The Survival Guide to Digital Disruptions Whitepaper

The Survival Guide to Digital Disruptions

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2 Overview

It is important to recognize that at no time in history has the pace of disruption been quicker than today. The magnitude of disruptions have also never been as great as it is today. What companies are currently experiencing is unprecedented. There is no indication that there will be a reduction in the pace or magnitude of digital disruptions that companies are and will continue to face. Due to continued disruptions, a company's supply chain must be capable of responding to today's digital capabilities. Tompkins International is interested in exploring and evaluating digital disruptions because of the impact it has on a company's success. The below circle of life presents the evolution of a company's on-going pursuit of success.

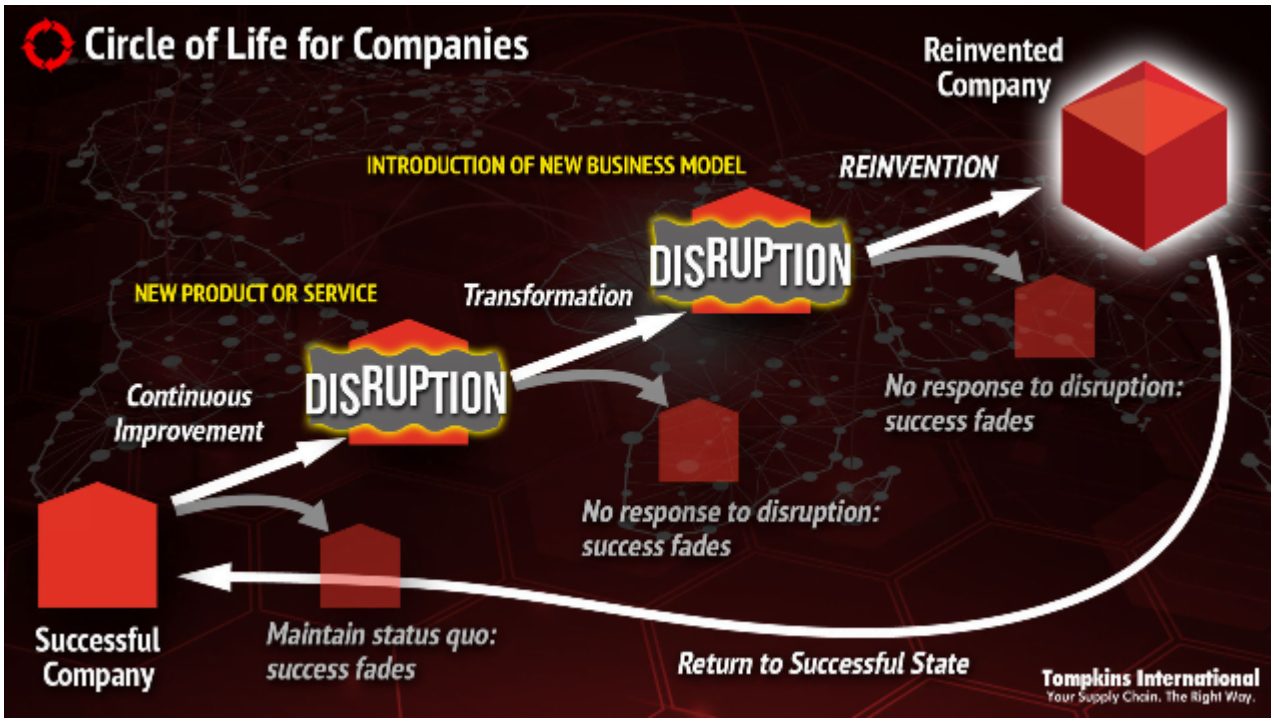


Figure 1 depicts the circle of life for a company's supply chain.

In this figure we see a successful company move from continuous improvement through disruptions in product or services demanding a transformation through disruptions in business model requiring, reinvention. Successful companies prosper through continuous improvement, transformation, and reinvention. Failure to continuously improve, transform, and reinvent your business can lead to bankruptcy or significant financial risk. Supply chains require attention and commitment at every stage of progression and reinvention.

What are continuous improvement, transformation, and reinvention?

Continuous Improvement: an addition by which a thing is improved.

Transformation: the act of changing in form or shape or appearance.

Reinvention: to remake or make over, as in a different form.

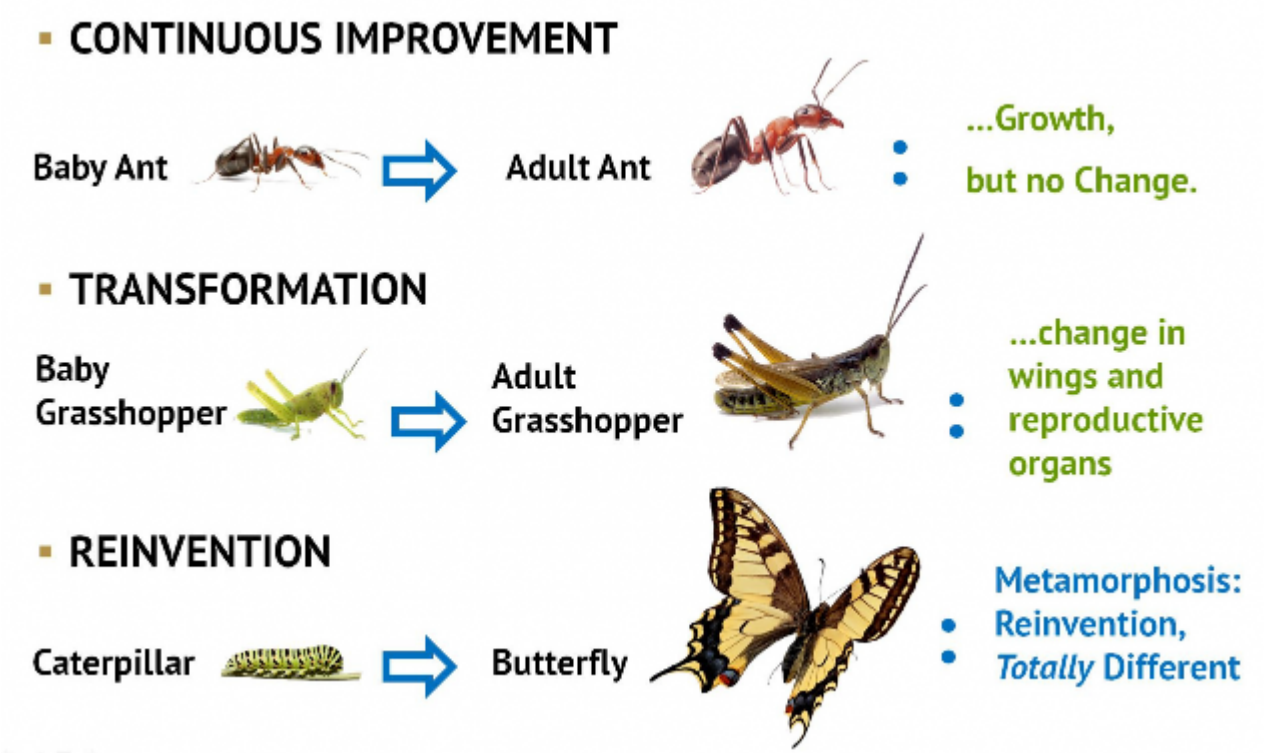


Figure 2 depicts each step in the form of an analogy.

