A Review of the Leading Opinions on the Future of Supply Chains

Supply Chain 2020 Project Working Paper

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Executive Summary

Growth and profitability are the two cornerstones of any successful business strategy. To remain competitive, organizations invest heavily in developing forecasts and robust plans to improve profitability and foster growth. However, forecasting in an uncertain environment is notoriously difficult, and poor predictions often lead to inadequate planning and flawed decision making. An effective way to handle uncertainty is to develop effective demand and supply chain management capabilities. A growing number of companies are recognizing that a well designed supply chain is a key component of commercial success. As a result, there is strong interest in identifying the trends that are shaping the future of supply chains; organizations are actively collecting and analyzing information that will help them divine the future and develop agile supply chains.

In this paper we survey the prevailing views on the future of supply chains. Based on our review and synthesis of 46 publications, we present a comprehensive list of the key drivers that can potentially transform supply chains in the future along with the underlying visions. Our review indicates that most of the publications support the vision of a highly connected world in which supply chain links will be extremely fluid and transient. In this vision activities across the supply chains are triggered by signals from end customers, supported by systems that will run efficiently, and facilitated by innovative production, communication, and information technologies. Furthermore, the constituent companies will share information freely and co-create products for the end customer. An important rider is that different publications work with varying time horizons, making it difficult to compare and contrast their respective opinions.

We, on the other hand believe that the future will not be so perfect. We have strong reservations about the level of supply chain collaboration and flexibility achieved in the year 2020. In the absence of tools to predict the future of supply chains, we maintain that the best approach to such foretelling is scenario planning rather than point forecasts. The scenario planning technique produces a set of predictions based on a holistic analysis of the universe being studied. We believe that this method offers a more robust view of the future. We highlight some of the shortcomings and inconsistencies in the prevalent opinions that are not plausible without a paradigm shift in our understanding of markets and business operations.

This paper is part of the Supply Chain 2020 Project initiated by the MIT-Zaragoza International Logistics Program.

1 Introduction

"The business of business is not only business."[1] There is a consensus among futurists that based on the experience and developments of recent decades, business is the only institution that is capable of providing an effective global stewardship of the future. That said, it is also true that, in their present form, business entities are not yet ready to undertake such a noble responsibility. However, revolutionary corporate structures, philosophical shift, and appropriate use of technology will eventually advance businesses and make them worthy leaders. In fact, this transition is already taking place, businesses are moving from the fast-disappearing "we are separate and must compete" mode to the widespread "we are connected and must cooperate" mode and on to the "we are one and choose to co-create" mode found in futuristic virtual organizations. The important message is that businesses have a critical role to play in the future and business processes must evolve rapidly to support this transition. And, one key business process for a successful transition is the ability to forecast effectively.

However, predicting the future is not easy. According to Moody and Morley, "Making predictions is a lot like physics. We can predict the future with 80% accuracy, provided we don't give a time scale on the predicted events."[8] In other words, as is well known, future telling is an inexact science. It is an iterative process that takes into consideration multiple inputs, for example the quantitative analysis of past data, qualitative judgment of the future, customers' predictions, the economic and industry outlook, to name a few. The importance and weight of each input and step is very situation specific driven by the nature of the industry segment, product characteristics, availability of useful information, technical capabilities, forecasting horizon, and company practices.

Given today's fast-changing business environment, the ability to anticipate trends is more important than ever. Additionally, the very nature of business is changing rapidly as companies are moving away from the traditional view of enterprises as separate, independent entities, towards a more collaborative model where the emphasis is on interconnectivity. Consequently, business processes must evolve rapidly to support the transition, and this evolutionary movement depends, to a significant degree, on the future-telling capabilities of enterprises.

At the same time, there is growing recognition that the supply chain is a strategic asset that plays a crucial role in sustaining growth and profitability. More demanding customers are compelling suppliers to better manage the "better-faster-cheaper" competitive triangle,[6] forcing corporations to become extremely flexible and adaptable. But, developing an adaptable, efficient supply chain in a volatile market requires a keen sense of how supply chains will evolve. Organizations that are aware of these emerging trends will be in an advantageous position to exploit the opportunities that arise.

Detecting future business trends requires a significant amount of effort to study and analyze numerous qualitative and quantitative factors (collectively referred to as Macro Factors in this paper), and this can be an enormous undertaking. At the same time, there is nothing in the process of forecasting that prohibits anyone from speculating about the future based solely on one's perception of the world and imagination. Furthermore, validating a forecast is never easy regardless of the forecasting method deployed due to the inherent uncertainty. As a result, business forecasts abound and a rich body of work is available in the open literature discussing the future. In this paper, we will review the literature to evaluate the prevailing notion of the future and try to organize the information into an effective framework. Since we are focused solely on the future of supply chains, we will limit our review of publications. A key objective of this paper is to motivate the research agenda of the Supply Chain 2020 project.

The rest of the paper is organized as follows. In Section 2, we present the motivation behind this paper, followed by a short description of the review process providing the number and type of publications reviewed along with other background information in Section 3. We introduce the framework used to organize information in Section 4. In Section 5, we present and discuss the result of the literature review. In Section 6, we analyze the assimilated information to highlight commonalities and shortcomings of the work so far. Conclusions are presented in Section 7.

2. Supply Chain 2020 Approach

After years of inwardly-focused improvement efforts, over the last decade or so organizations have come to a sobering conclusion: that they can no longer compete in isolation since this is a losing strategy. A direct consequence of this realization was the inexorable shift in corporate strategies to focus on the alignment and synchronization of supply chains to better manage products from start to finish. Indeed, most organizations now recognize supply chain execution as a key component of their overall corporate strategy to maintain leadership. For example, established leaders like Dell and Wal-Mart regard their investment in supply chain improvement efforts as paramount to continued growth and success.

To manage supply chains successfully, organizations need a good strategic forecast of what to expect in the near- and long-term future. But the complex interaction of numerous macro factors compounded by rapid globalization and technological change is making the business environment increasingly complex and dynamic. Moreover, history shows that we are not very good at predicting the future anyway. For example, Alexander Graham Bell predicted in 1887 that the telephone was such an important invention that “someday every community would have one.” In 1899, the U.S. patent office director, Charles Duell, stated that everything that could be invented has been invented. In 1943, Thomas Watson forecast a world market for about five computers. In 1981, Bill Gates said that 640K would be enough memory for anyone. Furthermore, it is important to realize that every time we take a step towards our predetermined goal, we act on the future state of the goal and permanently alter its course. So, what is the importance of forecasting given our lack of faith in predictions and the inevitability of an uncertain future?

