

The Supply Chain Trends in Digitizing Supply Chain Platforms with Enterprise Resource Planning (ERP) System

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Abstract: In today's global supply chain system, more companies are using the digital supply chain platform within the enterprise resource planning (ERP) system to conduct the logistics functions and provide supply chain information management that helps them leverage the information, build relationships to address and solve problems and provide guidance to deal with logistical challenges (Ferdows, K. et al., 2022). First, the supply chain decision-making challenges must be considered based on designing strategic plans and implementation based on vertical or horizontal processes. Then, supply chain hurdles associated with the company regarding supply chain technological innovation and product architectures to adjust the vertical/modular structure to the horizontal/modular structure or support an integration of the supply chain capabilities based on a case design from Fine, C. H., (1998), *Clockspeed: Winning Industry Control in the Age of Temporary Advantage*, the study that used supply chain design "clockspeed amplification" method. Lastly, based on Bayes' theorem or Baye's Law Statistics, the digital supply chain platform will examine predictive modeling within structural dynamics (Brandvoice, 2022). Therefore, this research paper will examine the structural decision-making dynamics within supply vertical and horizontal methods best suited to determine the digital supply chain platform to support Enterprise Resource Planning (ERP).

Keywords: Supply Chain Analytics, Supply Chain Platform and Decision Modeling

Some companies use digital twin technology in today's global supply chain system. For example, a digital twin technology platform might be seen as an advanced modeling software that integrates a wide range of databases to perform and present real-time information, which can help digitize supply chain systems through a data-centric solution approach to communicate and collaborate between providers, intermediaries, suppliers—distributors, and at the same time gaining insights of movements of commodities and goods in global supply network that might determine potential disruption scenarios and provide a plan response strategy—comprising of supply chain analytics by using predictive modeling's within a structural dynamics (Brandvoice, 2022).

A company's structural dynamics are often associated with either an organization formed as supply vertical or horizontal processes that affect the value chain within its supply chain designs based on a research study by Charles H. Fine (1998), *Clockspeed: Winning Industry Control in the Age of Temporary Advantage*. That said, if a company understands its so-called "Molecular" structure, which consists of its resources and capabilities, then a supply manager will know how to sustain its vertical and horizontal value chain. With that in mind, the double helix describes how companies would loop in and out between the vertical/modular structure to the horizontal/modular structure in which the former is a disintegrated system whereby various product architectures are driven by a company's technological capabilities to help in developing supply subsystems across the value chain. Also, supply chains must remember that the supply subsystems are influenced by the vertical structure's competitive forces when it comes to rival entry challenges or by its rigidity bureaucratic with integral product architectures (Fine, 1998). However, suppose a company supply system has a double helix system. In that case, it can often influence horizontal systems whereby technical advancement under one subsystem leads to scarce product commodities within the supply chain or the bundling subsystems with others to enhance control over the value chain to integrate into a modular configuration that considers the company's product architectures and organizational structure to sustain competitive advantage.

An example would be best represented by a logistical company with a vertical structure, possibly within the repair maintenance operation. It was created to provide service and support only to government agencies but not to a commercial ones in which it sought a new business venture. On the other hand, a vertical structure had a niche competitor with various technological innovation strategies servicing government and commercial sectors by using supply subsystems for the product commodities within its industry (Rosenbloom, 2013). Therefore, an organization must always consider a hedge strategy approach to sustain a competitive advantage, focusing on predicting the best-fitted value chain within the supply system, which would probably benefit the strategic organization process when dealing with the environmental factors within the supply chain design *clockspeed* approach (Fine, 1998). This paper will examine the structural dynamics within supply vertical and horizontal

methods best suited to determine the digital supply chain platform with Enterprise Resource Planning (ERP). However, a literature review will first be conducted based on the subject's situational analysis of peer-reviewed materials.

