends behind them

(Schwartz, 1996). One striking example of such a case was Royal Dutch/Shell's problem of constructing a giant off-shore gas drilling platform, which caused them to consider the European oil market and gas supply, which in turn caused them to consider the U.S.S.R. politics, and consequently foresee Perestroika coming.

These building blocks are not only relevant to our understanding of the system, but also to the plot construction process. For example, by looking at two of the major critical uncertainties and taking them to the extremes, we can construct a matrix of four possible combinations (assuming they are all possible, which is not always the case). By describing the reality created by those four possible combinations, we can start constructions of four basic plots.

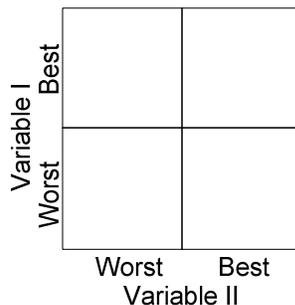


Figure 1: Two variable matrix

We should keep in mind that although the matrix looks simple enough, it is a product of sifting through many variables, determining which ones are important enough to base a scenario around, and determining the values for these variables. Although it is recommended to generate only three or four scenarios, it is not necessarily the case with the SC2020 project. For the project, we might choose to look at more variables and just use a “Supply Chain Generating Function” to see which supply chains would fit which scenario, rather than use the scenarios to answer a specific question.

5.1.4 Constructing the plot

The plot is the logic that ties all elements of a scenario together in a coherent fashion. However, as scenarios are usually created to force people to think about their assumptions and question them, they should be written accordingly. For example, scenarios should be frightening enough to cause management to pause and think things over, but not too frightening as to cause management to shut down and become unresponsive. A possible example of such sensitivity would be possible scenarios considered when deciding to buy life insurance for employees. We might want to consider the possibility of an employee being in a car accident, but not the possibility of an entire department going on a field trip and being in a bus crash. It is therefore essential to consider the audience when constructing the plot of a scenario. In fact, that is one of the major lessons learned by Pierre Wack after his 1970 scenarios which predicted the 1973 oil crisis (Wack, 1985). It was the scenario plot and construction which made it inaccessible to top management, therefore failing to change management behavior in time.

There are some archetypes of stories, which are easy to understand. These archetypes are engaging, and can be used for both best and worst case scenarios. Peter Schwartz gives several examples of plots, but more can be thought of. Among these plot types are:

- **Winners and Losers:** based on the perception of limited resources and the Zero Sum Game. This case often results in conflict, a balance of power compromise, buildup of tension, etc. This is an example for the need to consider our plot as a symptom of our assumptions. Although we may choose to tell a Winners and Losers story, that is not necessarily the case. Sometimes reality is perceived by

the players on the field as a Winners and Losers case, while an outside observer might see it as something completely different. This sort of thinking is often exemplified in wartime, where the warring parties see the situation as a winners and losers scenario, with this view partly driven by their common history and mythology. However, outside mediating parties often manage to mediate by “enlarging the cake” and introducing new elements into the conflict that enable all parties involved to find it in their best interest to just end the conflict.

- Challenge and Response: based on a series of challenges which have to be faced and overcome, while learning a lesson with every obstacle which is successfully tackled. This type of scenario might fit when describing such issues as environmental degradation and the relevant policies. It is often used by Japanese companies, as it fits well with the Japanese concept of life as a series of challenges, which by overcoming one is transformed into a better person (Schwartz, 1996). An example of such a story line could be the US deciding to intervene in the WWII conflict and as a result emerging as the world’s most powerful economy. Such future challenge for the US could be overcoming its deficit (ibid).
- Evolution: based on describing slow but constant change, which is the main driving force behind the scenario. Such driving forces might be technologic, demographic or environmental. Examples of such forces might include the evolution of the US highway system, computer technology, as well as the shifting of economic power towards the spots where technology advances.
- Revolution: based on dramatic change. Although rare, these changes must be taken into account if they are plausible. Example of such discontinuities might

be OPEC becoming a political power, the toppling of the Nixon presidency, the end of the Soviet Union, as well as natural calamities and plagues like AIDS. Based on archeological records, climate change might be in this category too, with ice ages taking relatively short periods of time to develop (possibly measured in decades). Although climate change seems to be outside our scope of interest, it might still be worth looking at since there is evidence that policy makers are looking into it with concern (Stipp, 2004).

