

Facing Disruptive Challenges in Supply Chain 4.0

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Modern technology has set the business competition to a much higher level. With the increasing population all around the world, the proper supply chain management to ensure products availability is inevitably required. Modern Manufacturing industry must put in extra efforts in all fields, especially in the supply chain management system to make the products ready on time, at the right place, for designated customers. This will certainly be not easy because the world is changing continuously. This paper aims to analyze the recent and most updated insights from the leaders in Supply Chain Network and gives new perspectives for the decision makers. Using qualitative research, this paper discusses the disruptive challenges faced by modern manufacturing industry and the preparations need to be done by all parties included in Supply Chain 4.0. The findings show that customer loyalty and customer satisfaction is no longer relevant for a successful supply chain management. Customer Experience will be the first brand differentiator in the future and must be given serious attention if we want to maintain firm performance supported by all other factors. The future research should be extended to quantitative approach by creating a proper research framework.

Keywords: *supply chain management; technology; disruption; industry 4.0; customer experience*

1. Introduction

The practice of supply chain management (SCM) has a strong impact on company's overall performance [1]. Previous studies on SCM have examined the importance of building and managing SCM between buyers and suppliers [2]. Strategies are needed in SCM to improve the social and sustainable performance significantly [3]. To understand more about the supply chain management, this paper will divide the supply chain into four phases:

Phase 1 - Disconnected Supply Chain

Integration with Shipper and Carrier is through EDI. Positive aspects with the use of EDI by the small and medium-sized suppliers to operational and transactional benefits [4]. Connectivity is provided through portals. Data is entered manually into multiple disconnected systems. Updating of shipment and order information is done manually using multiple disconnected source of information. Visibility and track and trace is manual via email and phone. Supply Chain in Asia Pacific is one of the world's major production, manufacturing and distribution hubs. South Pacific Island has turned into a smart shipping paradise [5].

Phase 2 - Supply Chain today:

Comprised of multiple segments – sourcing, production, transport and logistics, warehousing and distribution are now more spread out due to a changing global production

landscape, benefiting from cheaper labor, regulatory incentives and proximity to consumer markets. Maersk strengthened its capabilities as integrated logistics company by offering end-to-end supply chain management to its customers [6], in order to simplify the process.

Phase 3 - Complex Supply Chain

Many supply chain software applications have claimed that they can orchestrate supply chain, but the claim was not proven. The today's supply chains are complex and hard to optimize, digitize and synchronize. This is where the problem of this paper starts [7]. Supply Chains are becoming increasingly complex due to the following reasons: First, customer expectation – consumers want goods more quickly, choices of when and how goods are delivered to them with greater visibility. Second, globalization – bigger supply chains mean more potential complexity. Companies must manage more cultures, markets, legal and regulatory issues. Third, changing supply chain trends – omnichannel deliveries, custom processes, specialized suppliers, intra – division decisions – all these make for greater complexity. The new digital concept comprises of connected people, empowered consumers and agile Companies. People are highly connected, 24/7 mode, platforms and apps widely used for information and exchange. age of the customer, empowered consumers demanding utmost customer intimacy and instant satisfaction. Two keys to success are identified, Agility and Pioneering Spirit. The most innovative companies in 2020 are agile, digital pioneers. According to Fast Company, the three most innovative companies in 2020 are Snap, Microsoft and Tesla [8]. The three causes of supply chain complexity was also examined by [9] as follow: customer accommodation, globalization, supply chain trends and internal pressures. The complexity of integrating and orchestrating all parts of interconnecting supply chain management and still keep innovation ahead is surely a huge problem to be solved.

Phase 4 - Ready for a fast-changing world

The phase 3 has articulated the complexities of supply chain management that are viewed by the decision makers as the challenges to be addressed in Supply Chain 4.0. The following table 1 shows the changes of SCM in Supply Chain 4.0

Table 1. Changing in Supply Chain 4.0

Changing Industries	Changing Logistics Landscape	Changing Technologies
European industries adopt digital business models and improving their digital processes [8].	Demand for more flexible supply chain solutions is increasing. 3 in 5 companies plan to invest significantly in demand forecasting and want to decrease safety stock levels	Majority of logistics companies expect AI to have a strong impact on their business. AI will help to increase efficiency and open up new business opportunities [10], [11].
More than 90% of companies say importance of data and integration with suppliers will increase. Significance of data gathering, analysis and utilization for decision making [12].	Efficiency needs to increase. Leaders in digital supply chain management have 40% to 110% higher operating margins than their competitors [13]. Efficiency is made by reducing costs, more responsive production to consumer demand and boosting employment [14].	The reorganization of supply chains using advanced technologies, such as the Internet of Things (IoT), big data analytics, and autonomous robotics, is transforming the SCM model from a linear one to an omnidirectional manner [14]. Sensors will be connected to the internet. Data generated from sensors will be key for analysis and predictions [15].