Literature Review

Situational Analysis

A company's supply trends can be analyzed within a situational analysis to examine business environmental factors. For example, the global supply chain system must be reviewed through the macro-environment lens of analyzing and monitoring, such as PESTLE factors that examine the Political, Economic, Social, Technological, Environmental, and Legal factors in the external environment and how they affect PESTEL analysis can be used to identify external threats and weaknesses in the business environment. However, the SWOT analysis can also be used to analyze the strengths, weaknesses, opportunities, and threats that face a company's business environment to help determine the right sustainability of any situational analysis. In addition, the situational analysis will drive the global supply chain system, which captures the market's demand for products and services that influence the global supply chain trends (Hill & Jones, 2013).

Economic Conditions

Economic conditions are derived from the markets that provide the framework of the demand and supply forces that determines the pricing for the commodities and resources. Markets are not specifically known as a place or location but rather where buyers and sellers conduct a transaction face-to-face or with the eCommerce where goods and services or resources are bought and sold within the economic system, such as a perfectly competitive market. It is a marketplace that allows the many buyers and sellers to products whereby each of them cannot affect the market pricing of the product because all of the product units are considered homogeneous or identical within the resources-based mobilities. Therefore, market transaction knowledge will be perfectly based on demand concepts (McConnell, C. R. et al., 2009).

Demand Theory

The concept of the demand theory must be examined to determine the market demand curve for the commodity, which is the primary interest of understanding an industry's demand for the product or an individual's demand for a commodity in which the theory of the consumer demand must be examined to learn about the market demand. The demand for a commodity will arise from the consumers' willingness and abilities to obtain access to purchase specific commodities based on the desire and wants to be backed by their income status. For example, the consumer demand theory focuses on the demand for a commodity that depends on the commodity's price of complementary and substitute goods, based on how the consumer tastes drive the demand for commodities based on the consumer demand theory (Salvatore, 2015).

Consumer Demand Theory

The consumer demand theory can be defined within functional forms of quantity demand for the commodity by an individual per period, such as year, month, week, day of the other unit of time. The consumer demand functional forms are associated with the price per unit of a commodity to the consumer income and the price of related commodities, which are often categorized within substitute and complementary goods based on the consumer taste patterns. However, consumer demand will also focus if a firm increases the price of a commodity, which will generally affect sales, whereby selling more units of a commodity lowers its price. Therefore, consumer demand expects an inverse relationship between a commodity's quality demands and its pricing scheme. Furthermore, the quantity demanded of a commodity by the individual will also depend on the price of related commodities, whereby the individual will often purchase more of a commodity if the price of substitute commodity increases or if the price of a complementary commodity falls (McConnell, C. R. et al., 2009).

Demand Theory

The consumer demand theory also can postulate that the quantity demanded of a commodity per period increases with a reduction in its price scheme. It increases with the consumer income, which leads to an increase in the price of substitute commodities and a reduction in the price of complementary commodities, with the increase in consumer taste for the commodity, but must keep in mind that the quantity demanded of a commodity declines with the opposite changes and demand theory of the concept of the demand function. Thus the production theory consists of the concept of the production function. This production function relies on the maximum output the company can produce based on the commodity within a period within each set of the

produced inputs. Those production inputs and outputs are measured by the physicality of the goods rather than monetary units based on the technological limitations that will probably remain constant during the analysis period (Salvatore, 2015).

Production Functions

However, production functions also have an influence on the distribution channel regarding the inbound and outbound commodities or goods are often managed through the logistics information system (LIS), which can be defined as the people who manage the equipment and the procedures that gather the inventory of the goods or commodities which are sorted, analyzed and evaluated and distributed as needed within a timely manner and accurate information to logistics decision-makers (Murphy & Wood, 2009).

In addition, the decision-makers will often also use the decision support systems (DSS) that allow the supply and logistics managers to use information management systems, models or analysis tools to help determine the transportation and warehousing management concerns and challenges regarding inventory control decisions and automatic order picking systems and optimization model of the buyers and seller within negotiations processes (Murphy & Wood, 2009).