- Cycles: based on the cyclic patterns in market economy, as well as on policy resistance. Although identifying such cycles is relatively easy, actually pinpointing the exact phase of the cycle in which we are currently operating, or the phase in which we expect the cycle to be at the time of the scenario is very difficult.

These kinds of plots (or frameworks for understanding change), as well as others not listed here, rarely work alone. Often they are used to formulate and test the internal consistency or logic of a scenario, and actually interact with each other (for example, Revolution with Challenge and Response), merge and from one plot into another. In addition, when designing a scenario, we should consider the ways different plots might react to the same forces.

As scenarios are stories about possible futures, they are always constructed in groups. These groups are usually made of three scenarios, and sometimes four. It is generally agreed that two scenarios is too few, with resulting Utopia/Catastrophe scenarios, while having more than four scenarios is generally too complex for the recipient to handle. The basic scheme for a scenario package is therefore two scenarios

which describe two extreme (to a certain degree) cases of some element, with a third scenario which revolves around a totally different axis, as to avoid the obvious Utopia/Catastrophe/Average, with the Average scenario tending to be “more of the same”, describing the world as we know it today and contributing relatively little to our preparedness for the future. For the scenario reader/user, it is sometimes difficult to see beyond the type of plot into the elements which the scenario is built around. It is therefore the role of the scenario writer to make sure the group of scenarios is consistent with these guidelines.

5.1.5 Naming the scenario

A very distinct feature of scenarios is their names. A short, evocative name serves a dual purpose. First, it is used to convey the key element of the scenario, or the thing that makes this scenario thought provoking. Secondly, it serves as an easy to remember reference, which can later be used in conversation to stand for the future which that specific scenario describes, thus giving a group a common terminology with which to refer to the scenarios, thereby facilitating the use of these scenarios.

Examples of such names can be found in any set of scenarios, with Royal Dutch/Shell scenarios for 2020 having such names as “Business Class” and “Prism”, with elements named “The New Medievalism” and “The Great Game of Gas” among others. Another scenario project done by WBCSD with the participation of such companies as ABB, BPC, 3M, GM, IBM, J&J and many more took an even more artistic approach, with scenarios named “FROG!”, “GEOpolity” and “Jazz” (these scenarios looked at sustainable development to the year 2050).

6. Scenarios and SC2020

As mentioned in the introduction, the reason for writing this paper is the SC2020 project. The following chapter lays out the logic behind and the benefit to using scenario planning in this project. It then continues to providing a possible way of using scenario planning in the project, utilizing what has been learned about scenario planning up until now.

6.1 Why should we use scenarios?

“The leader needs to have a sense of the unknowable, and be able to see the unforeseeable....This is partly what gives the leaders their ‘lead’, what puts them ahead and qualifies them to show the way.”

Robert K. Greenleaf. *Servant Leadership*, Paulist Press, 1991

As described in the introduction, the SC2020 project is about looking into the future, with the aim of providing insight into what supply chains might look like, as well as what companies can do today to be better prepared for that future. These insights might be gained by a disciplined look into the mechanisms behind supply chains and the way these chains interact with the environment in which they are operating. To do that, we will first have to look at the present and try to understand the decisions and forces that helped position companies as leaders in their field; namely, best practices. We should then try and figure out the policies these companies took in the past, which enabled them

to emerge as leaders in the present. Other important insight that can be gained through such research is an understanding of the way leading firms have looked into the future, anticipated it, shaped it and adapted accordingly. Implementing these insights, we should try and figure out what do companies need to do today to become leaders in the future, or to at least be able to handle that future effectively. But what is the future?

Scenario planning methods can provide us with some tools with which to effectively concentrate our efforts at looking into the future, as well as help in avoiding some common pitfalls. In this chapter I will try to provide a reason for using scenario planning in this particular project (SC2020), as well as a suggestion for a possible method of integrating it into the project through its different phases.

There are many ways to analyze a system and to gain insight into its workings. These different methods can generally be classified into two and a half categories. The more obvious of those would be bottom up and top down. The third (or actually half, since it is sometimes classified as either of the former two, depending on the case) would be outside in. In the bottom up approach, one might look at the inner working of a system, the way all of its parts work individually, the way they are integrated and their inter-reactions to come up with a description of the system as a whole. In the top down approach one might look at the system as a whole, working the way down into describing the mechanics of its parts. In the outside in approach, one would try to explain the system mechanics and behavior in light of the environment in which the system functions.