Establishing concrete goals and objectives is necessary for focusing the efforts of any organization. Predicting the future is thus an important activity that allows an organization to be proactive and aggressive, and “only by speculating about the future will we be able to affect it.” [6] As noted by Bomba, “the future does not just happen” [6]; it is made, and we, therefore are responsible for how it is made. Although long-term forecasts are typically inaccurate, identifying common themes among predictions made by unrelated organizations and experts can offer valuable insights into the general direction of the future of supply chains. Additional information can be obtained by correlating long-term forecasts of key macro factors. It is our view that by analyzing a broad set of prevailing predictions and opinions, with due consideration given to the predictive process used, we can fashion a deeper understanding of prospective business scenarios. We believe that by developing a comprehensive view of supply chain possibilities, we offer a platform for the readers to appreciate the complexities of the future and allow them to speculate on the likely outcomes. Arie de Geus, retired Planning Coordinator for Royal Dutch/Shell, states that, "The ability to learn faster than your competitors may be the only sustainable competitive advantage."[4]

To this end, in this paper we present a synthesized view of the opinions compiled from numerous publications on the future of supply chains. This work is by no means a comprehensive survey or a scientific effort to identify the most accurate predictions. Rather, it is a literature review to identify prevalent themes in discussions that pertain to the future shape of supply chains. Although this work is not a structured study, it is based on numerous publications that collectively provide rigorous studies of the future. We will organize the information available in the published work into an effective framework to offer readers a composite view of the future, with a sharp focus on supply chains.

3. Review Process

A tremendous amount of information on the future state of supply chains is available to us, especially if we take into account the prediction of various macro factors related to economic, societal, environmental and technological trends. and advances in product development. As a result the greatest challenge is to find an effective way to filter and collect the most likely future scenarios and predictions. Since this study is focused on the future of supply chains, we will ignore all publications that are not directly tied to this specific area.

We performed an extensive search of library catalogues for books and journals and the internet for web-based resources for supply chain-related predictions. This process yielded a total of 110 publications (books, journal articles, white papers, industry presentations, research studies, commentaries etc.) The first review was filtered for relevance and importance, and the list was pruned to 70 publications. The second and final review led to the elimination of more publications, resulting in a final set of 46 publications. It should be pointed out here that most of the publications focused on supply chains in the United States.

4. Supply Chain 2020 Project Framework

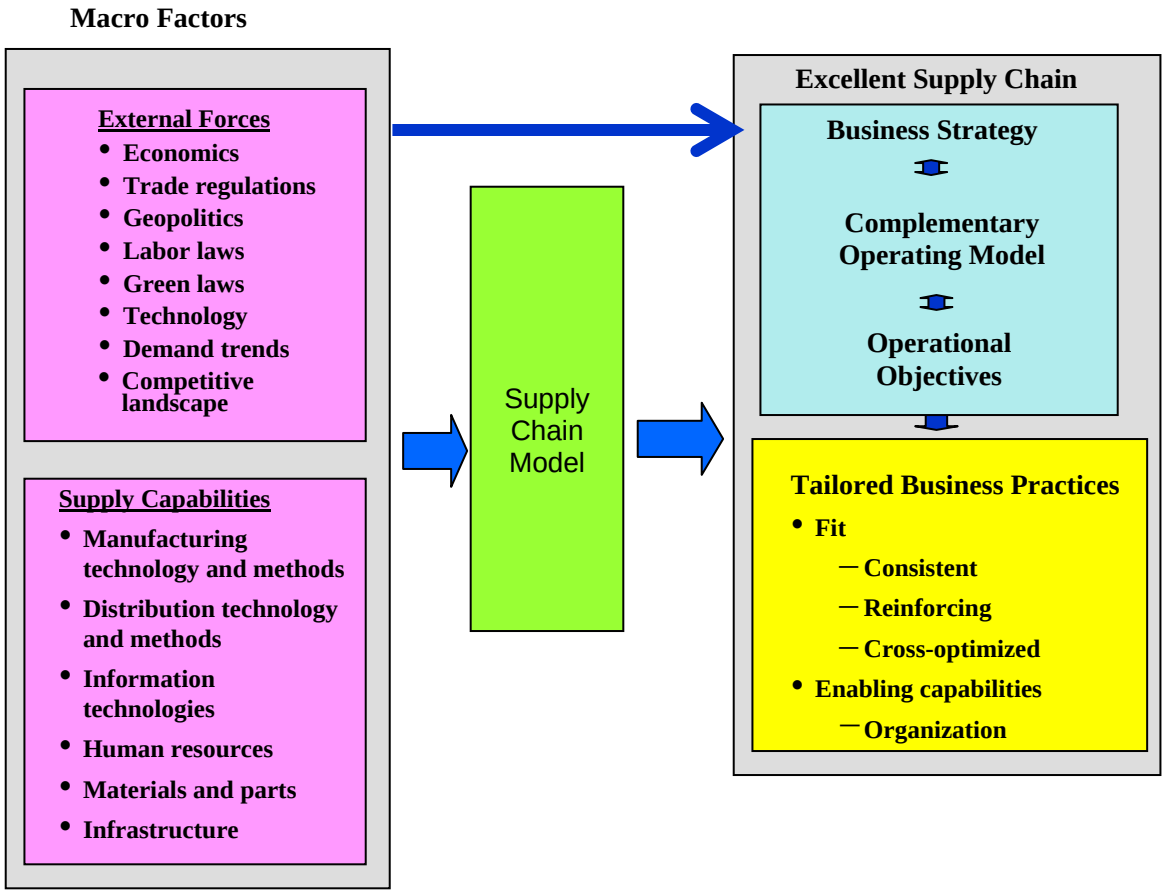
The current research is supported by the MIT Center for Transportation & Logistics (CTL) that launched the supply chain research initiative called Supply Chain 2020 (see www.supplychain2020.net). This multi-year research initiative will predict the supply chain of the future, mapping innovations and macro scenarios to the year 2020. By understanding what might happen and how various developments will influence future supply chains, companies can better prepare for an uncertain future.

As mentioned earlier, an organization's ability to consistently recognize market opportunities and threats is key to its future success and longevity. In fact, aggressive organizations take proactive steps to drive the future in a direction of their choosing. However, despite the fact that organizations are guided by the visions and goals of their leaders, in the end, the success of an organization is primarily determined by the effectiveness of its business processes. In other words, process design and implementation translates an organization's thinking and views into action and produces actual results. At the same time, it is also true that the majority of organizations follow commonly practiced processes, varying only in detail. So, what separates the leaders from the pack?

We believe that the success or failure of an organization truly depends on the degree of synergy created by its "activity system"[2]. An effective activity system allows an organization to remain competitive in every type of business environment, and keep evolving with the surroundings. The link between the macro factors and an organization's activity system, in this case the supply chain, is discussed in detail by Lapide[5] using the conceptual Supply Chain model similar to that presented below in Figure 1. We will use this model to develop a framework for summarizing prediction on the future of supply chains.

