This white paper shall explore the fundamental science behind the ever changing global supply chain. An analogous view of supply chain evolution to that of organic survival theory yields philosophies and methods for achieving strategic advantage and tactical superiority.
Supply Chain Evolution: Survival of the Fittest

Herbert Spencer (1820 – 1903) was an English philosopher and prominent liberal political theorist. Today, he is principally remembered as the father of “Social Darwinism”, a school of thought that applied the evolutionary theory of survival of the fittest (a phrase coined by Spencer) to human societies. As a close contemporary of many famous philosophers and scientists of his period such as John Stuart Mill, Thomas Huxley, and Charles Darwin, he was renowned for the profoundly sensible qualities of his work (Put aside his controversial view regarding government’s role in helping the poor). Unbeknownst to him, more than a century after his passing, his pragmatic philosophy stands the test of time and underpins today’s global supply chain model. Specifically, his conviction that the evolutionary process pervades the inorganic as well as the organic realm, tells us that business entities must adapt to and leverage change in order to endure.

There has been much debate in the logistics community about the lifespan of supply chain networks under the pressure of rapidly changing global markets. Some experts have gone as far as saying that very few networks are good for more than about twelve months. Most supply chain practitioners would agree that a one-year planning horizon provides a very limited opportunity to develop an acceptable return on investment in the processes, systems, infrastructure, and people needed for operational efficiency.

While the notion that few networks are serviceable for more than a year may be broadly accurate, the real question is how to balance the turbulence of the marketplace and still provide sufficient foresight for service level and cost planning. Issues of agility, flexibility, scalability and adaptation to a changing business environment must be considered. The recent volatility in fuel pricing, over-the-road equipment availability, and rail/port capacity issues underscore the difficulty of planning for the future based on the information of the past.

In the case of the creatures of the rain forest, the primary tenets of Darwin’s theory of natural selection tell us that species are fertile and multiply to the extent allowable based on limited food resources. Based on these observations it is clear that in such an environment there will be a struggle for survival among individuals. Similarly, within our global markets, new businesses will be formed and compete with the old for their share of a limited economic harvest. Only the strongest and most cunning will survive at the peril of the rest.
DNA Weakness

The unfortunate reality is that the proverbial DNA of most supply chain planning exercises is fundamentally flawed from inception. When designing a distribution network (or a specific warehousing facility) supply chain practitioners typically collect historical operating data and compound it with growth forecasts in order to develop the design-year criteria (network or facility lifespan). A five-year design horizon is often applied since shorter design-year targets make acceptable returns on investment difficult to achieve; while design horizons longer than five years become increasingly dangerous as the crystal ball turns evermore foggy with the passage of time.

When one steps back to examine this common approach and methodology, it becomes abundantly apparent that multiplying historical information (old information) by growth forecast data (inaccurate information) is a risky endeavor. Add to this equation, the fact that the designs spawned from this exercise will incubate for 9 to 24 months while facilities are retrofitted or constructed and the result is a formula for failure: “Multiply old information by inaccurate information and let it age before use”. As absurd as this method may sound, it is in fact, the underlying foundation of nearly all supply chain optimization initiatives.

While some might interpret this phenomenon to be a catalyst for the use of “flexible” third-party logistics providers (3PLs), these operators are equally impaired by the lack of economic horizon visibility since “flexible” 3PL contracts are by nature short-term and expensive. After all, third-party logistics operators are similarly reliant on forecast/cost models as their customers. Without a solidified understanding of volumetric capacity/throughput requirements and reasonably long contract duration (3-5 years), third party logistics entities cannot make the needed investment in infrastructure and systems needed to insure operational efficiency. As a result, they too will be inclined to minimize risk by relying on floor-space and labor rather than mechanized/automated material handling systems. Whether internally operated or outsourced to 3PLs, these labor intensive operations rarely produce the cost/service ratios needed to compete and survive in today’s supply chain logistics jungle.

Corporate Darwinism

Evolutionary change in the supply chain is inevitable and “corporate Darwinism” is a fact; only the fittest of organizations will survive. The ability to adapt to a changing environment is the key to continued existence. The reality is that the rate of change has increased exponentially in recent years. As a result, time is in fact, genetic currency in today’s supply chain environment. Organizations that ignore change are doomed to perish rapidly. Those that react to change will find themselves managing crisis’, fighting fires, and withering slowly. Companies that plan for change will smooth operational turbulence and mitigate risk. And those
with the foresight to drive change will achieve strategic advantage and tactical superiority.

There is no such thing as an optimized supply chain. The entire exercise is akin to aiming at a moving target and as a result, we must focus our efforts on finding balance between value, quality, service, cost, risk, and a myriad of other factors. The object is not necessarily to be “optimized”; for this is a far too lofty and costly goal. You simply need to be closer to being optimized than your competitors.