2.1 Company's Success Path

There are three phases of a company's success path (continuous improvement, transformation, and reinvention) and three responses to each phase:

1. Ostrich

2. Fighter

3. Pioneer

The ostrich buries its head in the sand assuming, none of this impacts it. It does not even see the changes / disruptions that are taking place. It says to itself, if it isn't broke, don't fix it. To the contrary, the fighter sees the changes, the disruptions, and wants to resist the changes, to block innovations and to explain why the changes or disruptions are not really an improvement or something the marketplace will value. After all, the fighter will argue, the supply chain has done well to this point and the marketplace never needed this before therefore, why rock the boat? The third response is the pioneer. The change is seen, the disruptions are seen, and they are embraced. The marketplace potential is understood and is positively responded to.

You have a choice when faced with the three phases of your company's circle of life: the ostrich, the fighter, or the pioneer. No matter which phase you are in, both the ostrich and the fighter will result in your company's demise. However, the pioneer will adapt a different approach to each of the three phases. If a pioneer is in a phase of ongoing success, continuous improvement will be responded to. If in a phase of product or service disruptions the pioneer will respond with transformation, and if in a phase of business model disruptions, will respond with reinvention. In this paper, revolution is the application of the right response at the right time. If faced with ongoing success, revolution is continuous improvement. If faced with product or service disruptions, revolution is transformation. If faced with business model disruptions, revolution is reinvention. Continuous improvement is an organization evolution, transformation is a major change, and reinvention is becoming entirely new. Revolution is the appropriate application of:

- Continuous Improvement

- Transformation

- Revolution

2.2 Evolution of Mankind

How have humans evolved into the digital era? Humans have evolved over a long period of time, first measured in thousands of years during the agricultural era, to hundreds of years during the industrial era and finally to tens of years during the digital era. With today's

technology advances humans are running to stay current. Since the year 2000 computing has gone from calculations and doing mathematics to communications and connecting people in ways we could only have imagined 15 years ago. The digital era has accelerated the pace of life, the pace of innovation, and the growth of the digital economy and digital commerce.

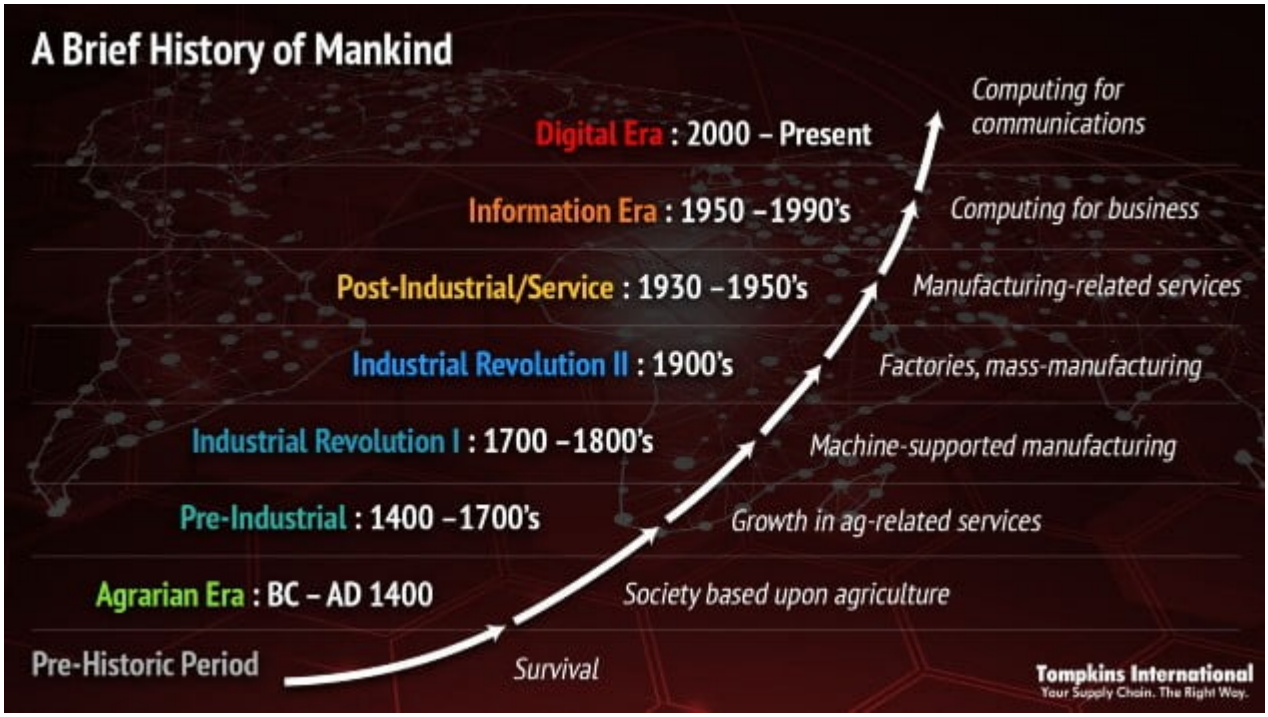


Figure 3 depicts the evolution of mankind.

The Digital economy is defined as the far reaching expansion of technologies into businesses and services. The new economy of how people, businesses, and governments work, interact, and prosper has changed. "The term 'Digital Economy' was coined in Don Tapscott's 1995 best- seller *The Digital Economy: Promise and Peril in the Age of Networked Intelligence*. The Digital Economy was among the first books to show how the Internet would change the way we do business," Wikipedia.

Digital commerce is defined as a subset of the digital economy that changes the economics of demand and / or supply. It encompasses the entire product and service life cycle and impacts all trading partners of global supply chains, not just buying and selling. Companies must have the ability to market, sell, and serve through digital means.

A Brief History of the Digital Era:

1930's-1950's – Rise of service sector, invention of computers.
1950's-1990's – Use of computers for computing.
2000-today – Use of computers for communication.

There are a number of companies that have used digital to separate themselves from the other companies. Illustrations of companies that have disrupted the marketplace with a different business model and forced many others to grasp the power of the digital economy are:



Figure 4 depicts some of the best known examples of digital disruptions.