Clearly, supply chains processes are a product of complex interactions between macro factors and the capabilities of constituent organizations. Driven by the overarching corporate visions, the supply chains respond to the macro factors by developing strategies and unique activity systems to achieve their objectives (the activity system includes all processes, inter and intra company, that deal with every aspect of managing a supply chain.) Thus, the future of supply chains is inherently interwoven with the future state of the macro factors, which are in general, beyond the control of a single organization or supply chain. The association of macro factors with forecasting the future of supply chains is critical as it allows us to make better predictions which is of immense value given that predicting the future precisely is impossible. A crucial reason for improving accuracy is our ability to predict dominant macro factors and broad strategy trends more accurately since these represent aggregated behavior.

Fig 1: Excellent Supply Chain Research Framework



Organizations continually seek opportunities presented by shifts in the macro factors, but at the same time, it is also true that many new opportunities arise as a result of interacting macro factors that are attributable to an organization's ability to influence them. In other words, an organization's strategies often lead to unexpected advantages and opportunities resulting from complex interplay with macro factors. Consequently, to predict the future of supply chains, we should not only focus on the likely macro factors trends, but also consider the emerging concepts in the domain of supply chain strategies and practices that are likely to influence the macro factors. Interestingly, in our review, we realized that most of the opinions fall into two such categories, namely,

1. Macro Factors - the likely drivers of future changes, without any explicit connection with the future of supply chains, and
2. Supply Chain Vision – the key strategic or operational shifts in future Supply Chains, manufacturing systems, and business practices in general, without explicitly identifying the underlying drivers of the future change.

We believe that by presenting the assimilated information in the above manner, we will provide readers with a comprehensive operational level view of the future. Since the majority of the work in this area is qualitative in nature, to enhance objectivity, we have categorized the information based on the approaches used to make the predictions, into:

1. Unstructured (U): pure opinions of expert commentators, or

2. Structured (S): a more formal undertaking that is based on a structured methodology, namely, a Delphi Study, a Panel of experts, Surveys etc.

However, it is important to note that in the end, everyone is making predictions. Given the nature of the problem, it is difficult to assign more weight to the predictions that are based on a structured methodology as opposed to the opinions of an individual. In fact, it can be argued that revolutionary concepts are not apparent to everyone and hence a panel based effort in this case may not be appropriate. In general, structured efforts present the prevalent and accepted view of the future by filtering out the fringe ideas.

5. Predictions Summary

In this section, we present a tabularized summary of the predictions from various publications. As described in the previous section, the predictions will be grouped into "Macro Factors" and "Supply Chain Visions" separately in Table 1 and Table 2. We will also comment on the predictions and discuss their impact on the supply chains. In addition, we will also provide the following information:

1. Macro Factor – Description of the macro factors likely to influence the supply chain. Where necessary, we have freely interpreted and rephrased the descriptions to include various description of the same idea by different authors.
2. Expected Impact on supply chains (SC) – Our interpretation of the different views regarding the impact of the macro factor on the organization/management/ performance of the supply chain.
3. Refer – Representative references that discuss the general theme of the macro factor.
4. Type – Whether the source was a structured study (S) or unstructured (U).
    a. Rel – *Our opinion* on the relevance of prediction to the future of supply chains.
    b. H : If the prediction is highly relevant to the future of supply chains.
    c. M : If the prediction is somewhat relevant to the future of supply chains.
    d. L : If the prediction has little relevance to the future of supply chains.
5. Odds – *Our opinion* on the likelihood of prediction coming to fruition by year 2020.
    a. H : Very likely to materialize in the manner predicted.
    b. M : Likely to materialize in some shape or form but not as predicted.
    c. L : Unlikely to materialize.
6. Freq – Occurrence of the topic in various publications.
    a. H : Mentioned quite often.
    b. M : Mentioned a few times.
    c. L : Mentioned once or twice.

5.1. Group A: Macro Factor Predictions

Table 1

No.	Macro Factor	Expected Impact on SC	Refer	Type	Rel	Odds	Freq
1	Globalization of markets and competition.	This will impact demand and supply, leading to changes in the supply chain (SC) scope, scale, and the lead times making planning and execution more difficult.	[6],[8], [7],[10], [12],[24] , [36]	S	H	H	H
2	Market opportunities will arise and disappear very quickly.	Increased volatility will keep the competition alert since the time to launch a new business will shrink and the market dynamics could be altered overnight giving the SC very little time to adjust. As a result, SC must be agile and responsive.	[6],[11], [13],[30]	S	H	M	M
3	Financial market will demand increased profitability & capital productivity.	Increased competition will exert tremendous pressure to become lean (additional pressure will be exerted by the environmental requirements to be lean.)	[10],[36]	S	H	H	M
4	Changing population mix – race and cultural aspects.	This will affect the market profile leading to rapid and significant changes in demand and hence supply plans.	[28]	U	H	H	L
5	Potential for substitution.	To retain competitiveness of the product, based on the market conditions, a product may be made using different types of raw materials. This will impact the complexity of SC.	[28]	U	H	H	L
6	Competitive climate enhanced by communication and knowledge sharing.	This will require rapid responses to market forces & have profound impact on the way SC capabilities are designed and used for competitive purpose.	[6],[8], [20],[27] , [37]	S	H	H	H
7	The global distribution of highly competitive production resources, including skilled workforces.	Organizations will be compelled to consider the globally spread resources in designing their SC through owned facilities or suppliers. It will impact the length and uncertainty of the lead times. With the support of superior information systems and supporting technologies, coordinating such activities will be rendered easy.	[6],[8], [20],[27] , [28]	S	H	H	H
8	Sophisticated customers, many in newly developed countries, will demand products that are customized to meet their needs.	Demand will be more difficult to predict compounded by longer lead times. There will be higher customization - increasing percentage of products will be unique - market of one, requiring SC to be very effective to support a diverse product portfolio in an efficient manner. SC must become agile.	[6],[10], [12],[24] , [27],[36]	S	H	H	H