Decision Support Systems (DSS)

Furthermore, the decision support systems (DSS) approach contributed to monitoring the logistics system to determine the needs and problems within the distribution or marketing channels and ensure the supply and logistics managers properly react to and respond to the logistics systems by surveying them. So that examine ways to make improvements to the logistic service and to ensure the logistics program is an integral part of the distribution or marketing channels to integrate a supply chain collaboration method (Rosenbloom, 2013). Therefore, the decision-making process must focus on sharing information with cross-functionalities to maintain open communication within the supply network. In addition, open communication among the supply partners means "Supply Chain Collaboration" will allow everyone to be more cooperative, collaborative, participative and interactive regarding decision support systems (DSS). Furthermore, the DSS mindset would perhaps encourage more small-medium and large enterprises to adopt digitized platforms to integrate supply functionalities and network systems to help capture and allow all logistical functionalities and supply chain systems better to serve customers in a global digital supply chain market. The literature review contains information that defines elements from situational analysis practice that allows for the methodology that will objectively discuss secondary data research design which will be useful to illustrate some of the common problems in the decision-making on adopting digital technologies based on fact-finding and modeling building. The case study design analysis will be a quantified study within a business model based on "*clockspeed amplification*" from Fine's (1998) study on *Clockspeed: Winning Industry Control in the Age of Temporary Advantage*.

Case Design

Supply Chain Design Clockspeed

The case design consists of supply law allows supply managers to examine how "*clockspeed amplification*" can be used to address the supply-demand from a "downstream" perspective on how the availability of produced products will affect the end-user (customer), which it be the business-to-customer analysis at three levels of the supply chain which can be categorized "tiering" system. Whereby the first-level can be a concern on how the designers or assemblers of end-items have established outsourcing subsystems of suppliers who will eventually seek out other suppliers must handle components that are used in the assembly of the end-items (Fine, 1998). Therefore, it might be a correlation between the company's *clockspeed* process to drive technological innovation and competitive intensity regarding temporary competitive advantage. For example, a company *clockspeed* process would probably cause an organization to use a form of opportunity and hedging strategies that focus on controlling the variable costs within the supply chain process, which is constantly changing based on technological innovation and competitive intensity within its resources and capabilities (Fine, 1998). That said, supply chain management must include effectiveness and efficiency to gather essential information that can benefit the logistics functionalities of the supply chain system. Therefore, the research question will address how a digital supply chain system can *help with complacency decision-making when designing strategic plans and implementation based on vertical or horizontal processes within Enterprise Resource Planning (ERP)*?

Enterprise Resource Planning (ERP)

Most global supply chain systems are configured within information management that use Enterprise Resource Planning (ERP) systems that enable collaboration, integration and coordination throughout the supply chain channels with the other information technologies. For example, logistical telecommunication networks are computer systems capable of collecting data and transitioning it from one place to another, allowing for internetworking by linking the separate networks into interconnecting networks whereby each one retains its identity and independence, often used in the international network. An enterprise resources planning (ERP) system also can be configured into software information packages designed to integrate the majority of a firm's business processes that can execute all types of transactions related to the business processes being integrated into the intermediaries, whereby its stores up each piece of data from enterprise-wide database functionalities that allow access to Data and information in real-time operation to directly into a client-server environment or traditional web-based system that includes anatomy to the customers and suppliers (Gasper et al., 2014). Thus, a firm's ERP systems can be seen as information management that enables digitalized supply-chain platforms to help them leverage the information, build relationships to address and solve problems and provide guidance to deal with logistical challenges (Ferdows, K. et al., 2022). Then, the question should be asked about how a digital supply chain platform approach.