The gap between your current supply chain performance and that which is possible is the weapon that a savvy competitor will turn against you. The relative magnitude of your Operations Performance Gap (OPG)™ in comparison to that of your competition is, therefore, a concise indicator of your vulnerability. A relatively small OPG™ may not be much of a threat since strong branding, sales, and marketing will often carry a somewhat weakened operations presence. However, tip the scales a bit too much and you may find that larger OPG™ indices provide sufficient leverage for a competitor to bring you to your knees and eat you for lunch.

Maintaining evolutionary supremacy in business demands a commitment to continuous improvement and periodic evaluation of the supply chain efficacy is certainly one of the fundamental requirements. As part of this ongoing effort, perhaps the most important element is sensitivity testing of the key variables in the model. Supply chain survival is predicated upon being prepared for what may happen and adapting your organization to change. Only by answering the “what if” questions before a crisis occurs can operations professionals be prepared to outlast the competition.

What if fuel prices rise? What if we receive smaller orders, more often? What if a shift from LTL to parcel shipment occurs? What if cubic velocity by SKU migrates? What if we produce on demand? What if we outsource overseas? What if inventory levels are lowered? Only by modeling the answers to such questions (independently and in aggregate) can some of the fog be cleared from the crystal ball.

Genetic Engineering

Genetic engineering is a laboratory technique used by scientists to change the DNA (deoxyribonucleic acid) of living organisms. Much like DNA is the blueprint for the individuality of an organism, the process logic and design of systems and infrastructure associated with a specific supply chain determine how it will react to specific operational demands.
While molecular biologists may focus on creating a tomato plant strain that is resistant to frost damage (thereby extending the growing season and/or geographic growing constraints), supply chain strategists can direct their energies toward adding value, reducing cost, assuring quality, and compressing time in order to achieve a strategic advantage and tactical superiority™. These efforts are ultimately aimed at insuring the survival of their business enterprise under a variety of operating conditions.

Just as scientists manipulate the genes and vectors associated with strands of DNA in order to test the outcome, supply chain engineers can build computer simulation models to test the performance of specific supply chain designs before deployment in an effort to develop the most productive concepts while mitigating implementation risk.

Simulation modeling is the process of developing a mathematical model that will duplicate the performance of an existing supply chain (or portion thereof) or emulate that of a concept under consideration. Once developed and validated, these computer models allow for the manipulation of a plethora of variables and can be used to dynamically test the systems under a multitude of stress conditions. “What if” questions can be answered on a much more granular level and layer upon layer of interacting variables can be programmed into a model to predict the system performance attributes such as throughput capacity and bottlenecks before committing to the concept.

Recent generations of computer simulation modeling programs include powerful graphic capabilities which allow the output to be displayed as a computer generated animation. While the true answers lie in the mathematical algorithms and statistical results, the graphical user interface is a valuable tool which can be used to convey (pardon the pun) the functionality of complex material handling systems or global distribution networks to executive management.

Much like our evolutionary ancestor Homo erectus survived by using crude stone tools 2.5 million years ago, today’s use of sophisticated computer models to forecast the performance of supply chain is a requisite to our continued existence in a competitive marketplace.

**Evolution or Extinction**

Regardless of industry and market channel, it has become increasingly critical to develop and deploy an agile and flexible supply chain strategy as a prerequisite to corporate success. While every business model is unique, those whose supply chains are condensed, tightly integrated, flexible, scalable, and collaborative and whose management is committed to flawless execution and continuous improvement will prosper while others drag their knuckles on the ground to their own demise.
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Shemesh has managed hundreds of operations design projects spanning a variety of industries and market channels including aerospace, apparel, appliance, automotive, building products, catalog, chemical, communication, computer, consumer products, electronics, food, fragrance, government, jewelry, military, pharmaceutical, publishing, retail, technology, third-party logistics, transportation, and utilities.

His client engagements have included many of the world’s largest and most prestigious companies. Shemesh’s work has been published in leading business journals, trade publications, and online information services. He is a frequent speaker at national supply chain logistics conferences and forums.

Shemesh is a member of the Council of Supply Chain Management Professionals (CSCMP, formerly CLM), Past President of the Material Handling Society New Jersey, President of the NY/NJ/CT Warehousing Education and Research Council (WERCouncil), Company Coordinator of the PTMO APICS Chapter, Past President of the Southern Middlesex County Chamber of Commerce, former Director of the Middlesex County Regional Chamber of Commerce, and recipient of the Nicholas Maul Distinguished Business Leadership Award.

Shemesh has held a High-Tech Business Incubator Funding Subcommittee Seat on the New Jersey Science and Technology Commission and a seat on the Middlesex Economic Development Commission. He has served as Warehouse Management Magazine’s “Warehouse of the Year” Selection Advisor, featured speaker at the National Conference on Operations & Fulfillment, three WERC National Conferences, the Texas Logistics Education Foundation, Parcel Logistics Exposition, Computer Distribution Exposition, and Rutgers University Department of Industrial Engineering Logistics Initiative Workshop.

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