No.	Macro Factor	Expected Impact on SC	Refer	Type	Rel	Odds	Freq
9	Basis of competition will be creativity & innovation in all aspects of manufacturing enterprise.	More focus will be placed on workforce and technology to offer better and unique products and value proposition to the customer in a very short amount of time.	[6],[27]	S	H	H	H
10	Unrelenting pressure to continually drive down supply chain costs, from product concept to delivery.	Primarily driven by competition and demanding customer. Superior technology - production and information, will enable competition to continue pressuring each other to offer similar customer service level at increasingly lower price.	[14]	S	H	H	L
11	Environmental replenishment needs and resource limitations.	Constant pressure to replenish natural resources through design, technology and investment will lead to manufacturing modifications and supplier selection and realignment.	[6],[20], [22],[24] , [28]	S	H	H	H
12	Strict requirements on Recycling	This will have significant impact on the SC design as the reverse logistics and disposal will also impact the manufacturing technology, distribution and partner selection.	[20],[28]	U	H	H	H
13	Strict requirements on Remanufacturing	Remanufacturing will also impact SC design through design, manufacturing, distribution, and partner decisions.	[6],[8], [28]	S	H	H	M
14	Safe waste management and disposal regulations.	The reverse logistics will be an integral part of the SC decisions. Product disassembly for reuse, remanufacturing, recycling will impact the design, manufacturing technology, supplier selection, and product traceability thru the life of the product.	[20],[22] , [28]	U	H	H	H
15	Global environment and planetary management regulations.	Constant pressure to improve manufacturing, distribution, and disposal aspect of a product will impact the production related decisions and the supply chain, regardless of the location.	[7],[28]	U	M	M	L
16	Creation of a hydrogen/non-fossil fuel based society.	Elimination of oil shock from the system will make the system more stable. Reduced dependence on natural resources will make supply chains more robust and less prone to terrorism and world politics.	[7],[8], [28], [45]	U	H	M	M
17	Rapidly expanding technology access.	Technology will not be the key competitive weapon as new technology will be replicated in a very short period of time and can't be exploited for long term leadership. New technology will offer a relatively short lived advantage and focus will shift to supply chain capabilities.	[6],[7], [21],[24] , [25], [28]	S	H	H	M
18	Rapidly increasing communication capabilities and resulting market visibility.	This will impact the speed of information flow and traceability of products leading to more real time applications and decision tools to support the SC. Better planning and execution capabilities will compress the time further leading to more agile organizations.	[12],[15] , [30],[36] , [39]	S	H	H	H
19	Accelerating technological change.	Organizations must become flexible to adapt and incorporate new technologies into their production systems on a regular basis.	[6],[7], [24]	S	H	M	H

No.	Macro Factor	Expected Impact on SC	Refer	Type	Rel	Odds	Freq
20	Constant pressure from emerging technologies.	Due to rapid development of innovative technologies, manufacturing and support systems will always continue to adopt leading to a paradigm shift in fixed asset investment policies and strategies. Organizations will try to limit their competitiveness dependence on manufacturing capabilities and outsource specialist for completing the tasks. The focus will instead shift to IP and product innovation with limited investment in cutting edge technologies, with an attempt to divest immediately as soon as new technologies emerge. The net impact will be on increased outsourcing influencing supply chain design and decisions.	[7],[24], [28]	S	H	H	M
21	Widespread instant availability and distribution of information and knowledge on all aspects of enterprises and marketplace in a standard form.	This will lead to rapid and effective assimilation for quick decision making. A resource that organizations will deploy to effectively cope with increasing variability in the supply chain and competition in the marketplace.	[6],[11], [21],[24] , [27]	S	H	M	H
22	Societal demands for superior environmental performance.	Pressure on SC design to supply products that are environmentally friendly in their production, delivery, usage, and disposal. This will affect the production technologies and hence the partners, choice of raw materials, delivery mode, and during disposal, need to think of disassembly etc, while developing SC processes.	[10]	S	M	M	L
23	The Age Shift - on an average the population will be older.	This will change the market composition in a very specific way and will influence the demand, creating new challenges for the manufacturers and service providers.	[19],[20] [26]	S	M	H	M
24	Global ecosystem strained by growing population – World population in 2020 - 8 Billion up from 5.6 billion.	Growing population will put more strain on resources and force organizations to become more efficient and creative in making products and services to remain competitive by focusing on every aspect of the supply chain.	[6],[20] [27]	S	M	H	M
25	Demand for basic human rights (health, food, shelter) and overall better quality of life.	This will highlight the social responsibility aspect of businesses and corporations will focus on providing these amenities to the world by incorporating these causes into their strategies. Social responsibility and hence the demand for richer products and systems will impact the design and supply of products.	[28]	U	L	M	L
26	Democratization of the world.	This will lead to new markets and competition with the basic tenet of free market in place, making supply chains more complex with longer lead times.	[20],[28]	U	M	L	L

No.	Macro Factor	Expected Impact on SC	Refer	Type	Rel	Odds	Freq
27	Growing readiness of ordinary citizens to engage in direct action.	This will impact the manufacturing and supplier selection since any problem along the supply chain regarding any inappropriate action will not be overlooked - e.g. recent issues with illegal immigrants being hired by Wal-Mart, suppliers using child labor to make products, meager salaries in 3rd world countries by supplier can hurt the SC in future.	[28]	U	M	M	L
28	Growing disillusionment with materialism, science, and technology.	Natural products, simple products, and wholesome products will become very attractive and compete with heavily manufactured products that are highly synthetic or genetically altered. SC will have to consider aspects of natural products in designing, manufacturing, and distribution of such goods. SC not involved in such products will have to consider the natural products as a competition and offer a strong value proposition to retain their market.	[28]	U	L	L	L
29	Changing workforce requirements and increasing workforce diversity.	Pressure on all company practices/processes to make them more people friendly and interactive. Significant investment in people will be required with an understanding that people can quit at any time and that IP is the key competitive edge.	[6],[10], [24],[25]	S	L	H	H
30	Increasing knowledge intensity in products, technology, & workforce.	The supply chain will have to consider the movement of product as well as associated information.	[6],[20], [22],[24] , [25]	S	H	H	H
31	Increasingly complex products and processes.	Due to the availability of superior technology and maturity of buyers and suppliers, the products will increasingly become complex, leading to more complex processes and requiring innovative material. Resulting in more dynamic supplier base and logistically complex.	[6],[14]	S	H	H	H
32	Enterprise focused on new lucrative markets and channels rather than self preservation and growth.	To be ahead of the hard charging competition, companies will try to remain ahead by introducing new products, since everything will move fast, competition will catch up very quickly too. But this will have its own limits. One powerful alternative will be to develop new markets and channels to exploit the existing product base to the extent possible – a significant challenge for supply chain management. This will impact the SC design in that it must be flexible to address the needs of the ever changing portfolio by constantly changing supplier base & demand volume.	[6],[14]	S	H	M	L

No.	Macro Factor	Expected Impact on SC	Refer	Type	Rel	Odds	Freq
33	Quickening pace of product innovation.	New technologies, tools, methods, bigger market, more sophisticated buyers and sellers - will all lead to this phenomenon, and this will impact the supply chain significantly since each new innovation may require the need for new suppliers in new locations, new markets, new mode of delivery, new information needs etc.	[14],[17], [27]	S	H	H	H
34	Threat of war and terrorism	The instability will impact the formation of global alliances and adversely impact the supply chain reliability, performance, and cost structure.	[7]	S	H	H	L
35	Pervasiveness of media	As a result of its omnipresence media has the power to rapidly disseminate information simultaneously to far flung areas of the world. This will impact the shaping and reaction of the consumers and markets, eventually influencing the supply chain design and performance.	[7]	H	H	H	M

5.2. Group B: Supply Chain Vision

Description of columns in Table 3 is as follows:

1. Vision - Description of the supply chain vision and where necessary, we have freely interpreted and rephrased the published descriptions to include various interpretations of the same idea by different authors.
2. Interpretation/Explanation - Interpretation of the scenarios, arguments, and discussions presented by various authors.

