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Impacts of Digital Transformation on Supply Chain Management

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As various industries around the world seeked to identify more sophistication and advancement of technologies to aid in the development of their business and company's success to their customers, clients, etc., there was much focus on growing and strengthening the infrastructure of one of the most critical and pivotal aspects of any business. This crucial piece of a constant changing and moving web is called Supply Chain. Supply chains are the inhaling and exhaling of any business structure.

The successes or failures of a highly functional and optimal supply chain, are the determining force behind a business ability to maintain high customer volumes, strong business-to-business relationships, and capabilities of their businesses' longevity and long life-span within the market that their industry is immersed in.

Research and development of new tools, equipment automation, and methodologies to assist in the implementation of new efficiencies and effective strategies for Supply Chain management are imperative and vital for a company to stay competitive within the market and to be able to achieve a constant flow of resources and transportation options.

This leads to the determination that more emphasis and research should be invested into the digitalization and streamlining of supply chain management. Market researchers have already concluded that there is already a very aggressive thrust into the digital market for supply chains, and predict that eventually, most traditional supply chain management practices will no longer be able to withstand and keep up with the fast paced demand without any upgrading and digitizing of the supply chain infrastructure (Agrawal & Narain, 2018). Companies have realized the importance of information sharing, and how much benefit there is to implementing this new technology within their corporations to assist with business development and sophistication of the infrastructures agility and digital networking across multiple supply chain platforms to gain more market comprehension, versatility and advantage of price reduction strategies. Big brand companies like Dell and Walmart utilize a new tool called 'web technologies' to further the emersion and engagement between themselves and their supplier base, enabling for a richer more

interactive collaboration method that enables cohesion as well as other benefits like cost reductions and the ability to streamline their supply chain management processes (Ranganathan, Teo & Dhaliwal, 2011). A web-enabled supply chain management system would be a great way for a company to mitigate and streamline supplier bases, advantages of outreaching of international suppliers, as well as inventory management procedures, creating better performance outputs by both the company as well as the suppliers.

In today's modern and fast-paced approach to business, the need for more improvements to keep up with the constantly evolving Supply Chain demand structure is becoming more challenging to achieve. According to supply chain studies done within the School of Management, Cranfield University, Cranfield, UK, "Driven by new digital technologies, the supply chain of the future will increasingly be self-aware, think by itself and require minimum, if any, human intervention to manage risks" (Calatayud, Mangan & Christopher, 2019). Currently, one of the most difficult challenges and long-standing obstacles for Supply Chains to overcome is forecasting and prediction of demand and seasonal or exponential fluctuations.

This is where digitalization of an age-long persisting problem could prove more useful than the typical demand sales forecasting methods that are in place currently within most industries. To drive more technological changes, digitized forecasting measures could be better calculated by means of optimization models, overseen and manipulated by software programs, such as ERP (Enterprise Resource Planning) systems, eliminating errors of misconception or inaccurate data processing.

Transformation of this portion of the business model could benefit Supply Chain groups to achieve optimal ordering capabilities; ordering what is needed and eliminating excessive inventories and warehouse capacity constraints. This would prove to be useful in company efforts to protect capital and maintain lower held inventory associated costs and dollars.

With more reductions in process errors, Supply Chain management has the opportunity to enjoy more ease of operational flow and less complexities will be encountered when new strategies are incorporated and market changes and customer behaviors are swift, unexpected and draped in uncertainty (Dudukalov, Terenina, Perova & Ushakov, 2021). With the increase of digital transformation in forecasting and prediction capabilities, anticipated order projections will be more accurate and adaptable to be solid enough to react to quickly changing demands in customer demand and be proactive in supplier communications and inventory management.

New developing customer trends and trajectories will be visible and captured more accurately, ultimately, to be utilized as an effective tool for executing new purchasing strategies and costs/risk mitigation maneuvers.

To add to the digital optimization of business processes, specifically when it relates to the ERP system, remote accessibility has become very fluid and highly demanded for information sharing capabilities. To be in front of any Supply Chain issue or constraint, response times are extremely important and could be what contributes to avoiding a catastrophic disruption to a company's operations.