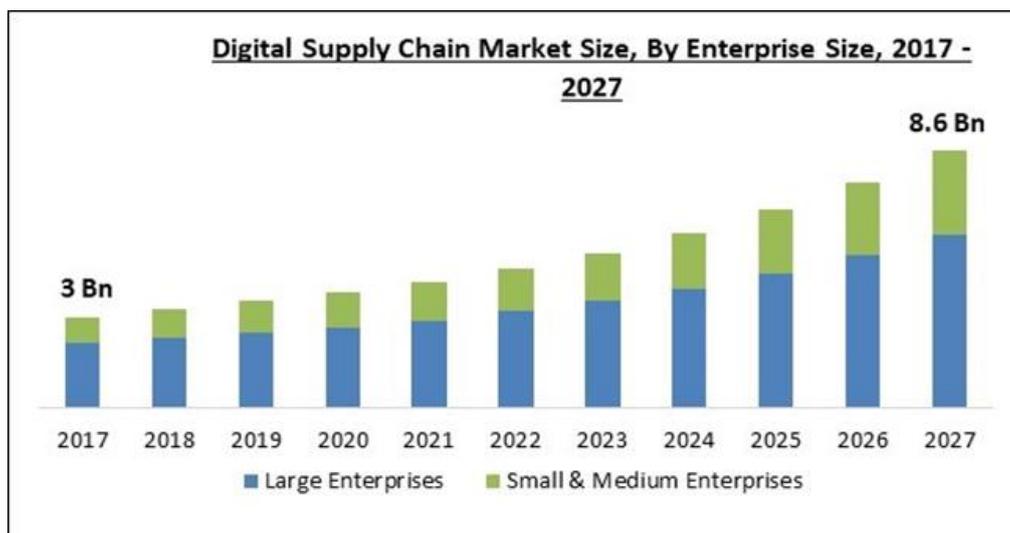
That said, the supply chain platform question should be addressed. For example, *what would be the most significant supply chain hurdles associated with company clock speed regarding supply chain technological innovation and product architectures? If companies adjust the vertical/modular structure to the horizontal/modular structure or versus to support a digital integration of the supply chain capabilities based on decision support systems' secondary data classification?*

Secondary data can be either described as internal to an organization or external to it. For example, the data can be defined as original, which means an internal source created, recorded or generated by the organization. However, external source data are recorded the same way but categorized into five basic categories: government sources, periodicals and commercial sources, etc. (Zikmund, 2000). That said, the study data resemble external data from credible commercial sources to conduct the data analysis.

Data Analysis

The data analysis examined three credible commercial sources. For instance, the first data source was KBV Research, which showed a chart that predicted the Global Digital Supply Chain Market size and how the global digital market expects to increase by around \$9 billion by 2027. Its market growth is expected to be up 13%. The digital supply chain market has immensely adopted the digital supply platform to keep within consumers' supply demands of goods or commodities with the increasing digitalization of technology worldwide. Moreover, it shows the correlation between business structural dynamics and supply chain analytics in adopting digital platforms.

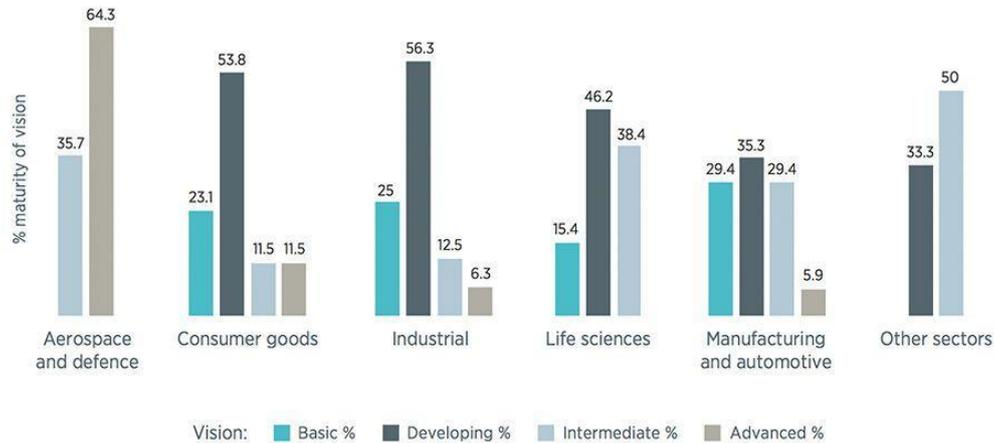
Chart 1:



Source KBV Research - referenced in the Global Digital Supply Chain Market Size, Share & Industry Trends Analysis Report by Component (Solution and Services), Enterprise Size, End User, Regional Outlook, and Forecast, 2021 – 2027.