2. Literature Review

2.1 Supply Chain 4.0

The company's performance is highly impacted by the practice of SCM [1]. SCM has a vital role in increasing the effectiveness in an organization, enhancing competitiveness, profitability and giving service to the customers under uncertainties and disruptions [16]. Thus, a proper supply chain strategy is needed for business development [17]. A positive impact on market orientation is seen through SC practices [18]. Previous studies state that supply chain integration determine performance effects [19] and to maintain sustainability and competitiveness, it is very vital to consider a systematic and integrated approach [20]–[22] to analyze supply chain properly [21], to examine trends, i.e.: visibility and innovation, leadership roles, collaboration and supply networks [23], supplier selection [24] by conception of trajectories data warehouse [25]. Mobility change is important for the entire supply chain network [26]. To adapt to changes, there are some ways suggested, such as cannibalization of new product by remanufactured products [27], fuzzy analytical framework to evaluate supply chain uncertainty [28], [24], [29], reduce inventory levels and lead times [30]

The Supply Chains of the future will be fully digitalized, enabled by technology and standardized processes. From the first industrial revolution in 1750 with mechanical production to the second industrial revolution in 1850 with mass production, labor division and electricity. The third industrial revolution in 1950 enhances the use of electronics, IT and

automated production. And now the Industry 4.0 brings the Supply Chain 4.0 and Digitalization which is still in the future. The industry that we are having right now is still between the Industry 3.0 and Industry 4.0.

Table 2. Ranks of ASEAN Countries in Logistic Performance Index [31]

Country	2014	2016	2018
Singapore	5	5	7
Malaysia	25	32	41
Thailand	35	45	32
Indonesia	57	63	46
Vietnam	48	64	30
Phillipines	53	71	60
Cambodia	83	73	96

From table 2, we can see that among the lower middle-income group countries, large economics such as Indonesia and emerging companies such as Vietnam stand out as top performance.

2.2 The Digitalized Supply Chain

2.2.1 Big Data Analysis

Logistics is being transferred through the power of data-driven insights. Thanks to the vast degree of digitalization, unprecedented amounts of data can be captured from various sources along the supply chain. Capitalizing on the value, big data offers massive potential to optimize capacity utilization, improve customer experience, reduce risk and create new business models in logistics.

Power BI

A business analytics service that aims to provide interactive visualizations and business intelligence capabilities.

Key Benefits

Enable collaboration and reduces the barriers to deploy a business intelligence environment for sharing dashboard and accessing information to corporate decision makers as well as operational team.

2.2.2 Artificial Intelligence

Artificial Intelligence (AI) is rapidly transforming the way logistics providers operate as a result of the ongoing trend towards automation and continued improvements in computing. AI will augment human expertise through systems that help generate novel insights from big data and eliminate difficult tasks in logistics. AI will enable back – office automation, predictive operations, intelligent logistics assets and new customer experience models [29].

Collaborative Robot

Adaptable, collaborative, and works safely alongside warehouse employees to support them on tasks such as piece picking e.g. in packing operations.

Key benefits

Resource efficient - Sawyer robot can reduce 1-2 co packing resources. Cost savings of up to 25% in direct costs from packing operations. Flexibility to use Sawyer across different processes. Increased productivity cover 24h period: A 12-hour shift with Sawyer equals to 18-hour human employee shift. However, the robot works 24/7 [32].

2.2.3 Internet of Things (IoT)

The Internet of Things (IoT) has the potential to connect virtually anything to the internet and accelerate data driven logistics. Everyday objects can now send, receive, process and store information, and thus actively participate in self steering, event – driven logistics processes. IoT promises far – reaching payoffs for logistic providers, they can use the data from the connected objects to generate actionable insights that drive change and new solutions.

Mobile Picking

Combining smart watches with ring scanners enable the replacement of RF scanners at sites.

Key benefits

Increased efficiency up to 19% and hands-free operations. Smaller and lighter than traditional RF scanners, improved safety for operators. Energy efficient

Table 3. Ecosystem Maturity Model in Supply Chain

Past & Present	Future
Execution	Component Level Execution
Transparency	Visibility & Tracking
Exception Management	Control
Planning	Tactical Planning
Integration	Collaborative Supply Chain
Collaboration	SCM Eco System

3. Research Methodology

This research uses a qualitative approach from study cases in several companies that are related to supply chain management system. The qualitative data are taken from big companies with reputable tracks in the supply chain business.

Table 4. List of Qualitative Sources

Resp	Job Position	Name of Companies
A	Director – Business Development	DHL Supply Chain
B	Vice President	AurionPro
C	Regional Sales Director	BluJay Solutions
D	CEO & Founder	Logisly
E	Chairman	APTRINDO
F	Head of Business Development	Mospaze
G	Chairman	APTRINDO
H	VP Expansion and Head of Growth	Ritase
I	Country Head Singapore & Indonesia	Anchanto
J	Chief of Compliance & Network	Lion Parcel

K	Director	General of Customs and Excise (DJBC)
L	Director	Digico Platform
M	Head	INSW

From all the sources above, due to space limitations, this research will only use 5 most representable data to obtain conclusions. The data was collected in one year, from October 2018 to October 2019 with study case approaches.

4. Findings and Results

Below are the five study cases on big companies involving the future supply chain management preparation to overcome the disruptive challenges in the world of supply chain 4.0:

STUDY CASE 1 - DHL

Digital Supply Chain in the Future

Data and Technology is the future for Supply Chain productivity improvements and customer excellence with the Rise of IoT. The past 25 years of Internet growth was fueled by human communications. The use of modern technologies to increase qualities and improvements of SCM are also applied in production lines [33] and SCM decisions would not be possible without digitalization [34]. The next 25 years of Internet growth will be fueled by machines. By 2020, with more things than people on the internet, will we still need web browsers? Because everything will be connected. Billions of wirelessly interconnected devices will communicate directly. Smart Digital World is developing a Smart Home Network just for the Internet of Things. For Smart Homes, the growth of Smart Meters are raising globally. In transportation, growth of connectivity platforms in our cars and predicted by 2020, 90% of cars are connected. Connected vehicles will be the norm for syncing productivity, entertainment, traffic management, direction to open parking spots, electric vehicle charging.

STUDY CASE 2 - BluJay

Enabling Digital Supply Chain Solutions must come from all parties, the shippers by aligning innovation investments with Customer Experience (CX), modernizing IT Systems and break down Silos, connecting electronically with trading partners and prioritizing data quality through better data management. From the research by BluJay [35] we can conclude that the majority of companies agree or strongly Agree that customer experience will overtake price and product as the No. 1 brand differentiator over the next five years. To deliver an enhanced customer experience is also the top factor driving supply chain innovation at many companies today and as studied by the researchers [36]–[38], particularly Innovator/Early Adopter and Above Average Performance companies. Real-time visibility is the most important supply chain capability in delivering an enhanced CX, which is why it is a top investment focus for companies, along with business intelligence and analytics. Siloed systems and/or processes is the top barrier to supply chain innovation, followed by Existing IT systems are outdated. Compared to last year's

survey results, it appears that companies are making some progress in modernizing their IT systems. Breaking down the silos between their systems and processes is a growing challenge. When it comes to trading partner connectivity, Innovator/Early Adopters and Above Average Performance companies are leading the way in terms of establishing electronic connections with trading partners and data quality — but there is still a lot of room for growth and improvement.

STUDY CASE 3 – MoSpaze Warehousing

The data by MoSpaze Warehousing [39] shows 15% - 20% of warehouse space is under-utilized during a year with many market challenges, i.e: Peak Requirements – the ability to flexibly increase or decrease capacity for seasonal peaks, growth – Quickly access warehouses to test new markets and products without long term commitments, distributed networks – build networks of regional distribution centers without significant capital investment, and contingency Planning – instantly redesign or rebuild temporary networks.

The rise of warehouse marketplaces provide shippers with new options when it comes to temporary storage needs, marketplace strategy trial and take advantage of marketplace offerings. On the demand side, they need to assess customer needs, while on the supply side, they can share their asset bases, leverage a network to provide a platform, and increase customer experience. Before getting to the level of customer experience, customer loyalty, customer satisfaction and retention have positively influenced the business performance to achieve competitive gain [47].

SCM synchronizes all parties involved such as the suppliers, manufacturers, retailers, customers and dealers to achieve customer's needs [47] but lack of attention to the needs for warehousing system that can burden the budget and creates problems for the company.

STUDY CASE 4 – Digico Platform

Digico is a platform that provides solution to Logistics Players with addition of government bodies. There are parties that gained benefits with GudDo, FF, Cargo Owner and Shipping Line [40]. Digico is a digital ecosystem which end-to-end solutions that connect business people in the logistics world. There are several problems addressed by Digico Platform. First, global trade is highly inefficient and burdened by paper-based processes. Second, silos system and Data. Information is held in paper and various digital formats across dozens of service providers along supply chain pipeline, manual, time-consuming, paper – based processes. Third, the collection and processing of up-to-date data, as well inefficient trade document exchange. Fourth, subjectivity to fraud, risk assessments by multiple dozens service providers lack of any transparency. Fifth, high costs due to the inability to forecast and plan effectively. The wrong choice of sharing trusted information across the supply chain leads to excessive inventory, administrative costs, operational challenges and others. To solve all these problems, Digico urged on the needs to digitalize the supply chain by connecting the ecosystem, driving true information sharing, faster Collaboration, and spurring innovation. The collaboration and capability of

supply chain have significant impact on competitive advantage [41].

STUDY CASE 5 – INSW (Indonesia National Single Window)

With the growth of New Technology Approach in e-commerce, Supply Chain Modelling is migrating from B2B Approach which rely on physical store, warehouse, office become Online Marketplace C2C Modelling using Virtual Store, Virtual Warehouse/Logistic, Virtual Office

Government needs to digitally transform. Government services work as a part of mandate, regulation, facilitation and as a part of Collaboration [42]. Government takes a role in digitalization by supporting fast-moving transaction in the marketplace and providing 'digital enabler facilities', such as INSW (Indonesia National Single Window) for digital customs and permit/licenses clearance consolidation process, InaportNet for electronic port clearance/licenses process. OSS (Online Single Submission) for digital business licenses issuance process, other government Digital Procedure Processing System and utilizing BlockChain for Collaboration between C2B2G (Customers to Business to Government). INSW posited that to build digital platform for supply chain ecosystem, we need to enable Integrated Logistics and multimodal operations, put productivity at the center of Supply Chain, increase end – to – end visibility to Inventory, orders and shipments across the supply chain, centralize command and control, and ease of monitoring performance metrics. This global approach represents SCM an integration of all supply chain members related to upstream and downstream activities. The integration and collaboration of different stakeholders can create better value, better performance and competitive advantage [1].

The five case studies written above and insights from other qualitative sources show several similarities that are analyzed based on previous studies and what most important measures must be done to ensure the companies are in the correct path of supply chain 4.0 and ready for the future supply chain 5.0.

5. Conclusion

This research comes with solutions for facing the disruptive challenges in enabling Digital Supply Chain 4.0. First, APAC Companies are now seeking out 'smarter' supply chains to improve overall operational effectiveness. Second, Digital tools like *analytics*, *Artificial Intelligence (AI)*, *Internet of Things (IoT)* and *Blockchain* [43] all in the mix. Third, tools will influence different supply chain attributes: *visibility*, *efficiency*, *resilience* and *reach*. Fourth, new digital approach will enable *greater supply chain effectiveness* now and for the future. Fifth and the most important one *Customer Experience* will overtake price and product as the No. 1 brand differentiator. The top factor driving supply chain innovation is to deliver an enhanced customer experience. While customer delight and customer satisfaction are measures of success [44], the customer experience is about creating a memorable experience that customers have on the company [37], [45], [46]. Sixth, *Collaborations* with Trading Partners in Sharing Economy is inevitable.

Thus, these six conclusions will help the firms face disruptive challenges in Supply Chain 4.0 and prepare for the next phase of SCM. With the rapid technology advancement, a breakthrough is needed especially as the consumers are going to society 5.0 and we need to act fast and focused. This paper has two limitations. First, the difficulties of conducting quantitative research because we are predicting the future, and the qualitative research is the most possible and appropriate to do this. Second, the qualitative sources were from big and medium companies. The writer argued that because this paper needs to address the future challenges, we need experienced and established companies who have gone through a clear track and they can give obvious judgement on what the business probably expected in the future. But this does not close the probability for a different result when the qualitative sources are from small companies. Future research may address this issue and confirm the findings of this research.

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