In a project as big as the SC2020 project, there seems to be a risk in using only the bottom up method, in which we analyze the scientific principles underlying each of the supply chain components, to better understand what the supply chain is.

If you will, the supply chain (although we have not defined what it actually is) may be likened to LEGO™. Taking the bottom up approach, we can quite easily describe a LEGO™ brick and all of its characters. We can describe its size, shape and recipe for making the plastic. From that recipe we can conclude the color of the brick, its mass, as well as physical properties. We can even go a step further and explain that two bricks can be joined (due to their shape) to form a new, differently shaped “super brick”. To complement the bottom up approach, we could also try to describe LEGO™ using the top down approach, whereby looking at enough different permutations of “super blocks” constructed from LEGO™ bricks, we can come up with a description of the system atoms and extrapolate some common characteristics to all super blocks possible. However, all that information which describes the brick perfectly does not say anything about the LEGO™ effect. Put a person in a room with a box of LEGO™. After some time, the person will create something with those bricks. Actually, many of the people who have never seen a LEGO™ brick before will try and taste it first, which accounts for the bite marks found on many of the bricks. That ability of the LEGO™ brick to bring out the creativeness and innovation in people can not be explained by any or all of its physical properties. It has to do with the environment in which they exist, namely human nature, dexterity and playfulness.

The same principle seems to hold true for supply chains as well. Although supply chain design is rooted in companies’ drive to optimize whole supply channels, instead of just sub-optimizing parts of them, the way in which they do that is very much dependent on the environment in which these companies operate. This environment is made of economic and political factors, as well as regulatory constraints and incentives, values

held by different stakeholders, availability and price of different resources, environmental as well as ethical issues and other factors which lie outside the direct realm of influence any single company has. Some of these factors change over time in a relatively trend-like fashion, while others tend to have shifting behavior, characterized by discontinuities. For example, the rising environmental concern, accompanied by activities carried by organizations such as Greenpeace forced oil companies to change their business practices and the way they interact with local markets, clients and suppliers. Although many of these outside factors can be quantified and turned into constraints that would shape an optimization model, some of them can not. Nevertheless, some those factors deserve to be strategically discussed to determine exactly how they should be quantified and what would be likely values for these factors in the future.

6.2 How should we use scenarios?

The following section is but one suggested way of using scenario planning in the SC2020 project. although it is based on literature as well as on the experiences of companies who had done scenario planning before, I expect the way we shall use scenario planning to shift and change as the project evolves and as different outside parties bring their own experiences of scenarios with them to the project.

6.2.1 Key variables

“I hold that man is in the right who is most closely in league with the future.”

Henrik Ibsen

As previously mentioned, a crucial part in scenario generation is identifying key variables around which our scenario revolves and which should be classified into driving forces, predetermined elements and critical uncertainties. The effort directed at identifying those key variables is likely to be in the initial phases of the research, but looking at accounts by people who have conducted this sort of research before, I think we can safely expect it to be a continuous process, whereby with every new piece of information gleaned throughout the course of the project, our understanding of the nature of these variables, their importance as well as of new variables will shift and be tweaked.

However, still looking at the first phase of the project, our “variable search” might take a threefold shape (not ranked according to importance):

- **Looking at previous work:** Since the energy market is considered to be a major force shaping the way supply chains are behaving today, it stands to reason to look at the scenarios generated by Royal Dutch/Shell for the year 2020. We should also look at previous future studies done in academia, as mentioned before.
- **Consulting with industry leaders:** It might be worth considering extending the outside contributors beyond the advisory board circle, through some sort of an open forum, which should serve as a bi-directional filter, forwarding relevant information to possible contributors, and receiving relevant input from them. It might also benefit the SC2020 project to consider engaging organizations specializing in scenario planning, such as academic future studies experts, certain consulting firms, as well as futurist societies.
- **Analyzing Current Supply Chains:** evaluating the correlation between the forces which we deem important in shaping supply chains and actual supply chain behavior.