The next external data source was from the commercial source named PA Consulting researched that some companies have invested value in the smart supply chain systems that provide benefits once some form of digitized maturity has been reached in Chart 2.

How mature is your organisation's smart supply chain vision?



Source Consultancy.eu

The above smart supply chain visions chart also provides data analysis that reflects the vertical structure focused on the company developing production system-and-service process and maintaining the essential elements of the production system in-house; to sustain a competitive advantage based on the value of the production system-to-service that would focus on technological competencies.

The last external source was from Finance Online Review For Business report has shown that one of the primary supply chain industry challenges is associated with supply chain data sources, which revealed how many professionals are having problems creating or customizing a digital supply platform due to cost information management systems to data-driven processes to improve overall supply chain system within a competitive business landscape. The below chart shows the Retail Supply Chain Executives' willingness to invest in 2021 for digital supply chain platforms (nd.).



Chart 3 - Source: Statista, 2021 from Finance Online Review For Business

The above chart showed that most retail enterprises have invested at least 50% in highly on digital platforms that support omnichannel fulfillment, productive planning and demand forecasting and enable flexible operations, whereby the investment of 40% contributed to improving inventory management and integration of the operational planning within real-time supply chain visibility, and while the rest was focused automate risk identification and issue resolution and production and distribution automation processes. The Statista, 2021 from Finance Online Review for Business datasets were examined using a descriptive statistical tool from Prentice-Hall statistics based on the PHstat application.

Descriptive Statistics Analysis

Descriptive statistics can be defined to obtain meaningful and substantive information from data analysis that allows for the measurement of variables to understand and know the central tendency, such as mean, median and mode and proportionality of them. It also allows for the measure of dispersion, which includes the variables' ranges, variances and standard deviation. Lastly, it can analyze the frequency distribution and histograms of the collected data to describe the findings (Evan, 2013). The Statista 2021 from Finance Online Review For Business was analyzed using the multiple regression model within a linear term. All variables are the coefficient of multiple determination in the context of multiple regression. It will allow the researcher to indicate the strength of the associations between the dependent and independent variables based on the R² of the variation in the dependent variable within the independent variables to address the findings.

Findings

The quantitative datasets examination was based on Naïve Bayes, defined as probabilistic classification methods based on the Bayes' theorem or Baye's Law Statistics, as some may know it. The naïve Bayes can also be used as a classifier that allows analysts to make assumptions about what is known as the presence or absence of a particular data feature, whether the Data is unrelated to other features. Next, this theoretical explanation of the Bayes' Theorem and Naïve Bayes Classifier with math equations and additional classification methods is used in the smoothing technique and then diagnosed to determine the "R." (Dietrich, 2015). Then, an analysis of variance (ANOVA) was used to conduct the F-Test to determine whether the variation could be due to a particular factor within the presented charts' variables associated with the means and the significance of any statistical errors. The ANOVA regression analysis was also used to test and describe the significance of the regression within the Summary Output that showed R Square 0.714657977 indicates 71% of the variation to suggest that seven out of the eight dependent variables that production and distribution automation were not key factors for investing in digital supply chain platform. The data analysis was backup by the residual plots, such as the normal probability plot does not suggest any departures from normality based on the upward spiral (Carlberg, 2013). The finding showed that the residual plot and line fit plot showed a positive intercept of 0.586, which equals 59% to the mean of the strong significant relationship between the fitness of good of data and the supply chain functionalities. The significance of regression can be described within a hypothesis test of whether the regression coefficient of B1 affects the slope of the independent variable equal to 50 or greater within the vertical/modular structure or the horizontal/modular structure format.