The greatest disruptor of them all is Amazon. Amazon is capturing market share, growing 30% a year in the U.S., and rapidly expanding its network for direct to customer fulfillment. Amazon is doing this with a focus on harnessing the growth in digital communications and data. Companies in many industries are feeling the impact of Amazon on their business and are struggling for a solution to keep pace. Amazon has quickly gone from the "Everything Store" to the "Everything Company."

3 Digital Supply Chains

The impact of digital on the supply chain mega processes (Plan-Buy-Make-Move-Sell-Distribute) is significant and could be a source of a paper on its own. To present a quick view of the impact of digital on supply chains consider:



Figure 5 depicts impact of digital on the supply chain mega process.

PLAN – The plan function is a major user of digital information to improve product availability and optimization of company resources.

BUY – Buy uses digital information to communicate with suppliers in sourcing and delivery. The buying function is very dependent on visibility across the supply chain to streamline material flow and reduce costs.

MAKE – Manufacturing or the make process, from a supply chain perspective, (from strictly a MAKE perspective of the supply chain- 3D printing or additional manufacturing requires a total reinvention of the manufacturing process) is the least directly impacted by digital. Progressive companies closely tie production to supply and demand which depends on digital information and technology. The Internet of Things (IoT) is also important for manufacturers wishing to control equipment and integrate their factories.

MOVE – The move function is impacted by digital and technology in meaningful ways, from digital payment, to communication, to mobile applications, and cloud technology, all focusing on efficient, effective, and timely movement of materials and products.

SELL – The sell function gets a lot of attention in the digital age due to eCommerce, digital application, and the customer experience. In some cases this is the focal point for digital information flow.

DISTRIBUTE – Distribute is significantly impacted. Getting products into the customers hands quickly, same day or next day, is the new expectation.

4 Digital Components

To grasp digital disruptions and digital supply chains it is important to embrace the top 11 building blocks of the digital era. This is not to say that there are not other digital components or that all 11 of these mentioned 11 are applicable to any given companies digital outreach or supply chain.

1. Artificial Intelligence (AI)
2. Big Data
3. Cloud Computing
4. Customer Experience
5. Digital Payment
6. eCommerce
7. End-to-End Visibility
8. Internet of Things (IoT)
9. Mobile (mCommerce)
10. Social Interaction
11. Uni-Channel

The next several sections present an overview of these 11 digital components.

4.1 Artificial Intelligence (AI)

Artificial Intelligence (AI) is the simulation of cognitive functions associated with the human mind by machines and computer systems. Key AI traits are machine learning and problem solving. It is interesting to note that some in the AI community are beginning to differentiate

between machine intelligence and machine learning (ML). A difference, but mostly still referred to as AI. The term AI originated in the mid-50's with the advent of the computer age. The terms "expert systems" and "neutral networks" were commonly used to describe early solutions and theories as they did not live up to the cognitive goal of AI. This has given way to fully embracing the term and abbreviation in computer science, business, and popular culture. It is a more recognizable term and abbreviation in popular culture than the Internet of Things (IoT) due to media coverage and movies / books (e.g. Spielberg 2001 movie A.I.). It touches most other digital components and impacts all supply chain mega processes.

AI's impact on digital commerce or the digital supply chain currently lies more in its potential than actual application. However, it is beginning to play a disruptive role on the sell side allowing marketplaces and mobile apps to more intelligently present buy and up sell suggestions. Coupling AI with personal / big data and predictive analysis will significantly change the face of uni-channel selling.

AI has certainly attracted considerable attention and investment dollars in final mile delivery solutions such as, self driving delivery vehicles and drones. AI has vast potential to dramatically change the role of robotics in the make and the distribute processes. Not generally recognized is its disruptive potential for automating and streamlining the plan and the buy processes.

AI offers several distinct value propositions for digital supply chain:

- Taking predictive analysis to the next level. This means moving beyond sense and respond towards processes with contextual awareness. AI enabled processes will not only identify the 'what' embedded in trend data, but will be able to factor the 'when', 'where', 'how', and 'why' into the decision making process. The result is a more agile and responsive supply chain.

- More intelligent machines. Robotics have a well established position in industry and supply chain operations. The role of robotics is primarily restricted to repetitive tasks where the operation's scale justifies the investment. AI allows machines to perform decision-based activities. The result is more cost effective and flexible robotic solutions.

- Process automation. Considerable labor is expanded in planning and managing supply chain processes. Process automation in supply chain operations generally means work flow automation that controls the availability and timeliness of data to human decision makers. AI can truly automate the decision making process, reduce labor costs, and improve timeliness.

According to the SCM World Future of Supply Chain Report 2015, the majority of companies do not consider AI as a disruptive or important factor in their supply chain strategy. They are content to let Amazon, Google, and others refine and help mature AI's potential. They view AI as a longer term prospect that really does not need to be on their radar any time soon.

Tompkins International believes this is short sighted on the sell side, where AI is beginning to make a significant impact. Merely, waiting for the technology to mature and for others to prove its value ignores the foundational work the top and mid-tier enterprises will have to make to incorporate AI across the supply chain. Self-driving delivery vehicles may be many years off; but leveraging AI to make the plan, buy, make, and distribute processes more efficient and responsive will be here sooner, as opposed to later.

Self-driving delivery vehicles and intelligent marketplaces are typical examples of how AI can be employed in the supply chain. Its potential cuts across all mega processes. Today, demand planning is as much an art as a science. Demand planning software is exceptionally good at forecasting trends, based on sales data. Demand planners typically invest considerable efforts into adjusting and tuning forecasts to reflect factors that are not embedded in the underlying historical data (e.g. promotions, local events, disruptions, etc.). Forecasts are tuned before they become purchase order requisitions, which still must be reviewed and approved before being sourced to vendors. All of this takes time and money. AI can automate these manual processes. Supply chain control towers provide a wealth of event based information. They rely on someone reviewing this information and taking action where appropriate. AI can help automate and improve the timeliness of these activities.

4.2 Big Data

The availability and management of business and operations data is increasing dramatically. The types of data collected are being obtained from multiple sources including, locations, RFID tags, social, sensors, smart metering, text, transactions, IoT, and surveys.

Data sets are being created that are so large and so complex that traditional data processing applications are inadequate. This exponential growth and availability is prevalent and continuing. It is being referred to as, "volume, velocity, and variety". Variability is also present in big data as data flows vary with periodic peaks. Complexity must be linked as well.

The digital age is fueling big data at a revolutionary pace. Companies are able to capture big data at the transaction level on an almost real-time basis. In fact, the availability of data is overwhelming supply chains and other process leaders in their ability to make use of it.

New data streams are available that can dramatically improve existing business processes and even create entirely new businesses. This rapid disruption cycle brings with it the ever-present question, what opportunities could be missed because process leaders do not know how to optimize use?

The rapid growth of data is consistent with the increasing digitalization of business. As more and more processes are being driven or enabled by digital methods, the more data is being generated and captured. The rapid growth of storage equipment, whether on-site or in the cloud, is a prime indicator of this.

Big data is being used by companies of all types. Companies are investing in analytics technology, talent, data, storage, and acquisitions. The coupling of advanced analytics with the data allows not only improves understanding of what is happening, but also predicting what is likely to happen, via three types of analytics:

1. – Descriptive – what happened and what is the problem?

2. – Predictive – what are the causes and what will happen next?

3. – Prescriptive – what if we try “this” and what is the best case scenario?

Advanced analytics provides the capability to derive insights from what is happening or what will likely happen. As long as the data reflects measures that matter or actually report on performance, then analytics can make use of vital signs. Key Performance indicators (KPI’s) can be identified for each area, cost, productivity, safety, quality, service, and even morale.

Examples of applying advanced analytics for insights:

- Network redesign.
- Demand planning (forecasting).
- Suppliers’ performance.
- Trends in buying and selling.
- Commodity price volatility.
- Risk analysis and management.
- Customer buying behavior.

- The value of customer experience.
- Inventory deployment and allocation.
- Supply chain assessments.
- Digital readiness assessments.
- Fulfillment center designs and business cases.
- Increasing operating margins.
- Supply chain optimization.
- Operations strategy formulations.

Big data continues to expand. Many companies have appointed “data scientists” to design, manage, and create new access points for its use. The intelligent use of advanced analytics can create competitive advantages for those companies that recognize its value. This is especially important for the digital age, where speed and accuracy will prevail.

4.3 Cloud Computing

Cloud computing is a broad term that entails the delivery of computing services and IT infrastructure via the Internet. It includes the ability to use an application such as a demand forecasting or transportation management system that is remotely hosted and managed by a third party on a usage or subscription fee basis Software as a Service (SaaS). It encompasses leveraging a remote data center server services via the Internet Infrastructure as a Service (IaaS). It allows software developers to access tools and related services that are remotely hosted to build and maintain applications Platform as a Service (PaaS). The remote services and infrastructure in question can be managed by a third party entity, public cloud, an enterprise for internal use, private cloud, or a mixture of the two, hybrid cloud, where public resources supplement private for specific usage or additional capacity.

Cloud computing can be viewed as an evolutionary process that has been ongoing for years. Most enterprises, large and small, leverage the Cloud for some software and / or IT infrastructure needs. Its growth has been fueled by large IaaS providers such as Amazon Web Services, Microsoft Azure, IBM Softlayer, and Google Cloud Platform. There is a large ecosystem of software vendors providing a wide range of cloud-based applications on a

subscription fee basis. In many ways cloud computing has become ubiquitous.

As a digital component, cloud computing is a significant disruptive force. This is due to its key advantages. It provides a framework for a ‘pay as you go’ usage model where initial investment and on-going ownership costs can be spread out across a large customer base. It enables organizations to rapidly deploy applications by eliminating the need to install and support on- premise hardware and applications. Its shared services structure can allow individual companies to cost effectively scale up or down usage to reflect demand. Since users access its applications and services through the Internet, cloud computing is a natural forum for collaboration across and within enterprises.

Cloud computing is an enabler for all the other digital components. It allows organizations to rapidly deploy supply chain applications. It provides software developers with cost effective platform for developing new supply chain applications. It helps breakdown supply chain silos across and within organizations.

Many mainstream supply chain solution vendors offer cloud-based WMS, TMS, forecasting, and procurement solutions. These are common place. Cloud computing advantages allow software vendors to offer solutions like distributed order management, last mile delivery scheduling, and uni-commerce applications that have been out of reach for many organizations, as on-premise or custom developed solutions.

Any enterprise that fails to adequately address cloud computing in its digital supply chain strategy will not be able to offer customers the value and services they demand. They will be displaced by others who do.

4.4 Customer Experience

Customers continue to receive great experiences and these experiences result in higher and higher customer expectations. The same can be said for businesses in B2B commerce, as you might expect, businesses are even more demanding from an experience perspective than customers. Customers expect the following:

a. Richer product information including, reviews, ratings, demonstrations, and help videos.

b. Improved search capabilities.

c. Improved social media process.

d. Real-time inventory availability.

e. Personalized search results.

f. Digital gift cards.

g. Product options.

h. Product specifications.

i. Delivery options.

j. Flexible return options.

k. Pricing and quality alternatives.

l. Suggestions for related purchases.

m. Personalization of products.

n. Wish lists and registries.

o. Tracking and status updates.

p. Special deals of the day, week, month, etc.

q. Clear information on customer service, warranty, and product support.

r. Help available during any point of the buying journey.

s. Flexible payment options including, credit cards, credit lines, an online payment system, and finance plans.

t. Comparison shopping.

Customer expectations are causing huge disruptions to businesses. Customers can now, save money, learn about the product, receive the product from multiple locations, and not have to go to a brick and mortar location. Customers are increasingly comfortable shopping online as more information becomes available. There are so many innovations in the eCommerce supply chain such as, the pricing concept utilized by Jet.com, owned by Walmart. “Pricing adjustments are offered to encourage users to buy more items at once and to purchase items that are located in the same distribution center, thus making the purchases less expensive for the company to collect and ship. As users add items to their virtual shopping cart, they are encouraged to select additional items using pricing incentives. Pricing options are also offered during the check-out process, such as having the user opt out of the ability to return merchandise for free in exchange for a reduced price. Users are also offered a price incentive to use a debit card rather than a credit card for purchases,” Wikipedia.

The value proposition for the customer experience is focused around what today’s customers get for their time and money. A business that saves the customer time, money, and deliveries in a timely manner will win business. Ensuring customers’ experiences are positive is a critical element in a company’s eCommerce growth. Failure to provide a great customer experience will quickly dampen sales. To be successful in eCommerce requires a high degree of attention to the customer’s buying experience.

Customer’s expectations on the speed of delivery continue to grow. Amazon offers same day delivery to over 165 million Americans. Two day delivery three years ago was considered fast. Going forward same day delivery in large cities, next day delivery in medium sized cities, and two day delivery in rural areas will be the norm.

An example of using a customer’s experience to enhance supply chain improvements is capturing information from the customer’s buying process, to generate further sales through digital means. The integration of systems is also required to provide the level of customer experience that is demanded, providing increased visibility across the supply chain. Creating an enhanced customer experience drives companies to improve their supply chain and organizational technology.

Customers are applying pressure on companies to meet these expectations. Supply chain leaders are expected to maintain growth rates, keep up with customer shopping patterns, and deliver big increases in digital channel sales. The combination of expectations is causing significant stress on organizations’ supply chain technology, people, and processes.

A tipping point has been reached for who owns a customer’s relationship. In the past retail has owned the relationship, but as time has passed, technology and the digital environment now owns a customer’s relationship to a much larger degree, predicting that in the future technology will lead the way with customers.

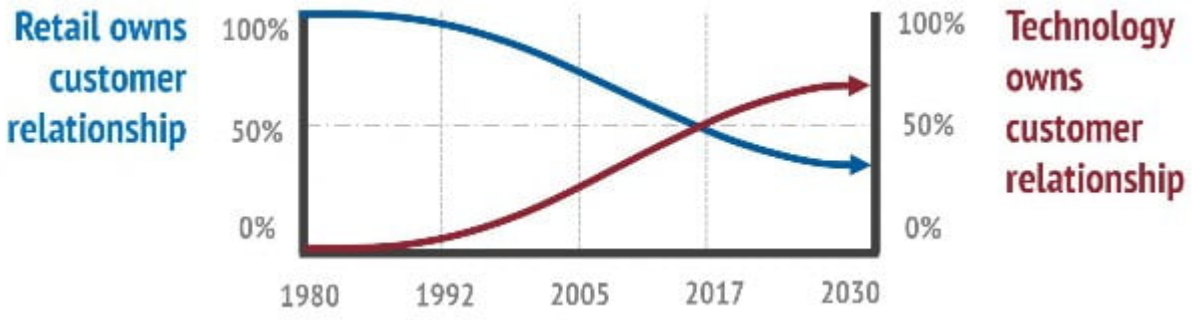


Figure 6 depicts who owns a customer's relationship.

4.5 Digital Payment

Digital payment is the electronic payment for goods and services. Electronic payment is a concept that predates eCommerce through EDI-based electronic funds transfers. eCommerce generates a credit card based electronic payment method where a customer registers or submits their credit card number and through payment gateways integrates into the marketplaces / website.

Digital payment has evolved beyond this electronic version of a card swipe. Digital payment services like PayPal and Amazon Payments provide a more streamline approach for both the merchant and the customer. They allow a merchant to by-pass the direct processing of credit card transactions, and allow a customer to use a single service across multiple vendors instead of registering with each individual merchant.

Digital wallet is a subset of digital payment where one or more credit / debit cards are accessed / managed through a mobile app. A customer can make payments for in store purchases through screen scans and Near Field Communications (NFC) by capable merchants. Digital wallets can also be seamlessly integrated with mobile eCommerce and uni-commerce applications.

Digital payments have primarily disrupted the sell side. Major players like Amazon, Apple, PayPal, and Google are well established. While they typically charge merchants on a transaction basis, their payment services also strengthen their own marketplace position. The Honest Company accepts Amazon Payments on their web store, as well as, sells via Amazon.com. Jockey accepts PayPal on their web store, as well as, sells on eBay. Customers are increasing turning towards digital payment and digital wallet services for convenience. The payment service an online retailer or CPG selects can impact their competitive position. The provider landscape is still dynamic. eBay spun off PayPal in 2015.

Digital payment directly impacts mobile, uni-channel, and customer experience components. It increases the use of mobile devices both for in-store and online orders. This in turns promotes show-rooming and uni-channel interactions.

Customer convenience is also a digital payment value proposition for retailers and CPG companies selling online by driving more traffic and increasing the conversion rate at their web stores. For smaller retailers it provides an easier method to accept debit / credit card payments than traditional payment gateways and in-store credit card processing. It also enhances a customer loyalty program experience for both the customer and the retailer by eliminating the need to provide and process separate membership numbers during a sales transaction.

The risks in not adequately addressing digital payment primary falls on the sell side for the customer retailer. However, many B2B sellers must provide similar buy experience to the customer as B2C retailers. Failure to account for digital payment will result in lost sales.

Amazon Payments or PayPal are prime examples of digital payment services. The Starbucks app is a good example of a successful and targeted digital wallet service. It supports mobile ordering, mobile payment, the Starbucks rewards program, and e-gifts. It is a pre-paid service loaded via a registered credit card or PayPal. Over 21% of Starbucks sales are currently through its mobile app.

4.6 eCommerce

eCommerce / digital commerce is the buying and selling of goods and services over the Internet. These business transactions occur either as B2B, B2C, C2C, orC2B. In fact eCommerce has become such a standard portion of everyday life that these titles are starting to fade and blend together, example B2B and B2C are now more often than not, B2ME.

eCommerce, draws on technologies such as mCommerce, electronic funds transfer (EFT), supply chain management, internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems. Modern eCommerce typically uses the World Wide Web for at least one part of the transaction’s life cycle, although it may also use other technologies such as e-mail.

At Tompkins International we have consistently and correctly continued to forecast the effect that eCommerce has had on tradition retail and wholesale sales, being at the forefront of the evolution of eCommerce to global / crossborder commerce. Brick and mortar stores are not going away, but the overall brick and mortar sales will be flat with all retail growth taking place via eCommerce.

The supply chain must be reconceived and redeployed in digital form to serve the needs of eCommerce and eFulfillment. This begins at the design and manufacturing stages and through reverse logistics.

The value proposition of eCommerce is well established and hardly needs to be recapped here. With that said, eCommerce creates customer satisfaction in all four pillars of the commercial/ retail paradigm, more selection, more convenience, better prices, and better

experience through rapid and affordable delivery.

4.7 End to End Visibility

End-to-end supply chain visibility (E2E) has been a top three goal of supply chain managers for over 10 years. The ability to see one's products or components as they are moved from origin to destination carries with it the opportunities to change routings, to inform trading partners, and to collaborate with customers. Moreover, the capability to manage risks, to reduce out-of- stocks, and to optimize inventory deployments, all depend on knowing "where my goods are," if not real-time then near real-time.

Optimizing each of the mega processes (PLAN, BUY, MAKE, MOVE, DISTRIBUTE, and SELL), as well as, the entire supply chain requires effective visibility of goods in motion. All types of companies have been seeking real-time visibility in order to not overbuy, overstock, or over serve; as inventory management is so critical to financial performance.

Digital disruptions, and companies' responses to the disruptions, make visibility even more critical, noted in a recent survey which shows that, "online shoppers demand visibility, as well as, speed in delivery," DC Velocity. Improved tracking and visibility during order fulfillment is required to keep customers coming back. They are demanding transparency throughout the parcel's journey from origin to doorstep. "Further, some 47% of shoppers have chosen not to return to the retailer due to weak or inaccurate transparency about status."

Of course, online order visibility is the final leg of the E2E chain. However, this critical need is only enabled by the other origins, transshipment, DC location, etc. Fulfillment mistakes are costly. The survey points out those customers will indeed go to competitors who are only a "click away."