Table 3

No.	Vision	Interpretation/Explanation	Refer	Type	Rel	Odds	Freq
1	Manufacturing will become Total Service Providers & build a long term strategic relationship with customers to service their total package of needs based around a manufactured product.	The supply chains will have to consider the linkage between suppliers and customers through the life of the product to offer long term support. In addition, managing the parallel support supply chain will add another layer to the supply chain design.	[6],[11], [12]	S	H	H	H
2	Trust will be a key word for all of us doing business in this anonymous market place. Buyers will look to names they trust, even for products not previously offered by that vendor.	Organizations and SC must incorporate processes to establish trust since brand will be one of the core competencies to help secure business quickly in this increasingly anonymous business environment. Since supply chains will be fluid, speed will be key to the overall success of the supply chain.	[6],[31], [42]	S	H	H	H

No.	Vision	Interpretation/Explanation	Refer	Type	Rel	Odds	Freq
3	Value will be built into the service and not the physical product. It is much more difficult to steal a service!	Will impact the SC design, now it must consider the post sale support for the life of the product as a part of the product. Since different products will have different reliability, life cycles, and support needs, sale of products will spawn a number of dependent processes that will require close monitoring and quick response. This is specially difficult since service by nature is non-standard and hence more difficult to control due to higher degree of interaction with customer.	[18]	S	H	H	M
4	Small and medium-sized companies will be affected as they become integral parts of a global network, even if their own facilities never expand beyond the country and manage multiple such relationships	Increasingly the organizations will find themselves in one alliance or another. To support the alliance they may have to make modifications to their organizations although their market or product does not change. In some case, a local company's products could all of a sudden be sold globally. This will pose a challenge to the global supply chain management.	[6]	S	H	H	M
5	Less outsourcing due to pressure exerted on businesses to perform in a very efficient and agile manner – need for compression of cycle time, shorter life cycles, lower cost, & superior quality.	One of the many different likely scenarios. This is contrary to the general belief, but there is a good reason for it to pan out. With more distributed and local manufacturing, companies may install owned manufacturing bases in different regions as a true link with the locals and for control and feedback.	[30]	S	H	L	L
6	Activities related to the creation, production, and distribution of goods will lie at the heart of advanced economies, but those activities will become increasingly knowledge and service intensive.	Information will be a key component of all processes involved in the manufacture and delivery of products and services in advanced countries in the future requiring the design of a compatible supply chain for these markets.	[6],[20], [27],[40]	S	M	M	H
7	Producers will be responsible for all waste streams for minimal impact on environment and significant infrastructure will be established to focus on 3 Rs - Recycling, Reclamation, and Remanufacturing.	This will add to the cost and technological requirements - the supply chain supporting products will become more complex and expensive.	[6],[8], [25]	S	H	H	H
8	High degree of Plug and Play interoperability.	Ease of introducing a new system be it by acquisition or temporary arrangement with a supplier, essentially, it makes the process of integrating the disparate system in a supply chain easy and support the planning and execution systems.	[25],[39]	S	H	H	M

No.	Vision	Interpretation/Explanation	Refer	Type	Rel	Odds	Freq
9	Distributed order fulfillment will be prevalent due to connectivity.	Extreme connectivity will allow organizations to fulfill orders from disparate sources in real time in an error free manner via virtual supply chains.	[21],[38], [39]	U	H	M	H
10	Most of the interactions will be between machines and hence extremely quick and mostly automated.	Currently, despite the availability of different types of technologies, the communication speed across supply chains and organizations is not at its fastest due to the interwoven human component. The human nodes along the way are the bottlenecks that slow the communication down to their level. In doing so, the true potential of the technology can't be reaped, whereas in future, more of the communication will be between machines enabling the system to exploit the technology to its fullest.	[38]	U	M	H	L
11	Enterprise functions will be highly integrated as virtually one entity, linking customers to innovators of products.	A view wherein the consumer and creator will be in direct touch with each other for effective feedback system via an effective supply chain mechanism, for offering better service and creation of better products in the future.	[6],[12], [32],[37], [46]	S	H	H	H
12	Information finally triumphs over Inventory - Products will communicate with one another in real time, and trading partners know product's exact location at every point in the supply chain.	Variability and presence of lead time make the problem of matching demand and supply difficult. As a result, supply chains typically position inventory points along the chain to decouple and alleviate the problem of demand-supply mismatch. However, inventory also breeds inefficiencies and create problems. To address this issue, the current trend is to slowly move away from buffering using inventory to using a mix of inv, flexibility, and time. With the significant rise in information availability, the companies are making transition to an information rich space that will allow better management of the system leading to lower inventory levels.	[40],[43]	U	H	H	H
13	Companies will move from an organization-centric environment to a multi-supplier-services environment due to outsourcing of activities enabled by superior network connectivity.	This is the more popular belief and supports the increase in outsourcing. It proffers that organizations will be essentially a loose supply network system of multiple buyers and sellers with the links activated ONLY when there is a real demand. The organizations will try to retain only those skills or competencies that make its products/services unique and competitive.	[8],[12], [16],[44]	U	H	H	H

No.	Vision	Interpretation/Explanation	Refer	Type	Rel	Odds	Freq
14	Ownership of assets may not matter and assets will be mobilized without owning them.	Organizations will move away from investing in fixed assets unless absolutely necessary. Due to the constant shift in demand, technology and supplies, organizations will avoid becoming heavy to remain nimble. A common option will be to rent or lease equipment or outsource.	[36]	S	M	H	M
15	Horizontal diversification into related products and services will become a key characteristic of successful manufacturer.	SC will offer product portfolios to satisfy more of the consumers' needs in order to establish a strategic long term relationship, which will lead to horizontal diversification.	[42]	U	H	H	M
16	Quick development of real and virtual collaborative partnerships by assembling the necessary resources from a highly distributed manufacturing capability in response to market opportunities, just as quickly dissolved when the opportunities dissipate.	Virtual supply chains will be essential to enabled this vision enabled by very sophisticated business processes to facilitate expansion and contraction of the network.	[6],[8], [12],[27], [37]	S	H	M	H
17	Equal availability, access, & cost will level the playing field for retailer or manufacturer. Competition based on innovation & creating market desire for better total customer experience.	Supply chains will come into focus and organizations will be on the constant lookout for compatible suppliers and new customers, to survive.	[17],[46]	U	H	M	H
18	In order to satisfy customer demand more quickly and efficiently, while at the same time heeding the environmental pressures for reducing the use of fuel in transport we are likely to see more local, distributed manufacture taking hold.	This will require more effort to coordinate across the distributed units and lower the lead time and transportation costs. Majority of the manufacturing will be done closer to the point of consumption (postponement) as a result, some sort of HUB-SPOKE system may be installed to support the distribution	[6],[42]	S	H	M	H
19	Benefits in business to business transactions will drive more cost out of the supply chain - a far shorter time will be spent on non value-adding activities such as transport and warehousing. Manufacture during transit could be another way of compressing value stream.	With the help of technology and effective business processes, transactions will be more coordinated and smooth leading to a more agile and fast supply chain systems.	[13],[30], [42]	S	M	M	M