With remote access enhanced and the ability for supply chain teams to be 'live' within the ERP system, will greatly influence the productivity and proactive resilient approach to risk mitigation and effective prioritization of the supply chain performance. Remote accessibility will

allow for more collaborative approaches with suppliers and other organizations to diversity and broaden the supply chain framework.

A growing concern of many companies in this era is corporate social responsibility. The sustainability and environmental global impact should be a high priority for all companies and businesses in this modern world, however, attempting to execute and monitor any program or initiative is very difficult without the proper tools in place to capture and record any real progress or current projection.

As the growth of digitalization progresses further, there are new supply chain strategies that becoming more advanced with the help of technology, to help minimize the accumulation of waste and increasing resource use efficiencies all while maintaining operational goals and objectives to achieve the highest level of customer satisfaction (Fu, Abdul Rahman, Jiang, Abbas & Comite, 2022).

With the additions of digitalization within supply chain infrastructure, there is more predictability, capturing, and tracking of the progression of emissions, scrapping and other harmful functions that are associated with processing, manufacturing, and distribution operations that are considered normal, yet do not have the appropriate surveillance programs and systems implemented to cause any real affect or improvement, both to the internal and external environment.

With the incorporation of supply chain digitization, comes more advanced and enhanced analytical capabilities that will fuel the supply chain infrastructure and exterior with higher probability of accuracy for planning procedures of operations and integrated S&OP practices. The integration of more advanced digitalization and applied technological innovations will help gain traction to redesign their supply chain model if they need to revise their current structure to better perform and exceed customer expectation and anticipation.

A large benefit to incorporating more digitized transformations to supply chains is the extreme impact it will have on closed-loop supply chain initiatives. Advanced technologies can equip supply chains with a more productive and efficient process for integrated close-loop and reverse logistics structures to be utilized for increased sustainability and repurposing functions of resource efficiencies.

More technical software sophistication enabled in this endeavor would increase the feasibility of the process and create a interface that would provide a flexible process of continuity that is automated and intuited enough to setup inventory sufficiencies, such as safety stock levels, both on-site and third party, while being fully self-managed and possessing the ability of re-ordering, kanban forecast fulfilling, depletion and replenishing of raw materials or purchased components. This ability would eliminate the need for human interference and potential for errors or oversight in the ordering process.

As companies are working diligently to evolve and develop the efficiencies of their supply chains to better improve performances by use of digital advancement, there grows also with this development of sever cyber risks and lack of defense measures to properly prevent any critical compromising of both sensitive company data as well as supplier and customer intelligence and information leaking.

As a much higher risk target, Supply chains are most notably attacked due to the presence of weak and vulnerable links in their integrated system, this enables third-party hackers easy access to compromise security and steal critical and sensitive data from a company (Creazza, et al., 2022). Alongside the digital implementation improvements, there is potential for external infiltration of data theft that can happen if there is vulnerability within the supply chain information security walls.

Even within reputable, high-level manufacturing companies, such as Hyundai Motors and LG Electronics, there still remains a risk to integrity and intellectual property being usurped from supply chain portals and across other information systems sharing platforms, due to the security measures and policies in place not being properly implemented, performed, effectively enforced (Kim & Im, 2014). To protect itself and its customer privacy and sensitive intellectual properties, preventative measures are available for supply chains that are seeking to incorporate additional security measures such as applying layers of authenticity within blockchain systems to effectively eliminate the possibility of a security breach and any other potential digital threats that may be present.

With all of the many operational and functional advantages that the integration of digitizing supply chain management systems holds, there is always the bottom line to consider when making decisions to incorporate a new interface or implementation of new infrastructure practices and/or models. For understanding the financial impact that digitizing supply chain processes and procedures will have on companies' books, it can be reflected within a breakdown of costs saved and also avoided when the implementation is measured and compared with the contrasting 'traditional' supply chain methods.

The integration of supply chain digitization is proven to grow business cash flow. On average, a data entry specialist, as well as sales forecasting analysis who monitor and capture the market changes and update company demand forecasts as necessary, have an annual salary of around $55,00 - $66,000, average hourly costs of $24.00/hr plus the costs of benefits (average 10.00/hr) totaling costs at $32.00/hr. per salaried employee.

Typically, manufacturing firms will employ at least two of each position, i.e, two data entry specialists and two sales/market analysts, who will work Monday through Friday at 8 hours per shift/day. With the integration of an automated, self-sufficient supply chain management system, these positions will no longer be required to fulfill, saving the company roughly $264,000 annually with the removal of these positions. Additionally, the value gained and costs avoided would be the results of mitigating and eliminating the costs associated with human errors, i.e, excessive inventory costs, material rejections, and miscommunications.

Supply chain management has argued that traditional methodologies practiced within corporations are creating bottlenecks, disruptions, and lack of reliability in the supply chain umbrella that extends over many different elements and facets. A case study conducted by Nada Sanders Ph.D. Northeastern University, and Morgan Swink Ph.D. of Texas Christian University, interviewed different supply chain managers to gauge their thoughts and perspectives on the integration of supply chain digitization and if they felt improvements and efficiencies were apparent upon implementation.

Many supply chain leaders felt that the traditional method of supply chain process entailed too much data that was never useful and did not contain information necessary to make supply chain decisions, but was more confusing and excessive (Sanders & Swink, 2022). Digital transformation within supply chains provides the accurate and detailed visibility that is needed to be exposed for management to make informed decisions that hold the potential of altering the direction of the business as well as operational paths.

The case study resulted in a determination that while many supply chain leaders do not have a clear understanding or directional visibility to proceed or manage the new digitization techniques or automation processes, but agree that it is imperative that the changes occur (Sanders & Swink, 2022). It is determined that the integration of digital supply chain management is crucial and inevitable for all businesses and companies to initiate implementation to gain ground with competitors and achieve long-term success for their future outlook and relevance within their industry's market.

The long-term future outlook of full synchronous integration of digitizing supply chain management systems is a priming one. Most companies have already dedicated millions of dollars into the investment of research and development to identify key element improvements to their technologies to aid in advancing and providing agility, adaptability and reliability.

With the occurrence and consistent presence of COVID-19 virus, global supply chains have been possibly permanently altered and disrupted, causing global shortages, excessively long lead-times, and increase in product value. In lieu of this new supply chain environment, businesses must rely on new technologies and innovations to survive the new ‘normal’ for supply chains and its movements and progression. Digitalization transformation of supply chains will enable an increased speed of value to their customers by providing built-in analytical capabilities that can be ahead of the traditional forecasting curve ("Why Legacy Tech Is the Biggest Hurdle to Digital Supply Chain Transformation - SPONSOR CONTENT FROM GEP", 2022). The increase in speedy analytical-driven data of market research, customer input, etc. will help companies to avoid any major operational disruptions that could jeopardize the industry reputation, reliability and profitability of the company.

The success rate of digital integration of supply chain management is highly dependent on supply chain management and leaders investing appropriately in both the coordination and collaboration of their team to effectively implement the transformation phase smoothly.

The future of supply chain management and its integration of digitalization is hopeful and creates inspirational and motivational broadcasting to business leaders who are seeking a solution to slow and inaccurate methods and procedures that are riddled with errors, deficits and economic risks that would become detrimental to the survival and financial health of the company.

References

Creazza, A., Colicchia, C., Spiezia, S., & Dallari, F. (2022). Who cares? Supply chain managers’ perceptions regarding cyber supply chain risk management in the digital transformation era. Supply Chain Management, 27(1), 30-53.

"This scholarly article provides an explanation of potential cyber risks that are prevalent within supply chain systems and how they can be mitigated and avoided with the implementation of digital transformation of the supply chain infrastructure".

Dudukalov, E., Terenina, I., Perova, M., & Ushakov, D. (2021). Industry 4.0 readiness: The impact of digital transformation on supply chain performance. E3S Web of Conferences, 244, 8020.

"A scholarly article that defines the impacts of digital transformation on supply chain performances in contrast with traditional, human based supply chain procedures. The article relays how new technologies and programs can impact the supply chain functions as a whole entity, and what benefits and gains are associated with its implementation".

Calatayud, A., Mangan, J., & Christopher, M. (2019). The self-thinking supply chain. Supply Chain Management: An International Journal, 24(1), 22-38. doi: 10.1108/scm-03-2018-0136.

" This scholarly article summarizes the new era of supply chain management as being fully automated and self-sufficient, commenting on how the human element of supply chains may become out-dated and no longer relevant as time progresses and more innovations are implemented within the supply chain infrastructures".

Agrawal, P., & Narain, R. (2018). Digital supply chain management: An Overview. *IOP Conference Series: Materials Science And Engineering*, *455*, 012074. doi: 10.1088/1757-899x/455/1/012074.

"A scholarly article which focuses on the topic of supply chain management possessing key opportunities to enable the integration of digitalization of the supply chain systems to become better equipped to manage the supply chain challenges and changes that are predicted to occur over time".

Kim, K., & Im, I. (2014). Research letter: Issues of cyber supply chain security in Korea. *Technovation*, *34*(7), 387-388. doi: 10.1016/j.technovation.2014.01.003

"A scholarly article that captured and detailed cyber security breaches within supply chains of high-level, big name brands in Korea due to intellectual data information sharing security policies not being enforced effectively and its results"

Ranganathan, C., Teo, T., & Dhaliwal, J. (2011). Web-enabled supply chain management: Key antecedents and performance impacts. International Journal of Information Management, 31(6), 533-545.

"A scholarly journal article on the topic of web-enabled supply chain management systems and how large retail companies are slowly integrating this method into their supply chain infrastructure to increase supplier engagement and reduce costs, errors, stagnant inventory progression, etc."

Qinghua Fu, Abdul Aziz Abdul Rahman, Hui Jiang, Jawad Abbas, & Ubaldo Comite. (2022). Sustainable Supply Chain and Business Performance: The Impact of Strategy, Network Design, Information Systems, and Organizational Structure. Sustainability (Basel, Switzerland), 14(3), 1080.

"This scholarly article provides an in-depth qualitative analysis of the sustainability practices that are incorporated and achieved with the implementation of digital transformation of supply chain systems, and what are the benefits of company incorporation by eliminating waste, scrap, etc.".

Sanders, N., & Swink, M. (2022). How to Build a Digital Supply Chain | ASCM. Retrieved 7 August 2022, from https://www.ascm.org/build-digital-supply-chain/

"A business case study that aimed to capture the perspective of supply chain management and leaders on how they viewed the integration of digital technologies and innovations being implemented within supply chain structures and what initiates are best used to fully implement and initiate the success of newer methodologies to support the supply chain functions of a business".

What Is Supply Chain Digitization & Why Is It Important?. (2022). Retrieved 7 August 2022, from https://www.shipbob.com/blog/supply-chain-digitization/

"This article provided insight into supply chain digitization effectiveness of corporations and the importance of its integration within supplier chains to better aid and support operational excellence within companies. This article helps to better understand exactly what digital improvements are present within the transformation of supply chains and its overall benefits"

Why Legacy Tech Is the Biggest Hurdle to Digital Supply Chain Transformation - SPONSOR CONTENT FROM GEP. (2022). Retrieved 7 August 2022, from https://hbr.org/sponsored/2022/05/why-legacy-tech-is-the-biggest-hurdle-to-digital-supply-chain-transformation

"This is a scholarly article taken from the Harvard Business Review Journal. This article explained what are some of the present challenges and obstacles that are faced when trying to implement digital transformations of supply chains. This article provides solutions to the current traditional problems faced in supply chains once the COVID-19 virus appeared, and how the new efficiencies of digitalization will help companies mitigate the remnants and aftermath of the global impact.

The True Cost of Employee Benefits Packages. (2022). Retrieved 7 August 2022, from https://www.zenefits.com/workest/the-true-cost-of-employee-benefits-packages/

"This web journal articles help provide a breakdown of salaries and benefits that aided me to better understand the hourly/annual pay rate of both wages and also benefits so I may calculate costs savings and avoidance with the integration and adaptation of digital supply chain practices".