Fortunately, recent advances have been made in E2E visibility. These advances are both technological and process-based. Global transportation systems such as GT Nexus, Amber Road, and INTTRA, are cloud-based and integrated with freight forwarders, ocean carriers, 3PL's, and customs brokers, along with other trading partners, such that companies can track and trace their orders, goods, and parts, from E2E. More and more online products are sourced and moved crossborder, this is of critical importance. Global marketplaces are relying on these systems. In fact, retailers and their suppliers are putting in place global control towers in order to view their goods in motion in real-time.

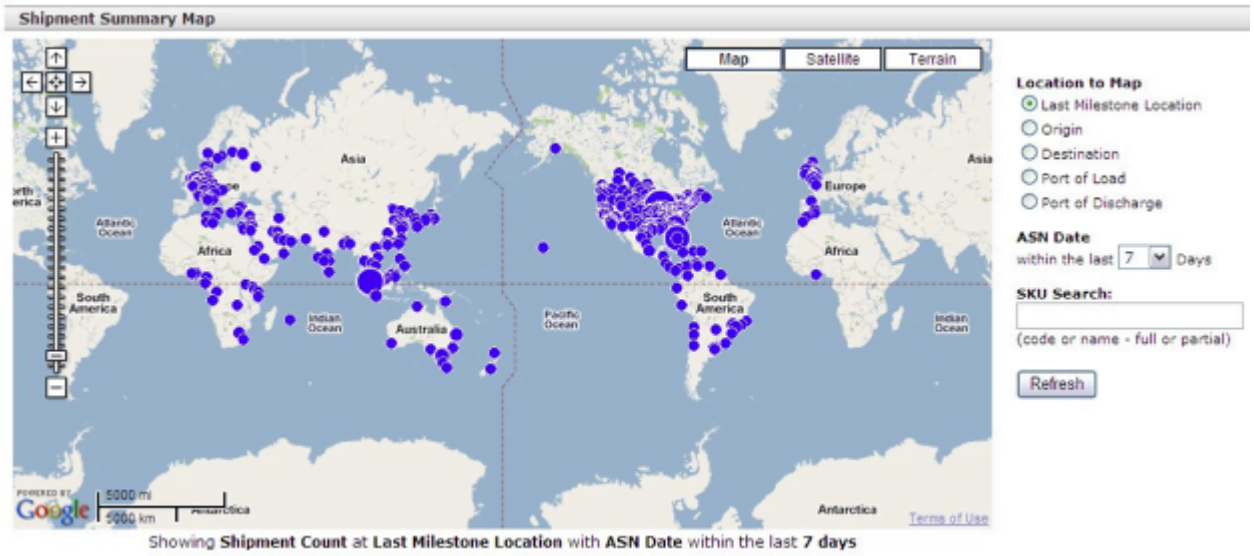


Figure 7 depicts global visibility enabled by GT Nexus.

The GT Nexus system provides E2E visibility from origins to the handler of the f nal delivery. The origins can be in China or other parts of the world where products are made. The system also tracks and handles customs and supply chain finance (letters of credit, etc.).

E2E visibility has been solved and is rapidly becoming an essential digital comp nent for any company, or marketplace, in order to enable the improved “customer experience,” as well as, a method for leading to inventory optimization.

Digital strategies and operations require this capability, which will continue to expand globally.

4.8 Internet of Things (IoT)

Internet of Things (IoT) was originally the concept of, things talking. In the early days it was envisioned that RFID tags would be on everything, helping to identify and locate any object in the universe. The RFID tag would uniquely identify the item, determine its location, and put a time stamp to the transaction. This was a pretty straightforward concept. It was either there or it was not there. It was all about identity and location.

Once understood that RFID could “talk” people started to think about other things that could “talk” over the Internet. This brought sensors and devices into the fold. Similar to a RFID tag detecting a change in location, sensors and devices detected a change in state. It was either on or off, hot or cold, dark or light. Understanding this simplifies what a sensor or device is. It was essentially a binary decision reporting on a change in condition. At the time one was looking for that change in state to create a response. If a temperature sensor was above freezing, there was a problem with the freezer. If an RFID tagged item moved

from the store shelf, one reduced the inventory in that location. A predetermined response or responses was tied to that change in state. The analysis of the data was straightforward. One was trying to get a broader view of what was happening in near real-time to improve operations.

It became apparent when connecting two IoT devices together a more accurate response would be developed, providing multiple pieces of information. It moved from being a binary response to being a system response. A simple connected system was developed. No longer was it on / off, but now it was on / off and hot / cold.

Take a warehouse for example; think of all the devices, motors, sensors, machinery, and mechanical equipment in a warehouse. There are thousands of points of information and potential changes in the state of a warehouse. Today, all of this information is in a functional silo. The conveyor system has information that is separate from the lighting system that is separate from the WCS, WES, and WMS. In a warehouse today there is optimization of a subset of the total operation.

Now, think of an IoT connected warehouse. All of the devices communicate across a common platform. Within that platform resides all of the information that is generated by the connected warehouse, proving a holistic view of the warehouse. Thus, able to analyze the data in a near real-time manner and improve the performance and efficiency of the connected system. The performance of the system can be changed to achieve a specific business goal.

Today, discussions can be made around wave picking versus waveless picking. In the IoT environment the questions are not going to be around the picking strategy, but rather around how to achieve maximum throughput given the constraints of the connected warehouse. The system will look to maximize the total efficiency of the facility and may very well blend the two picking strategies for optimal performance.

The first step to achieving this connected future is to install a platform that is capable of collecting, cleansing, and harmonizing all of the information generated in a connected warehouse.

Layered on top of the platform will be industry specific analytic tools and business applications that will take advantage of this data. The analytics will be used to look for improvement opportunities in the business. The business applications will take advantage of the data to use it in specific processes to improve operations. This will require that the platform enable data to be distributed to the right process in order to facilitate these improvements.

Finally, when there are enough devices connected to the platform, the machines, and sub-systems, the systems will begin to communicate with one another in an attempt to optimize automatically. If a pattern in the business continues to predict a future reaction, the system learns to accommodate for that pattern. For example, if the system identifies when a certain

volume of cartons flows past a certain point given certain conditions there is a 90% certainty of a failure in the next 10 minutes. The system generates an action that avoids that failure. It could shut down a lane or slow down the input capacity, but it will do a series of actions that avoid the failure. This is the essence of machine learning.

The warehouse is an example of a connected entity. We have connected cars, connected houses, and connected cities. In the future we will have connected supply chains. Connected takes a complicated system, puts it on a platform, and optimizes and automates the environment, in a way that was never before possible. This is the future potential of IoT.

4.9 Mobile (mCommerce)

Mobile commerce (mCommerce) is the extension of eCommerce onto mobile devices.

mCommerce is the buying and selling of goods and services through wireless handheld devices, such as cellular telephones and personal digital assistants (PDAs), known as next-generation, eCommerce / mCommerce, enabling users to access the Internet without needing to find a place to plug in.

Customers shop online from their mobile phones, primarily because it can be done from multiple locations, at home, at work, and while traveling, to name a few.

Years ago when we wanted to do research we read books available primarily at a library. Eventually research could be done on a desktop computer. Now, with the convenience of smartphones research can be done anywhere.

Another one of the advantages of mCommerce is that there is always the potential to bring in new customers. An optimized site is not just one that retains your current customer base, but it is also one that attracts new customers who come across your store and find it appealing.



Figure 8 depicts the benefit of mCommerce.

Another advantage of mCommerce is that a new marketing channel is created. iBeacons are sensors that are placed on shelves, product displays, and signs that interact with nearby mobile devices. They are essentially what offer a personalized shopping experience.

China is far ahead of the U.S. in terms of mCommerce. Many Chinese eCommerce shoppers skipped the PC generation and went straight to mobile where nearly 70% of transactions take place.

App-based snacking or small impulsive purchases made on mobile devices throughout the day, is largely coming to replace the increasingly antiquated practice of making a lower number of larger purchases on less portable devices.

Amazon's mobile app, which presents a user interface similar to its desktop version, has allowed shoppers to do most of their errands from the comfort of their smartphone.

These types of applications promise to radically transform the retail industry by creating new shopping habits, reshaping sales tactics, and carving out winners and losers. Instead of placing one big order from a computer, people are increasingly making smaller purchases in short bursts throughout the day on their smartphones.

Mobile sales are booming, especially compared with sales gains from desktop computers. In 2015, U.S. sales from mobile devices jumped 56% to $49.2 billion, doubling the previous year's growth, according to comScore. Desktop sales still dwarf mobile, reaching $256.1 billion in 2015, but annual growth slowed to 8.1% from 12.5%. Mobile devices are driving demand. They can create an impulsive buying moment at any point in the day because they are with customers all the time, right in their pocket.

4.10 Social Interaction

Social interaction with the customer and how the customer socially interacts with you in return is important. Social interactions include all the ways customers get and share information through social media about products and services they have received.

The social interaction digital component is causing huge disruptions to business because company's can share information with customers like never before, having a fast and efficient means of reaching millions of people with their messaging. Also, customers can interact with each other on an emotional level about their buying experience. Social interactions have grown enormously over the past two years as people are taking to their social networks to communicate with each other at a speed and volume never before seen. This free flow of information can make or break a company based on how a customer perceives the experience they have had with the company or product. Social interactions have become critical to purchasing decisions and have become a major source of information about what products are trending.

The value proposition for social interaction is focused around what companies are able to push out to customers and what customers share with each other. The selling organization that saves the customer significant time by providing more product information, good prices, and an acceptable speed of delivery, will win the customer's business. Ensuring the social response is very positive is a critical element in a company's eCommerce growth. Failure to effectively utilize social media to reach customers and build a network of true believers is detrimental to the growth of a company's top and bottom lines. Another important point, social interactions have a life of their own. Unless a company involves itself in this world and stays current on what is trending, social interactions can turn very negative and threaten the core of a company's business.

Companies pursuing a digital strategy must pay particular attention to social interactions concerning their organization, products, and services. Social media has become too important to the overall buying process to be left in the control of customers. It is also too highly emotional in its nature to not participate. Customers view the information they receive via social interactions as sound information based on their network. A positive social experience is critical to success. Although this discussion has been primarily focused on B2C, customers' social interactions, the discussion is equally applicable to B2B businesses.

An example of using social media interactions to enhance an organization's performance would be to post sale information on a product with excess inventory, providing pricing incentives on the item. Other examples of using social media to enhance an organization's performance include: sharing positive product reviews, providing regular deals of the week, and / or contests that incentivize customers to re-tweet, re-share, or re-post. Social interaction is at the forefront of interacting with customers.

4.11 Uni-channel

Uni-channel is when a company is delivering a completely unified brand experience that delivers total and holistic customer satisfaction. Shoppers' no longer want / can / need to differentiate between channels or differences in experiences on channels.

Omni-channel was a noble idea that attempted to connect and unify experiences across all channels. Uni-channel takes things a step further and erases the differences and walls of differing channels and creates a single channel / experience.

Meeting customer demands for a unified experience means bringing together systems and processes across different channels; increasingly, leading to the same tools being applied across all channels. For progressive retailers, the future is not an omni-channel experience, but a unified one, perhaps better described as uni-channel.

"This idea of a universal experience, or experiential commerce, is becoming the focus of retailers," says David Geisinger, Retail Innovations and Product Marketing Chief, Magento, an eCommerce software and solutions company. "And it's not because retail had the idea, it's because that's what customers are forcing retail to work towards. "As shoppers, we

don’t think of shopping as a channel experience. We think of it as a brand experience.”

Some keys to creating and sustaining uni-channel:

- Robust, all digital, all encompassing CRM.
- Robust all encompassing customer services.

One company running with the concept of a unified experience is Winning Group, receiving the award for Best Customer Experience for its Appliances Online pure-play online retailer at the 2015 World Retail Awards.

Chief Executive, John Winning said, “the win was the direct result of learnings he gained working with his father in his family’s century old retailer, Winning Appliances. We aim to offer the same high level of customer experience across every business and channel of the Group, whether that’s online or offline. Some of the learnings acquired through our online presence are universal and can be applied to every channel used by the Group; however, there are obviously some insights specific to an online experience. As online involves less face-to-face interaction, we try to replicate the traditional service found in a store in a modern context, by offering 360-degree imaging and product videos, 24/7 customer support and live chat.”

Winning says the company’s CRM integrates web analytics, point of sale / ERP information and phone interactions between all channels to deliver a single customer view. This is currently being rolled out to customer service representatives.

5 Digital Organizations

The supply chain organizations that will be successful in the future will have digitally focused leadership and a forward thinking / revolution oriented mindset. Organizationally companies must have a culture capable of agility, an appetite for risk, be data-driven, passion to work, and collaborative work styles. Companies must invest in their own talent and have practices to retain talent. Employees must be aligned with the digital agenda and dedicated to aligning their company and customers in a digital interaction. Innovation will be a requirement of the digital organization as a continuous wave of new ideas must drive actions.



Figure 9 depicts a digital supply chain organization.