No.	Vision	Interpretation/Explanation	Refer	Type	Rel	Odds	Freq
20	Rapid development and translation of core competencies into new business opportunities.	Speed will be of the essence and organization will focus on the overall speed to develop, design, manufacture, and distribute new products across complex supply chains in a short amount of time.	[20],[34]	U	H	M	H
21	Businesses will keep changing at an accelerating pace, requiring rapid response.	Supply chain flexibility, agility, dynamic strategies, every changing supplier base, and nimble organization in every respect.	[20]	S	H	M	H
22	Physical assets no longer the sole value propositions – managing IP, Brand equity, and Customer Relationships, a strong value generator.	The supply chain strategies will have to consider these softer issues in designing, manufacturing, and selling their products and services.	[6],[8], [11],[17] , [20]	S	H	L	H
23	Enabled Supply Chains - Built around compressed cycle times and increased information flows characterized by total con-nectivity & free exchange of data interchange without any restriction.	In this view of the world, everything will be ideal and organization will work seamlessly to offer completely customized products and services to the consumer at low cost and quickly.	[38]	U	H	L	H
24	Federated Supply Chains - Supply Chains will never be able to function as a harmonious discipline due to the tension and complexity inherent to the system; instead, it will be characterized by effective connectivity, collaboration, data & information sharing, and visibility. Players will retain individual goals and profit targets.	This is another view of the world where total connectivity is not assumed. The premise is that organizations will not share critical information with everyone and will still be driven more by their own profit goals rather than the profit sharing across the SC.	[12],[16] [38],41]	U	H	H	H
25	Global companies will be perceived as local within each market they serve, but driven by their global market positioning and flexibility.	Focus will be to adapt to the local environment without superimposing the global image. This will require a large local content and integration of highly disparate systems – a significant challenge for global supply chains.	[20]	S	M	L	M
26	Total connectedness/ connectivity.	Organizations will be connected leading to superior supply chain performance.	[7],[21], [25],[38] , [39]	S	H	L	H
27	New corporate architectures will emerge, primarily Networks & Teams.	The hierarchical organizational structures will be replaced by the new and better networks and teams. Most of the teams will be self driven working under a broad guideline of the overarching corporate goals and objectives.	[6],[8], [20]	S	H	M	H

No.	Vision	Interpretation/Explanation	Refer	Type	Rel	Odds	Freq
28	As global companies grow to mammoth proportions the only way they will be managed effectively is by using a biological model that mimics the self-governing & learning techniques of a complex organism.	Such models will allow companies to implement highly flexible systems and processes, offering their customers highly innovative & customized products at a much faster pace than their competition.	[7],[12], [29]	U	H	L	M
29	Alliances and virtual organizations with the ability to dynamically match the needs with the Supply Chain partners' capabilities will be the key to the survival.	In majority of the cases, the organization will thrive by forming alliances when required. Alliances will be formed and dissolved on demand leading to the establishment of virtual organizations existing solely in response to demand for a product. Since there will be significant shift towards alliance formation and virtual organizations, the selection of capable partners and procedures to dynamically connect and disconnect will be key	[6],[16], [31],[33]	S	H	M	H
30	Quick organizational learning, comprehensive organizational intelligence and knowledge management.	With the advent of new tools and technologies, information and knowledge will be disseminated faster leading to quicker organizational learning and intelligence, to continuously improve.	[6],[20], [31]	U	H	M	H
31	Product distribution and support as part of product model.	Since service will become an increasingly important part of a product, it is therefore critical that the product design consider this aspect of the total product offering at the very beginning.	[22]	S	H	M	L
32	Products designed for life cycle support, birth through death of a living organism OR producers responsible for products from cradle to grave.	With the increased focus on environmental issues and customer relationship, there will be shift towards supporting products throughout the life of the product. The idea will be to treat even manufactured product as a means of providing service to the consumer in a different manner.	[16],[20] [22]	S	H	H	H
33	Ease of disassembly and sorting will be important.	The reverse logistics aspect will become a key component of the overall supply chain design.	[22]	S	M	L	M
34	High value added content will be essential.	To remain competitive, more processing of products will be required to deliver a distinct value proposition which may lead to more technologically advanced manufacturing needs leading to outsourcing and constant lookout for innovative suppliers.	[28]	U	H	M	M
35	Highly customized mass produced products.	Demand flexibility requiring agile supply chain so that it can handle extreme variability.	[6],[8], [13],[28]	S	H	H	H

No.	Vision	Interpretation/Explanation	Refer	Type	Rel	Odds	Freq
36	Most products will have shorter life cycles.	Due to technological advancement and competition, the products in general have shorter life cycles leading to greater pressure on supply chain effectiveness. As a result, managing supply to match the demand from introduction to obsolescence will become extremely critical to the success of any supply chain.	[6],[36]	S	H	H	H
37	Products will be reconfigurable to meet changing customer needs.	With the drive towards extreme customization and customer relationship, one solution will be to make products that can be reconfigured by the customer to meet their growing needs. This will entail a supply chain support throughout the extended life of the product via customer support, additional parts, and spares.	[22],[28]	U	L	L	M
38	Dynamic Capable-To-Promise capabilities.	Supply chain must offer total visibility to every one involved to enable the dynamic CTP globally.	[38]	U	H	M	M
39	Collapsing forecasting horizons will give the planning solutions an "execution" feel.	Efficient supply chains and superior information and communication technology will compress the lead times and lead to implementation of systems that will allow real time exchange of information and execution plans across multiple units.	[38]	U	H	M	M
40	Robust virtual production systems will enable simulation of the total enterprise, eliminating costly trial and error development of products and processes.	Technology will allow organizations to perform detailed supply chain wide what-if scenarios to create better plans before execution leading to better performance.	[6],[12], [23],[40]	S	H	M	M
41	Manufacture/assembly at the point of use.	More customization will be enabled in part by extreme postponement with the customer involved in the last stages of manufacturing.	[8],[25]	S	H	L	M
42	Flexible, reconfigurable, autonomous FMS and self learning smart systems.	Better technology and systems will allow people to work with the systems rather than on the systems, enabling a superior system that will evolve with every decision to improve overall performance.	[6],[8], [22],[40]	S	M	M	H
43	Atomic-level manipulation, test, & inspection.	This will improve the quality of product beyond expectations and make the products more durable and efficient affecting the recycling aspect.	[7],[22]	S	M	L	M
44	People and machines will interface more effectively to co-create.	More automated and agent based systems will control and operate the supply chains.	[6],[[7],8], [22]	S	L	M	H
45	Tele-manufacturing and Direct Deposit methods.	This will allow supply chain to design and sell products that are extremely flexible, inexpensive, good quality, made locally, and in a short amount of time.	[6],[8], [22],[40]	S	H	L	M