State the null hypothesis: $H_0:\mu=50$

State the alternate hypothesis: $H_1:\neq 50$

Then, it may be concluded that the slope of the independent variable will not be 0; therefore, if the statistical significance explains the independent variable's variation around the mean. However, if the value of the significance to the *p-value* for the *F-Test* or intercept described can be less than the significance level, then the null hypothesis would be rejected. However, the intercept was found to be 0.586; equal to 59% and greater than 50, which concludes that the business *clockspeed* approach based on a vertical/modular structure makes it more possible to drive technological innovation rather than the horizontal processes to determine how supply chain digital platforms were found in various industries' Enterprise Resource Planning (ERP) were found in this study, the statistical analysis will be shown in the Appendices A and B and leads to the recommendations.

Recommendations

That said, supply chain managers must focus on how the expand the supply chain management system with innovative performance measures to determine how to improve the supply chain agilities and effectiveness between marketing channel members to them ensure that distribution services on providing commodities or goods to the right place, and the right time and right quantity within the global marketplace with a digital supply chain platform to determine how it influences the global supply trends regarding the economic conditions, the political climate, and some of the substantialized measures that influence supply chain systems; thus, the essay

aims to understand better supply chain trends based on business structural dynamics and supply chain analytics in adopting digital platforms, which help to focus on future study.

Future Study

In the information management system programs, there are possibly different digital supply chain systems that can be viewed by which it delivers the products to the marketplaces based on the supply-demand. However, the Haier company created an information management system called the COSMOPlat in 2012 with a digital platform. It has the capabilities of providing short order-to-delivery times of goods within services. Still, at the same time, it helps to provide greater production efficiencies and increases the product customization process by using three collaborative modules with digital capabilities. For example, the three collaborative modules have digital capabilities to interconnected within the logistics functionalities, which could consist of cooperative innovation and design measures, and enable more efficient production resources and integrated supply channels. It has also been shown to be the best one that can provide a digital supply chain platform that would mostly have resources and capabilities to sustain the logistical aspects of distribution channels and services to sustain the logistical operations (Ferdows, K. et al., 2022). That said, future studies should examine are determinant variables that found COSMOPlat in 2012 an efficient digital supply chain platform based on Stefanovic's (2014) study about "*proactive supply chain performance management with predictive analytics*" if practitioners can use it to understand and predictive analytics to common types of business scenarios needed to examine and interpret the qualitative terms in global supply chain trends.

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Appendix A:

SUMMARY OUTPUT									
<i>Regression Statistics</i>									
Multiple R	0.84537								
R Square	0.71466								
Adjusted R Square	0.54799								
Standard Error	3.1071								
Observations	7								
ANOVA									
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>				
Regression	1	145.076	145.076	15.0274	0.011682959				
Residual	6	57.9244	9.65407						
Total	7	203							
	<i>Coefficients</i>	<i>Standard Err</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>	
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	0.586	10.2413	2.64187	3.87652	0.0082	3.776834094	16.70568	3.7768341	16.70567579
RESIDUAL OUTPUT					PROBABILITY OUTPUT				
<i>Observation</i>	<i>Predicted</i>	<i>Residuals</i>	<i>Standard Residuals</i>		<i>Percentile</i>	<i>l</i>			
1	5.70745	-3.70745	-1.28882		7.142857143	2			
2	5.41455	-2.41455	-0.83937		21.42857143	3			
3	4.96906	-0.96906	-0.33687		35.71428571	4			
4	4.09855	0.90145	0.31337		50	5			
5	4.09855	1.90145	0.661		64.28571429	6			
6	3.80463	3.19537	1.11081		78.57142857	7			
7	3.228044	4.771956	1.658879		92.85714286	8			

Appendix B:

