

COULD TECHNOLOGY AND UBER CHANGE GLOBAL SUPPLY CHAINS, HELP SMALL BUSINESS, AND EVEN IMPROVE THE ENVIRONMENT.

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ABSTRACT

The global supply chain has been under severe pressure from politicians, changing local market expectations, logistic shortfalls and now a pandemic. The question is whether Multi-National Corporations (MNC's) will continue existing practices even as product shortages grow and delivery costs increase or will they look for alternatives to the status quo. The authors propose that new 3D manufacturing technology as well as enhanced scheduling and supply coordination applications first pioneered by companies like Uber could change manufacturing and supply chain from the traditional hub and spoke strategy to a localized spider web of small business manufacturers and mid-sized assemblers all supporting local markets in a fast and responsive manner.

Key words: Global supply chains, 3D printing, Uber, localized supply chains

INTRODUCTION

Overseas manufacturing (agricultural or industrial) has been a foreign policy for as long as there have been ships that could safely carry cargo across the ocean. Over the last 50 years, as global borders fell and near-free trade agreements between nations flourished, the multi-national corporation (MNC) emerged and a world platform for production of parts and components, rather than just finished products, became a key manufacturing strategy.

In addition to raw materials and semi-finished goods, companies began to carve-out other components of their operations that were not considered critical to their core operations and placed them with other providers. Outsourcing became the critical strategic imperative for companies heading into the 21st century [1].

Outsourcing has been defined as “the practice of having certain job functions done outside a company instead of having an in-house department or employee handle them; functions can be outsourced to either a company or an individual” [2]. However, outsourcing was not identified as a formal business strategy until 1989 [1]. Outsourcing eventually became linked as an integral part of globalization and identified as “one of the very few business tools available to managers with the power to fundamentally transform their organizations” [3].

However, over the past decade attitudes towards outsourcing and globalization has radically changed. No longer is globalization and the global supply chain looked upon as the surest way to improve economic development and income equality. In fact, the opposite attitude has been enough to radically change political policy. The following paper looks at the global supply chain of 2021 in an era of tariffs, nationalism, accelerated cycle times, and global pandemics. We will also look at how changing consumer

tastes and expectations, as well as technology, has altered performance expectations of a global supply chain and the ramifications these new expectations may have for MNC's. We will finally offer that these changing performance expectations may offer future opportunities for small businesses.

OUR FATHERS SUPPLY CHAIN - OUTSOURCING

During the 20th century supply chains evolved from trade routes designed to acquire resources for the domestic manufacturing of goods to the acquisition of semi-finished or finished goods for resale in domestic markets. Finished goods were also purchased abroad through trade for resale to domestic markets. During the end of the 20th century supply chains had become more fragmented as specific business operations throughout the value chain were outsourced to other entities. Initially these services were outsourced to other domestic providers but soon many of these services were offshored to foreign providers. There were many reasons given as to why business would outsource [4] which included:

- benefit from best practices
- focus on core competencies
- adapt to changing market conditions
- a way to rethink and actually transform the business.

Ultimately the outsourcing of certain business processes became the centerpiece of a global supply chain strategy. There was a consistent view of large-scale manufacturing that reducing costs, particularly labor costs, would be a lasting way to increased profitability. Companies viewed labor costs as the greatest obstacle to competitiveness and, through offshoring, feverishly looked for the cheapest sources of labor. For some companies the solution to controlling labor costs was to automate factories. For many though, the solution was to offshore manufacturing to countries with labor costs so low that it overwhelmed any concerns regarding distance, control, and quality. The phrase “race to the bottom” quickly became the mantra for companies as a way to lower prices, maintain consistent margins, and respond to customers, who, many in industry felt, were solely concerned with acquiring goods as cheaply as possible.

The shifting of manufacturing to other shores began slowly but grew rapidly as companies quickly adopted first mover strategies regarding off-shoring. Since 1960, 75% of all manufacturing jobs in the United States have been lost with a large portion of that loss due to outsourcing (or more accurately offshoring) or from the closing of businesses no longer able to survive against foreign competition [5].

In 2005, Thomas Friedman wrote in his book The World is Flat [6] that through globalization the world had become inseparably interconnected. From the 1990's MNC's began a St. Vitus Dance chasing the lowest costs, or the greatest market access, across the world and global trade seemed to rule. In 2014 it was estimated that the cost of logistics to support a global market and supply chain represented 10% of the cost of a finished product and 15% of global GDP [7]. The costs, as well as the inherent waste in uncoordinated management of global supply chains, caused some in science to propose a “physical internet” with standardization shipping throughout the manufacturing and distribution life cycle which would allow for more efficient movement of goods [7]. Unfortunately, the various standards used in moving goods across oceans, rail, and roadways have proven too extensive to overcome. However, the urgency for standardization may have started to wane according to a report from the OECD which stated that global trade growth had fallen from 5.5% in 2017 to 2.1% in 2019. According to Tom Linton, chief procurement and supply officer at *Flex*, a U.S. contract-manufacturing company in California, “we're heading into a post-global world” [8].

Together, a perfect storm has been created. Workers and their families seeing their lives upended by loss of jobs and livelihood to workers in foreign countries, or neighbors frightened that it would happen to them, and politicians able to craft stories to help them to personally acquire power. Rightly or wrongly, free trade was described as the cause of this worker hardship not a solution to world poverty, a disease, not a solution, and globalization soon became described as the carrier of that disease. In 2017, global supply chains were rocked by this populist political movement which created tariffs, other trade barriers, and radical changes in political and industrial policy. The most obvious change occurred from the Trump administration's desire to revise or leave trade and other international agreements that the administration didn't believe were in the country's best interest. Other countries, particularly in the EU, had also begun processes to unravel long-standing regional and international agreements disrupting the fabric of the global supply chain.

The general marketplace has also changed due to technological innovations and changing societal expectations. Companies such as Amazon, Alibaba, and Tencent have convinced markets that it is reasonable to expect an almost infinite variety of products delivered almost immediately to a customer's doorstep. In total the era of long, stable, global supply chains have been challenged as companies try to respond to political pressure, public disdain, and changing market expectations.

Other technologies most notably artificial intelligence (AI) and personal predictive data analytics, can draw upon an individual's personal experience, and provide the individual with products that are best suited to their personal tastes and desires. In the near future, digitization and 3-D technologies could produce products almost on demand with customization to match the customer's individual expectations.

THE EVOLUTION OF A NEW GLOBAL SUPPLY CHAIN

Global supply chain management has evolved over the past ten years from being complicated to complex and traditional performance expectations of cheap labor and scale economies that allow for prices to continually drop have been replaced with additional taxes and non-tariff barriers, designed to enhance domestic production. Compounding the change is a U.S. domestic marketplace that desires products to be customized to individual tastes and delivered immediately.

In 2016, in response to the changing political attitudes towards the global market, Jeff Immelt, then the CEO of GE, wrote an essay for *Time* magazine [9]. He stated that while globalization may lose favor, the world global markets will remain. That the "global elites" were the ones at greatest risk of being adversely impacted by these changes in attitudes. In response to all of this, Immelt said that GE shifted from a globalization perspective to a strategy of "localization" [9]. In many instances, localization is simply a miniaturization of global manufacturing and supply chains to regional centers. The strategy of localization provides some protection from tariff and non-tariff barriers currently favored by populist governments. It also provides some ability to reduce cycle time getting products to market's faster and to respond to regional variation as a way to cater to local market taste as well as. Yet, according to Tom Linton, a localized and miniaturized supply chain may still not be nearly fast enough to meet the market expectations of the 21st century.

THE IMPACT OF COVID-19

During the early stages of the global pandemic, it became clear that the modern global supply chain was not resilient enough to withstand the shutdown of manufacturing cities in China or the closing of ports. According to Tradeshift, a global platform for supply chain management, week-to-week trade activity

plummeted throughout the world. In China international transaction experienced a 56% week-on-week drop which began in mid-February of 2020. In the United States, the United Kingdom and Europe these also experienced transaction reductions averaging an approximate 23% drop combined through April of 2020 [10].

In addition to a reduction in trade activity there was also an increasing delay in average payment terms (37.4 days during the first quarter of 2020) and in weekly order volumes and invoicing. This created an early concern regarding cash flow. According to a PWC survey of CFO's cash flow had become a primary concern of 77% interviewed as well as a corresponding drop in confidence regarding when business would be back to normal [10]. This was the beginning stages of what is known as a "bullwhip effect", a supply chain where business and manufacturers under- and then over-responded to changing market conditions [11].

In 2020, this bullwhip effect was first experienced by companies reducing orders in anticipation of a long slow recovery from the pandemic and manufacturers cutting production capacity or even closing entire operations. These responses were practiced in almost all global sectors even though consumer behavior, especially in the United States, continued to be strong. Companies like Amazon and sectors like home health care and exercise saw a boom in consumer demand even as other sectors such as travel and hospitality virtually ceased operations.

As the pandemic completes its second year many sectors are starting to rebound, global manufacturers are starting to ramp up production. However, distribution channels continue to lag. Elements that were considered in the past a minimal issue in the cost/benefit decisions to outsource, namely shipping and distribution, have become the latest, and perhaps the most damaging, obstacle in having the global supply chain recover and return to normal.

For example, the shipping container, considered the catalyst to the development of the global supply chain as we know it, has gone from an after-thought to a primary chokepoint in getting product from Chinese factories to retail shelving the U.S. and Europe. The average cost of shipping a standard container has increased 400% from 2019 to summer of 2021. The spot price has seen even more drastic increases, in some instances being ten times what the cost would have been 2 years ago. Some companies have become so concerned about shipping from Chinese manufactures to the United States that they have resorted to drastic and expensive alternatives [12].

Peloton has begun shipping the more expensive exercise bikes by air freight while Home Depot and Walmart have begun chartering entire ships. Shipping carriers have run out of standard container ships and have resorted to pressing into service ships that are not designed to ship containers. In other cases, large retailers have begun to ship product from China to Europe by train and truck rather than risk not having their product ship at all by vessel. All these delays add up to an average door-to-door time for freight rising from 41 days to 70 days over the past year ending in September 2021.

It is not just trying to get product shipped from the foreign manufacturer to domestic ports that is the problem but also getting the product off-loaded and onto trucks or trains for delivery to distributors and ultimately store shelves. According to a report by Grace Kay of Business Insider [13] there were almost 500,000 shipping containers waiting in almost 150 ships in port and offshore in Southern California alone as of October 6th, 2021. Compounding the backlog was a shortage of truck drivers globally which not only slowed delivery times but also added another factor in increasing the overall logistic costs as shipping companies competed for a limited supply of drivers.

A perfect storm has created both excessive delays and extra costs related to the global supply chain. While it is possible that the extreme effects of a pandemic, a bullwhip effect in ordering and manufacturing, a backlog in ports and a shortage of truck drivers may all be temporary, it is also possible that these factors and others will plague the global supply chain for the next several years. During that time businesses will have to decide if it is prudent to continue their global supply chain strategy or is it time to rethink and innovate new ways to respond to local market demands.

WHAT THE FUTURE MAY BRING ...

How can the global market respond to customers who want a vast array of products that they can buy on-line, be customized to their personal tastes, be delivered almost on demand and produced by local manufacturers? Solutions like “localization” or drone deliveries attempt to address issues without considering any fundamental changes in the manufacturing and supply chain processes. Yet customers themselves may ultimately chart the course for the future of the global marketplace. Concerns over the environment and social justice as well as desires to have products made to specific individual desires delivered at almost lightning speed may create fundamental customer and market changes that challenge globalization and global supply chain strategies.

3-D printing may be the ultimate solution to the political, environmental, and social concerns associated with globalization and the global supply chain. In 1981 Dr. Hideo Kodama first patented a “rapid prototyping device” using a laser beam resin curing system. However, it was not until 1988, with the first commercial printer (the SLA1), that 3-D printing stopped being a technological oddity and started becoming a manufacturing tool.

It has taken the past 30 years for the technology to be considered an integral part of any forward-thinking manufacturing strategy. Today, 3D printers are being used either commercially or in prototype to produce everything from heavy equipment (Volvo), to clothing (Danit Peleg), to food (Food Ink, UK), housing (ICON) and even to rocket engines (Orbex). Materials that can be used in 3D printers are just as varied and robust ranging from metals and resins, to glass, bio ink and bone material. With costs of 3D printers ranging from several hundred to several thousand dollars there is limited barriers to entry for any small business to become a 3D printing manufacturer. The most pronounced limitations seem to be perceived concerns regarding quality, security, producing at scale, and the general attitude that 3D printing is still a novelty. Today, 3D printing is an emerging technology just as the moving assembly line and robotics once were. However, given the current stress being placed on the global supply chain from multiple pressure points the strategic potential of a manufacturing process centered around a distributed 3-D production base may become not only plausible but even preferred. The question is to how best to implement and coordinate a local manufacturing strategy with hundreds, perhaps even thousands, small manufacturers.

... AND CAN UBER LEAD THE WAY?

Technology, especially digitization and 3-D printing, may ultimately redesign the global supply chain from an integrated, large-scale organizations controlled by the “global elites” to a more democratized system of production with regional and local manufacturers producing for local markets. The traditional manufacturing response to current resistance to “globalization” is “localization” which would allow for regional production that would still create traditional scale efficiencies in manufacturing and supply chain management. Yet in the emerging world, businesses do not have the resources to create even a small-scale manufacturing operation and supply chain. These companies developed using a different scaling strategy

“miniaturize but infinitely expandable” [14]. A strategy that Uber used to become a global business valued at 70 billion dollars.

Uber was a taxi alternative that owned no taxis, no taxi garages, and hired no drivers. Instead, they created a critical mass of virtual resources to provide the service of moving people from point “A” to point “B” at a price cheaper than the incumbent industry [15]. Uber’s motivation was to provide a value proposition for cheaper transportation. It created scale by designing a virtual transportation company where scale was provided at the individual driver level. Control, coordination, marketing, and branding were provided by Uber, all other functions are provided by a critical mass of independent contractors. It is the co-ordination of these thousands of independent contractors to provide timely and affordable service to a metropolitan area that is the critical added value provided by Uber. A capacity to coordinate activity anywhere in the world and a capacity that can be applied beyond just transportation. Applying this capacity to coordinate manufacturing schedules and product deliveries to hundreds or even thousands of local small manufacturers may allow scale to be achieved without creating a massive manufacturing footprint and the associated waste and environmental and social degradation that historically had been considered the price to achieve scale.

It is not impossible to image a time when manufacturers, faced with political, economic, public health, and social expectations, may also become virtual, contracting with thousands of small, local 3-D printing businesses to produce at scale finished and semi-finished products for local final assembly facilities and retail. Using patented, copywritten, and controlled digital blueprints and basic materials specifications provided by the manufacturer these small producers could become the equivalent of franchised contract producers or independent manufacturers depending upon concerns that the brand name manufacture may have regarding intellectual property, brand protection, and quality. There seem to be many advantages of a fully distributed local production operation. These include:

1. A reduction in capital equipment investment and material inventory.
2. A response to nationalist concerns regarding jobs migrating away from home markets.
3. Shorter and flatter supply chains reducing cycle time and environmental degradation.
4. Raw materials crossing foreign borders at almost commodity pricing for most processes.
5. Customers being able to modify products to meet personal specifications.
6. Shorter cycle-time from production to the last mile to the customer.
7. A return of local, small business craftsmen.

CONCLUSION

There are many questions manufacturers and MNC’s are facing today. Will there be a time, when product variation will be infinite and delivery almost instantaneous? Will there be a time, when global businesses will again be welcomed into countries as a way to provide economic development and choice to local markets? Will there be a time when additive manufacturing and cradle-to-cradle design will be commonplace and will reduce environmental degradation finally making economic development and environmental stewardship two aligned processes? Will there be a time when Uber will be looked upon as the rubric for producing to the global market? One thing is certain, perhaps at no time in the history of industry, manufacturers are looked at as much more of the problem than the solution. The old mantra of “scale rules” is quickly being replaced by “smart rules” and while large scale manufacturing will never be replaced as a primary solution from some industries, for many industries, perhaps most, technology and small business may be the solution to what had been thought of as unsolvable, global market and supply chain issues.

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