No.	Vision	Interpretation/Explanation	Refer	Type	Rel	Odds	Freq
46	Nano-and bio-technology fabrication processes will be well established - a machine called "assembler" will be in vogue.	Better products to meet consumer needs more effectively with environmentally friendly methods.	[6],[7], [20] [22]	S	M	L	H
47	Elimination of Batch manufacture and stock building, further compressing the supply pipeline and releasing working capital. More small lot, shorter distance distribution activities with much shorter lead times, perhaps even to consumers' doorsteps.	Movement of smaller lots across the supply chain will call for creative processes and techniques to keep the non-value added cost in the supply chain low.	[6],[42]	S	H	M	H
48	The product will be able to deal with malfunctions autonomously, be easily recycled and disposed, and evolve its design for the next generation of products this is called "interactive" manufacturing. The product's designer, manufacturers and consumer "interact" throughout the product's entire life cycle.	It will impact the design of the supply chain to take the new product attributes into account. It will require significant remodeling of SC to enable quick response to malfunctions identified by product at any time, continuous support in an effective manner throughout the product life cycle and its disposal. Another consequence will be the continuous modifications resulting in plethora of new product variants; a significant burden for the SC requiring immediate response.	[22],[29]	U	H	L	M
49	New materials based on molecular engineering.	Unique material will allow for unique products that can be manufactured just right at low cost and quickly.	[6],[7], [8],[22], [40]	S	M	L	H
50	Self-assembling materials.	Extreme state of manufacturing where we direct the products to mimic the nature and develop into a specific item - highest level of flexibility, postponement, and efficiency.	[6],[7], [8],[22]	S	L	L	H
51	Markedly rapid learning of new skills through advanced network-based learning and computer-based communication across extended enterprises.	This will allow the dissemination of ideas and practices quick and effective, helping organizations bring products and services faster to market.	[6],[8]	S	L	L	H
52	Multi-skilled workers will continuously upgrade their skill levels.	Constant changes in technology and market will require workers to continuously upgrade their skills which will require support from organizations. Additionally, the companies will have to get used to the idea of employees being in the driver's seat.	[20]	S	L	M	M

No	Vision	No.	Refer	Type	Rel	Odds	Freq
53	Companies and employees will move from an ideology of lifetime employment to one of lifetime employability	With the shift of competitiveness to creativity and IP, workforce will become more powerful and mobile since competitive advantages can quickly move from one organization to another with the workforce.	[20]	S	L	M	M
54	Knowledge supply chain designed and operated to provide integrated lifelong, “K through 80” (K-80) education.	New systems will evolve to support the constant training and skill development needs of employees throughout their careers.	[20],[22]	S	L	L	M
55	Individuals will take increasing responsibility for their career development independent of specific companies, and will move toward a system of skill certification instead of conventional hiring and retraining.	Each employee will act more like an independent organization with the ability to enter into a more equitable contract with one or more organization at any given time. This will essentially expand the previously discussed concept of outsourcing. Organization will retain a core of their employees and treat all others as suppliers of needed skills. In return, the new "employee" will have greater say in their terms of employment, better pay, and higher flexibility. In such a scenario, it is completely acceptable for an "employee" to in turn sub-contract their task to some other contractor, with the appropriate approval of the hiring organization.	[20]	S	L	L	M
56	Companies will demand instant productivity in response to fast-breaking opportunities.		[8],[20]	S	L	L	L
57	Focused manufacturing corporate architecture leading to Material Enterprise and Product Enterprises		[6]	S	L	L	L
58	Lifetime product marketing by continuing to upgrade their product after sales	Supply chains that will interact with the customer long after the product is sold.	[6]	S	M	L	M
59	Distance, national boundaries, financial differences, & information issues will no longer be barriers, but will be key factors for decision making	More complex supply chains that will consider numerous very different types of variables in design and management.	[6],[7], [8]	S	M	L	M
60	Time will become the most important contributing factor to cost, particularly for products that become obsolete quickly	Speed will be the driver of supply chain design.	[6],[31]	S	H	M	L

Note: The author has made every effort to cite all relevant and material publications as extensively as possible. Any significant omission is unintentional and would be rectified if brought to attention.

6. Observations and Synthesis

6.1. Overview

In the future, the focus for businesses will be on efficiency, flexibility, and speed, and "all activities that are non essential in implementing new ideas in marketable products will be eliminated."[6] Our review shows that a tremendous amount of attention is being paid to mapping the future performance of businesses and the economies in which they operate, in light of recent technological advances in manufacturing, communications, and information technology. Indeed, there is a consensus among academics and practitioners that the business landscape will be very different in a few years. A growing number of innovative companies are unleashing new technologies to take advantage of potential opportunities and to establish themselves as leaders. In fact, we are witnessing the creation of the DNA of future business practices.

While the predictions and visions promulgated by various groups will not materialize as described, such information is important for organizations to prepare themselves for the imminent threat of change and be ready to realign quickly as new developments occur. The common view of the future is that there will be total connectivity among businesses and that businesses will behave like a living organism – a metaphor to reflect the need for innate flexibility and adaptability required to counter any change in the environment. It is also argued that the organizations will gel together instantaneously to form virtual organizations capable of ramping up or down in response to demand fluctuations. Customers will be in total control of the product as well as service creation and delivery. There is a presumed environment of total trust and commitment from all involved in the formation of such alliances. Also apparent is an unspoken assumption that global boundaries will be non-existent and all countries will foster an environment supporting frictionless international trade. Implicit in these assumptions is the growth of mature economies around the globe that pave the way for frictionless trade.

6.2. Shortcomings and Inconsistencies in the Consensus View

On studying the predictions closely, it became clear to us that there were significant contradictions that challenged the very core of business practices driving competitiveness and growth as we know them today. Surely, we are not implying that the fundamental forces behind current business structures are invariant. Even so, these contradictions are worth reviewing and should be understood to detect the emerging trends and prevalent thoughts as we move forward. We highlight a few such predictions and opinions below that are not entirely consistent and challenge our common understanding of key business principles and present potential dilemmas [20]:

1. Many visions predict or assume a complete sharing of information and knowledge. At the same time, the general understanding of the future business environment also calls for competition driven by information-based strategies. So, how can we share information and knowledge completely if information and knowledge is itself a basis for competition? How can such a strategy lead to sustained growth? If businesses will not share critical information, then what is the real value of the information that is being shared in improving the overall supply chain performance?
2. Another pillar of future competition is the knowledge worker. What security can companies offer their skilled employees when the rapidly changing nature of new manufacturing, including service operations, means that firms cannot guarantee long term employment? How can the gaining of new knowledge be rewarded in a "reward-for-doing" environment?[20] If knowledge workers can't be retained, then how will the companies sustain their competitiveness?
3. Should a company rush to outsource everything that is not a core competency or outsource in a controlled manner since outsourcing typically lead to loss of control and coordination? Additionally, outsourcing can affect an organization's ability to design new products rapidly if the enterprise is not effectively integrated. So, how can one control core competencies without owning them?[20]

4. In a capitalistic world enterprises invest in productive assets that can be owned, as symbolized by major investments in fixed assets. However, going forward, the most important asset will be the "knowledge bearing human being" – an asset that can't be owned. Companies will have to undergo a fundamental change of approach and start investing heavily in the training and development of employees, knowing fully well that these individuals can leave the organization at any time and take the critical knowledge with them. How will this transition take place?