While looking for variables, we should also make note of the way leading companies, or companies with Best Practices in a certain domain became leaders. While in other parts of the project we would be interested in understanding the best practices themselves, for the purpose of envisioning the future we should be looking at those companies from a slightly different angle. Since we are trying to figure out what do companies need to do now for them to be prepared for the future, we should ask ourselves and the companies we are looking at “what did companies do fifteen to twenty years ago that turned them into present day leaders?”. The answer to this question might teach us something about successful preparation for the future, which we could apply to

our project. Another possible outcome might be a realization that nobody looks that far ahead into the future. As mentioned earlier, a normal planning horizon is usually about five years long. If we find out that indeed no one looks that far ahead, it may teach us another lesson altogether. We should then try to evaluate the role of evolution, promoting the “survival of the fittest”. We should do so with a critical approach, bearing in mind that a company strategy’s de-facto match with its operating environment, which allows it to become an industry leader, does not necessarily stem from exceptional foresight. It is possible that we should only look at the past and try to identify trends in outside factors companies have limited or no control over. However, I suspect we will find cases of discontinuities that could not have been predicted using trends, which will push us again towards the use of some method to try and figure out where these discontinuities will appear.

6.2.2 Variable Classification

After we have identified the variables affecting supply chain formation, we should try to classify those variables. As mentioned earlier, there are three main classifications: driving forces, predetermined elements and critical uncertainties. One way of classifying these variables would be to conduct a Delphi leading to a consensus among all parties involved (after of course familiarizing all participants with the concept of variable classification). After determining which variables we think are important, these variables should be ranked by importance and uncertainty. This method of classification would allow us to establish the variables we should concentrate on when constructing the scenarios.

6.2.3 Scenario logic

“The trouble with our times is that the future is not what it used to be.”

Paul Valery

After identifying the variables of interest, we should try to limit ourselves in the number of scenarios we will be generating. A proliferation of variables and consequently of scenarios would lead to a dilution of the main point in each scenario, as well as to an overload of information which would be counter-productive. We should therefore place our most important uncertain variables on an axis (single variable), matrix (two variables) or volume (three variables) and try to assign possible values to them, without necessarily assigning probabilities to those values. By considering how far each of the uncertainties may go, we can better calibrate these grids to better fit possible reality. At this point, a fleshing out of scenarios may occur, since some combinations of outcomes are more likely than others. For example, if we choose to consider the two uncertainties of fuel prices, national and international security concerns and regulations (which sometimes act very similarly to protectionist laws), we may find it likely that placing limits on trade with oil producing countries will come hand in hand with higher oil prices. On the other hand, we may find some combinations of variable behavior to be so unlikely or unreasonable that they can be eliminated from our grid. It also stands to reason that people familiar with scenario planning methods would consider possible plot lines while choosing the variables. However, this should be a conscious act, or else it causes to

choose those variables which match a plot that is easier to construct, and not necessarily a plot that carries more meaning.

After we have managed to reduce the number of scenarios to about three or four, we should consider possible story lines that would help explain how things evolved from current state to this future state. Possible plot types were discussed earlier in this paper. It is often easier at this stage to split the project group into several subgroups, each responsible for generating one scenario (Schwartz, 1996). However, we should not only look at the variables around which the scenario is woven, but rather try to incorporate other variables as well. These other variables might include such variables whose behavior goes hand in hand with that of the core variables, or which might have some explanatory power that would enhance the scenario credibility.

While choosing our scenarios, we should be careful not to create scenario sets that would cause us to gravitate towards one scenario by design. Mechanisms that do that include (among others) having two extreme scenarios and one “middle” or “average” scenario. This type of average scenario is usually reminiscent of the world as it looks today. Since we know more about how the world works today than we do about the future, we would be inclined to attribute a higher probability to this scenario over others. We should also avoid assigning probabilities to different scenarios. While probabilistic ranking is useful in deciding which elements to put in a scenario, having a more probable scenario causes us to focus on that specific scenario, neglecting the other scenarios.

6.2.4 Establishing signposts

Each of the scenarios generated stands for one possible future. However, it is highly unlikely that the future will turn out to look exactly like one of these scenarios. It is much more likely that the future will look like a combination of elements from all the different scenarios. It would therefore serve us well to incorporate into the scenarios some sort of sensor, or a signpost. These signposts are events that are very likely to occur under a certain scenario and not under the other scenarios. Hence, observing these events actually happening would serve as a good indication of the future actually going in a certain direction, allowing companies to adapt their strategies as the future unfolds.

6.2.5 Putting the scenarios to work

“As for a future life, every man must judge for himself between conflicting vague probabilities.”

Charles Robert Darwin

After we have come up with our three to four scenarios (or more, as discussed earlier), we should go back to our initial questions and try to answer them using these scenarios. Namely, we should be trying to devise supply chain strategies and behaviors that would fit each of the different scenarios. We should then ask ourselves whether there are elements which are similar in all strategies, whether strategies can be made more robust by changing them so they might fit more than one scenario (in case we recognize as we go along that a certain scenario is not likely to happen) and questions of that nature.

For example, if we consider possible global factors, we might want to look at Asia as it develops. We might then come up with two different scenarios, where China and Japan form an alliance that turns Asia into one mega block, or where due to political inability to adapt to change, China declines back into hard core communism, thus causing a sudden devaluation of the efforts put into setting the stage to the rise in Chinas involvement in the market. We should then come up with signposts that would help us identify in advance which way Asia is going, but notice that in any case, strengthening relations with Japan would prove beneficial.

7. Conclusion

This paper tried to accomplish several things. First, to provide the reader with an understanding of what scenarios are and how they evolved into their modern business strategy oriented form. The paper then proceeded to describing the manner in which scenarios are generated. Finally, concluding with a suggested way to incorporate scenario planning into the Supply Chain 2020 project, a suggested implementation of the scenario planning method was given. Although proponents of scenario planning often cite the amazing success scenario planning had at Royal Dutch/Shell, I believe it is not necessarily inherent to the scenario planning method to be such a good future prediction and forecasting tool. This belief is based on the designated use for scenario planning given by Wack and Schwartz (Wack, 1985 and Schwartz, 1996), which is mainly as a tool for facilitating strategic discussion as well as issue clarification. It is oftentimes hard to look beyond the disciplines ability to foresee, almost clairvoyantly, very dramatic shifts such as the 1973 oil crisis and the fall of communism. However, I tend to side with the claim, partly advocated by people who were involved with the Royal Dutch/Shell scenario planning efforts, that it is the nature of the future itself that renders conventional forecasting methods insufficient, not only in predicting what the future will turn out to be, but also in aiding in strategically understanding what our business environment is really made of and which factors in it are important. In that regard, I have come to believe that scenario planning would be extremely helpful in stimulating, facilitating and focusing an ongoing strategic discussion among the different parties involved in the Supply Chain 2020 project, as well as essential in pinpointing our blind spots and directing us towards overcoming them.

Scenario planning is but one discipline within the realm of future studies, which includes other practices like extrapolation, impact assessment, pattern identification, systemic analysis, visioning and many more. There is a large body of knowledge and available literature on the subject of the future and of different ways to approach its exploration.

As for scenario planning and the Supply Chain 2020 project, the paper looked at how this method might fit different stages of the project and how it may complement other scientific methods of research that might be used in the project. That said, perhaps as important as an understanding of what scenarios are, is an understanding of what scenarios are not, as well as awareness of some common mistakes made by people who use scenarios as well as of some pitfalls that should be avoided as we go through the scenario planning process.

8. Bibliography

Anonymous (1999), *The Study of the Future*, Bethesda, MD: World Future Society [On-line] <http://www.wfs.org/studytoc.htm>, May 4th 2004.

Armstrong, Scott J. (1998), *Forecasting Principles*, Wharton School, University of Pennsylvania [On-line] <http://hops.wharton.upenn.edu/forecast/>, May 4th 2004.

Bell, Wendell (1997), *Foundations of Futures Studies*. New Brunswick: Transaction Publishers.

Calvin, William H. (1989), *The Cerebral Symphony: Seashore Reflections on the Structure of Consciousness*, New York: Bantam Books.

Calvin, William H. (1991), *The Ascent of Mind*, New York: Bantam Books.

Chicoine, Garry (2002), *Deconstructing the Future: The Cognitive Case for Scenario Planning*, Pitlochry, Scotland: Metabridge AB [On-line] <http://www.metabridge.com/assoc/stratscen3.html>, May 4th 2004.

Davis, Ged (April 28 1998), *Creating Scenarios for Your Company's Future*, New York: The 1998 Conference on Corporate Environmental, Health and Safety Excellence. [On-line] http://www-static.shell.com/static/royal-en/downloads/creating_scenarios_companys_future_28041998.pdf, May 4th 2004.

Davis, Ged (August 27 2002), *Scenarios: Exploring Societal Problems*, Johannesburg: IUCN Environment Centre.