5.1 Where is Digital Happening

Digital is a global phenomenon. Countries such as, Singapore, Switzerland, Hong Kong, U.S., Korea, New Zealand, and Ireland are leading the way with the development and momentum in the use of digital technologies. Countries gaining momentum in the use of digital include: India, China, Brazil, Vietnam, Malaysia, Thailand, Mexico, and South Africa. Your competition can come from anywhere at any time. “Americans using digital means for commerce include 72% of all American adults, 89% of all American college graduates, and 94% of all American high household incomes,” Pew Research Center. The focus is on the young and around urban population centers.

5.2 Digital Value Propositions

The customer relationship in a digital commerce environment must be shared between retail owning the relationship and technology owning the relationship. The customer / company interaction requires a blend of retail and technology to allow:

- Explore – the customer to discover options and pursue choices.
- Purchase – the customer to order from the company.
- Receive – the company’s supply chain fills the customer order.

- Support – the company supports ongoing needs of the customer.

- Community – the company cultivates customer loyalty and enthusiasm.

6 The Supply Chain Revolution Path Forward

You now understand the pace and magnitude of digital disruptions and the need for a supply chain revolution to respond to these digital disruptions.

The process to address the disruption path forward is not complicated, but it is not easy to implement.



Figure 10 the digital supply chain path forward.

6.1 Current State Assessment

As an organization responds to digital disruptions the value propositions that should be achieved includes:

- Limiting the impact of and responding quickly to all competitive disruptions.

- Enhancing the customer experience and manage personalization.

- Achieving speed and low cost of product fulfillment.
- Providing a high level of information visibility and accuracy.
- Minimizing uncertainty and risk.
- Supporting strong revenue growth.

The tasks to be pursued in assessing the current supply chain are:

1. Map current supply chain flows, product, information, cash, and work.
2. Document current levels of performance capacities and costs. Benchmark to best in class preferences.
3. Evaluate the customer experience to best in class performers.
4. Review information technology and benchmark to best in class performers.
5. Develop a strengths, weaknesses, opportunities, and threats analysis (SWOT) of the above four tasks and document current supply chain improvement opportunities.

Addressing the digital disruptions in the current state assessment requires attention to the following top 25 questions:

1. What disruptions are impacting your company?
2. What are your competitors doing differently with their products, services, and / or business model?
3. What are you doing to continuously improve your supply chain?
4. What are you doing to transform your supply chain?

5. How are you reinventing your supply chain?

6. What is your company’s digital status?

7. What digital disruptions are impacting your supply chain?

8. What is your company’s competence regarding the top 11 digital disruptions?

    1. Artificial Intelligence (AI)

    2. Big Data

    3. Cloud Computing

    4. Customer Experience

    5. Digital Payment

    6. eCommerce

    7. End-to-End Visibility

    8. Internet of Things (IoT)

    9. Mobile (mCommerce)

    10. Social Interaction

    11. Uni-channel

9. How is your organization responding to digital disruptions compared to your competition?

10. What is your organization’s competency of the digital supply chain mega processes?
    a. Plan
    b. Buy
    c. Make
    d. Move
    e. Sell
    f. Distribute
11. What are your organization’s digital objectives and how are they measured?
12. What is your organization’s digital vision and does this vision fit with your business strategy?
13. Have you plotted your customer’s journey?
14. What role does brick-and-mortar play with your customers?
15. What are the most important opportunities for you to enhance your digital supply chain?
16. What are your most significant supply chain operational challenges?
17. What are your most significant supply chain digital organizational inhibitors?
18. What is the value proposition for your digital supply chain path forward?
19. Do you have supply chain capacity constraints that are limiting your ability to achieve your digital objectives?

20. What gaps do you have in current practices and technology vs. your desired practices and technology?

21. How do you blend your retail and technology capabilities?

22. What opportunities do you have to improve your customer / company interactions on, Explore / Purchase / Receive / Support / Community?

23. Who owns digital in your organization?

24. Who owns digital supply chain in your organization?

25. Is your digital thinking:

    - Forward-Looking
    - Change-Oriented
    - Agile
    - Bold
    - Exploratory
    - Data-Driven
    - Passionate About Digital
    - Collaborative
    - Aligned
    - Innovative

6.2 Future State Design

This assessment of the current supply chain lays the foundation for defining the future state of supply chain design. The two step process to develop the future state supply chain design is:

1. Scan

2. Focus

The steps for scan are:

1. Internally brainstorm, ponder, and reflect on current supply chain improvement opportunities.

2. Externally brainstorm, ponder, and reflect from a customer’s perspective supply chain improvement opportunities.

3. Internally and externally brainstorm, ponder, and reflect on current and future digital disruptions and identify supply chain improvement.

4. Identify new opportunities, capabilities, and / or services that are needed to transition your supply chain into a competitive advantage.

5. Based on the above four steps, document the gaps to be filled to revolutionize your future state supply chain.

6. Assure executive agreement of supply chain gaps.

The steps for focus are:

1. For each identified GAP, develop initiatives to upgrade your supply chain to fill the GAP.

2. Do a cost / benefit analysis of each initiative and a risk assessment.

3. Establish criteria for the prioritization of initiatives.

4. Establish dependencies among initiatives.

5. Create several versions of the supply chain future state by selecting and prioritizing the identified initiatives.

6. Evaluate, select, and document the design of the future state supply chain.

7. Present the future state supply chain design to an executive team to get feedback and consensus.

6.3 Future State Assessment

Addressing the digital disruptions in the roadmap and change management requires understanding and development of the following:

- Address change management by addressing readiness for change and identifying organizational deficiencies.

- Develop a step by step roadmap for each initiative.

- Develop the supply chain revolutionary plan that documents the overall transition from the current supply chain to the future supply chain by defining “Do Now,” “Do Next,” and “Do Later” sequencing of initiatives.

- Document resources and finances to pursue the future state supply chain.

- Communicate the future state plan to everyone affected; obtain stakeholders’ agreement / buy-in.

- Pursue the future state supply chain roadmap.

Follow the digital supply chain path forward. Complete a current state assessment, a future state design, and future state assessment. As stated the process to address the disruption path forward is not complicated but it is not easy to implement. Once implemented, your

business will reap huge benefits.

7 Conclusion

Lastly, a brief summary:

A. Digital disruptions are a HUGE deal.

B. Digital is rapidly changing the way we do business.

C. Businesses cannot be successful in this digital era with yesterday’s supply chain practices and technologies.

D. How are you going to respond to the Top 11 Disruptions?

    1. Artificial Intelligence (AI)
    2. Big Data
    3. Cloud Computing
    4. Customer Experience
    5. Digital Payment
    6. eCommerce
    7. End-to-End Visibility
    8. Internet of Things (IoT)
    9. Mobile (mCommerce)
    10. Social Interaction

11. Uni-channel

We live in very exciting and fun times. Supply chain professionals are more important to the success of our companies than ever before. This is the time to stage a supply chain revolution that responds to an unmatched level of digital disruptions.