5. We will be entering an era of significant and fast-paced technological advancement and product/service innovation to win over well informed and very demanding customers. How do companies recover rising plant and equipment costs from increasingly shorter product life cycles, shorter process lifetimes, and rapid new product introduction, while remaining cost-competitive?[20]

In addition to the above mentioned dilemmas, we believe that many of the approaches considered by various authors are fundamentally flawed. It is a well known that highly specific forecasts and predictions about the future have little chance of coming true regardless of the methodology or model used, especially when very long forecasting horizons are involved. Instead, to be useful for strategic planning, predictions of the long-term future of the business and supply chains should be presented as a set of multiple likely scenarios i.e. predicting a range of possibilities instead of a point forecast. Furthermore, if the predictions are very specific, it is very likely that there will be disagreement between the various forecasts. As a result, using such information in an effective manner becomes a challenge, if not impossible. To address these concerns, we recommend the Scenario Planning approach for forecasting the future in the long term. The Scenario Planning approach recognizes the fact that the future is inherently uncertain and the best way to deal with an uncertain future is to develop flexible strategic plans. A brief description of this approach is provided later on in this section.

6.3. Supply Chain in the year 2020 – A Reality Check

Given the inconsistencies described above, it is our opinion that the vision of a Totally Enabled Supply Chain is utopian and not likely to unfold in the predicted manner - at least not by the year 2020. Instead, we are of the view that although there will be tremendous advances in many business areas, the transformations will be less dramatic. We tend to lean in favor of the Federated Supply Chain view presented by Booz, Allen, and Hamilton (BAH)[40] as opposed to the Totally Enabled Supply Chain vision described above. We share the belief that powerful technologies will be unleashed in the future and this will have a dramatic impact on the design and functioning of supply chains. However, we don't foresee such developments leading to a total revamping of supply chain structures. Not every production facility will be staffed by self-managed work teams, and not every successful production facility will use machine intelligence to run its organization.[8]

The forces driving changes in supply chains will gain momentum rapidly, but the impact will be negated by the counteracting friction between the numerous "moving parts" that will make up these new structures. Furthermore, the operation of supply chains will still be deliberate and not spontaneous. In the current global political environment it is unlikely, in the foreseeable future at least, that countries will eliminate trade boundaries and allow goods and information to flow freely. On the contrary, there is a growing concern that with the recent rise in terrorism and resulting international tensions and instability, there may be increasing restrictions on the movement of people, products, and information. In fact, there is a distinct move towards the formation of stronger local alliances in different regions of the world, primarily to ward-off the economic dominance of the United States. Of particular interest is how the European Union, China, and Japan, will respond to the pressures of globalization.

Additionally, since supply chains are created by people and managed by people, such systems will always suffer from inherent friction. It is difficult to imagine a supply chain that will share risks and rewards objectively among its constituents. Based on past experience we have seen that it is difficult enough for organizations to align internal departments, so achieving this across a supply chain seems almost impossible. In other words, the supply chains will run very efficiently, but the concept of total connectivity will be present only in spirit. The actual operations will be driven by the local objectives and

actions of the constituents that may not be globally aligned with the overall performance of the supply chain.

6.4. The Scenario Planning Approach

Scenario Planning was developed at Shell as a powerful decision support tool to objectively and effectively predict highly uncertain futures. Using this procedure, Shell was able to successfully handle some very difficult situations. At the present time, a few large companies are engaged in the development of their future view of the world using this methodology. To our knowledge, there is no published structured study that looks at the future of supply chains using this approach.

The scenario planning approach derives its strength from its ability to look at a set of predictions in a holistic fashion, to facilitate a better understanding of future events and their impact on the performance of the organization. Since there are differing opinions and varying degrees of confidence in predictions of macro factors and the future shape of supply chains, we believe that the scenario planning approach of developing multiple, internally consistent scenarios will provide a more robust view of the future. The key differentiator of the scenario planning approach is the acknowledgement that the future is uncertain, in essence because there is a lack of information about the future. By developing scenarios, organizations cultivate an “options” mindset.

With the passage of time, organizations acquire more information and peel off layers of uncertainty from the future. If an organization is capable of responding effectively to the set of new facts, it is in a better position to compete. But, realigning and exploiting opportunities at short notice requires a high level of agility and organization-wide discipline, a challenging task indeed. A comprehensive scenario planning approach incorporates “sensors in the ground” to guide an organization towards the most likely scenario and develop better solutions using the latest available information.

7. Conclusions

In this paper, we reviewed the prevailing predictions about the future of supply chains. We categorized the predictions into two groups, namely predictions about the macro factors and future supply chain visions. These predictions and visions were generated by individuals as well as groups of experts involved in detailed structured studies at various organizations. Overall, in most cases, there was a general agreement on various aspects of the future supply chains.

Recent technological advances are revolutionizing manufacturing, with able support from equally spectacular advances in information technology and communications. These newly acquired capabilities have enabled organizations to leap into new domains that were unthinkable a few years ago. The powerful medium of the internet is creating a rich milieu for global entities to interact and produce remarkable results. Companies seem emboldened by the e-commerce boom and are willing to undertake any project, despite the subsequent bursting of the bubble. It is this "can do" attitude, along with technological breakthroughs, that is driving change at breakneck speed.

In reviewing the literature, an additional and important realization was the noticeable shift in the way businesses organize and execute today. Our search identified numerous structured studies that were undertaken by industry groups to predict the future in their respective markets. The increasing number of such studies point to a disciplined attempt by organizations to understand the business terrain. Each study was quite comprehensive and made significant effort to identify future technologies and product trends in order to offer their constituents as much information as possible to help prepare for the future. Indeed, advances in computing and information processing have helped further this cause, but business organizations now appear more mature and objective in the management of their operations. Undoubtedly all specific predictions will be wrong, nevertheless, there is ample evidence that businesses recognize the process of predicting and preparing for the future as key to survival and growth.
Finally, we echo the almost certain view that the world will be a very different place in the year 2020. It is difficult for us to predict the exact nature of the breakthroughs in the next 5-15 years that will shape the

world in the year 2020, but we can imagine a world full of hi-tech products that, even today, may seem like science fiction. But despite these advances, "the United States will not go metric and the screw drivers will still have funny heads."[8]

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