Davis, Ged (July 12, 2002), *Scenarios as a Tool for the 21st Century*, Probing the Future Conference, Strathclyde University. [On-line] http://www-static.shell.com/static/royal-en/downloads/gd_scenarios_as_a_tool_12072002.pdf, May 4th 2004.

de Geus, Arie. (1988), "Planning as Learning," *Harvard Business Review*, March-April 1988, pp. 67-74.

Ingvar, David H. (1985), "Memories of the Future: An Essay on the Temporal Organisation of Conscious Awareness", *Human Neurobiology* 4, no. 3 (1985), pp 127-136

Kahn, Herman (1962), *On Thermonuclear War: Thinking the Unthinkable*, New York: Horizon Press.

Kenter, Renate (1998), *The Art of the Possible: The scenario method and the 'Third Debate' in international relations theory, a master thesis in international relations*, Amsterdam: University of Amsterdam.

Kleiner, Art (1996), *The Age of Heretics*, New York: Currency/Doubleday.

Kleiner, Art (1999), *Scenario Practice*, [On-line]
<http://stage.itp.nyu.edu/scenario/overview.html>, May 4th 2004.

Kuhn, Thomas S. (1996), *The Structure of Scientific Revolutions*, Chicago: University of Chicago Press.

McNees, Stephen K., Ries, John (1983), The Track Record of Macroeconomic Forecasts, *New England Economic Review*, November-December 1983, p. 5.

Meadows, Donella H. et al (1972), *The Limits to growth; a report for the Club of Rome's project on the predicament of mankind*, New York: Universe Books.

Ogburn, William F. (1937), *Technological trends and national policy, including the social implications of new inventions. June, 1937. Report of the subcommittee on*

technology to the National resources committee, Washington: U.S. Government printing office, 1937.

Popper, Karl R. (1989), *Conjectures and refutations: the growth of scientific knowledge*, New York: Routledge.

Ringland, Gill (1998), *Scenario Planning: Managing for the Future*, Chichester, West Sussex: John Wiley & Sons Ltd.

Schultz, Wendy L. (2003), *Future Studies: an Overview of Basic Concepts*, [On-line] <http://www.infinitefutures.com/essays/prez/overview/index.htm>, May 4th 2004.

Schwartz, P., Randall, D. (2003), *An Abrupt Climate Change Scenario and Its Implications for United States National Security*, GBN, [On-line] <http://www.gbn.com/GBNDocumentDisplayServlet.srv?aid=26231&url=%2FUploadDocumentDisplayServlet.srv%3Fid%3D28566>, May 4th 2004.

Schwartz, Peter (1991, 1996), *The Art of the Long View: Paths to Strategic Insight for Yourself and Your Company*, New York: Currency/Doubleday.

Schwartz, Peter (2003), *Inevitable Surprises: Thinking Ahead In Time of Turbulence*, New York: Gotham Books.

Senge, Peter M. (1990), *The Fifth Discipline*, New York: Currency/Doubleday.

Shell International (2003), *Scenarios: an Explorer's Guide*, London: Global Business Environment, Shell International. [On-line] http://www-static.shell.com/static/royal-en/downloads/scenarios_explorersguide.pdf, May 4th, 2004.

Sherden, William A. (1998), *The Big Business of Buying and Selling Predictions*, Chichester, West Sussex: John Wiley & Sons Ltd.

Slaughter, Richard A. (1999), *Knowledge Base of Futures Studies, Millennium Edition CD-ROM*, Queensland, Australia: Indooroopilly/Foresight International.

Stipp, David (2004), "The Pentagon's Weather Nightmare," *Fortune Magazine*, February 9th 2004, Vol. 149 No. 3.

Townsend, M., Harris, P. (2004), "Now the Pentagon tells Bush: climate change will destroy us," *The Observer*, February 22, 2004.

van der Heijden, Kees (1996), *Scenarios: The Art Of Strategic Conversation*, Chichester, West Sussex: John Wiley & Sons Ltd.

Wack, Pierre (1985), "Scenarios: shooting the rapids," *Harvard Business Review*, November-December 1985, p. 139

Wack, Pierre (1985), "Scenarios: uncharted waters ahead," *Harvard Business Review*, September-October 1985, pp. 73-89

Wylie, Ian (2002), "There Is No Alternative to ...", *Fast Company*, Issue 60 July 2002, p. 106. [On-line] <http://www.fastcompany.com/magazine/60/tina.html>, May 4th 2004.