POLITECNICO DI TORINO

**Master of Science in**

**Engineering and Management**

Master's degree Thesis

# Electronic Data Interchange and Advanced Shipping Notice: First Steps Towards a Digitized Supply Chain


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# Acknowledgements

I would like to dedicate this work to my parents Adnan and Sawsan who have always believed in me and have shown unwavering support when I needed it most during my time here.

I hope I make you proud.

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# Contents

# List of Figures



# List of Tables

## Summary

This thesis is handling the topic of Logistics and supply chain in the digital era. How the use of Electronic data interchange (EDI) and Advanced Shipping Notice(ASN) are the building blocks for our client's journey towards a more digital and connected logistics operation. I will talk about industry 4.0 and its impact on logistics in the first chapter and introduce the topic of this dissertation. In the second I will focus more on supply chain management and how some companies are facing various issues what are the steps they need to take to improve. In the third chapter, I will go in depth about the project and the work I did at Accenture with our client. With a focus on some of the cost and benefits that the project has had on different aspects of the company. And finally, I draw some conclusions on how this implementation has succeeded in providing the client with what they need as a first step to embark on a bigger plan for improving and updating their supply chain system. As well as, a quick look at future technology that could possibly be a next step for companies seeking for the best and brightest in supply chain.

## Abstract

This thesis talks about the supply chain management and advancements in the digitization of supply chain in leader in the automotive parts industry. It takes a closer look at the benefits and importance of communication along the supply value chain and emphasizing the role that technology has played in improving the demand forecasting among other things. In the atmosphere of Industry 4.0, companies need to always be ahead of the curve and on the look for the next thing needed to maintain a competitive advantage in their respective industry. This thesis will mention some benefits on inventory, planning and supply as well as a comparison between benefits from both client and supplier side.

Keywords: Supply chain , Logistics, EDI, ASN, Automotive, Industry 4.0

# Chapter One: Introduction

## 1.1 Industry 4.0

Industry 4.0 isn't a new technology, it is related to the way companies have evolved with the new trends of data and automation during their day to day processes. (Forbes, 2018). If companies don't adapt to these advancements, they run the risk of being left behind, they need to embrace automation and seamless exchange of data between manufacturing technologies. These technologies could include cloud services, cyber-physical systems, and automation.

There have been 3 industrial revolutions prior to this:

- Machines and factories
- Mass production
- The digital era

The first industrial revolution was from the late 18th century to the beginning of the 19th, and it was related to the introduction of machines into the work force and thus replacing agriculture as the main course of work.

The second industrial revolution started at the end of the 19th century and with the emergence of new technologies such as gas, petrol, electricity, and large factories like the ones in the United States by Henry Ford which enabled mass production.

The third industrial revolution came around at a time around the middle of the 20th century again with the emergence of new technologies such as electronics, resistors, microchips and nuclear energy. All these factors contributed to making new innovations in products and increasing productivity in plants around the world.

For what concerns the fourth industrial revolution, with today's ever-growing connectivity and utilizing tools such as the cloud and automation, we can expect that great things are to come in terms of a better, more efficient production especially given the growing world population and the constant need for faster more reliable products.

Industry 4.0 is also referred to as the Industrial Internet of Things (IIoT or simply IoT), using this network of connected entities, we are slowly but surely reaching a fully integrated "smart" factory where all the separate components are communicating constantly in real time and securely. (Forbes, 2018)

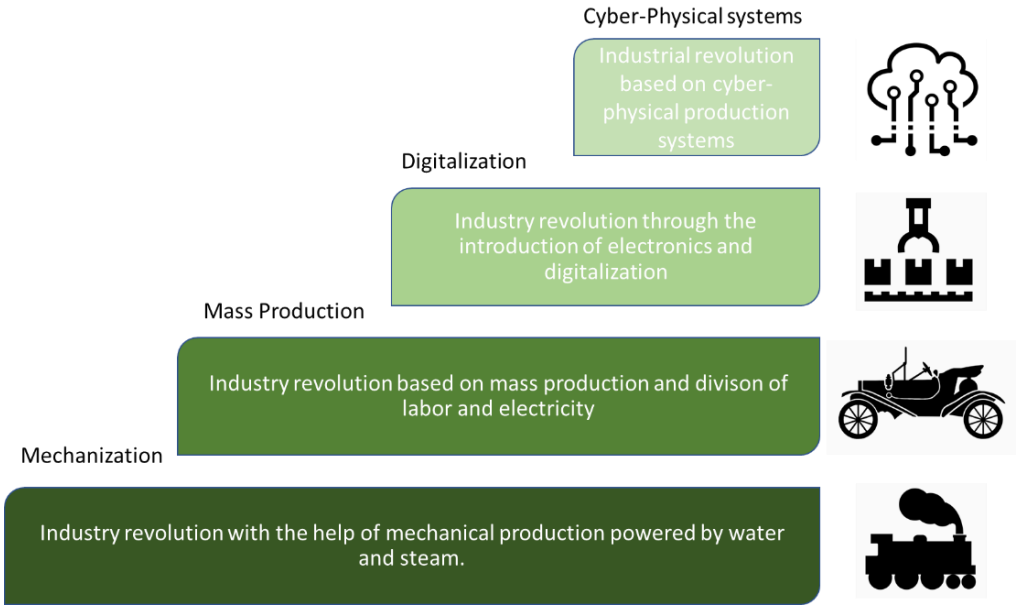



*Figure 1. The four Industrial Revolutions*

Industry 4.0 or IoT is more than just a collection of sensors, machines and IT systems; all of these works together to improve along the value chain of an enterprise. (BCG, 2015) By using the internet and various protocols they can communicate with each

other and analyze data and adjust to any changes necessary even by predicting the future outcomes. It is also heavily related to automation and robotics as much as it is with new cloud technology and interoperability of devices. It does not only affect industrial manufacturing companies, it also affects service providers, retails, and logistics companies as well as other sectors. (Tjahjono et Al, 2017)

The term "Industry 4.0" comes from Germany when it was created for a project related to automation and digitalization of manufacturing. The term “Fourth Industrial revolution” has been used to refer to industry 4.0 by some, this term usually refers to a revolution of sorts. And it has been used to describe other advancements over the years. By this definition, the first industrial revolution was related to water and steam power, the second to mass production, and the third to digital and electronic innovations.

After that, the “Industry 4.0” was re-introduced at the Hannover fair in 2011. And in Oct 2012 the group working on industry 4.0 introduced some recommendations to the German government. The members of this group were like the founding fathers of industry 4.0.

Companies adopting Industry 4.0 in their organization are supported by four main design principles:

1. Interoperability: Having machines, sensors, devices, and humans able to connect easily and exchange data via the Internet of things, or cloud services.
2. Transparency of information: The use of digitalization to create a virtual version of the physical plants for example and with the use of sensors data to create scenarios and anticipate future problems with the use of this complex information analysis.
3. Assistance of technology: Which can be divided into two sides, the assistance that machines can provide humans by making data easier to use and visualize as information. The second is machines assisting humans in preforming tasks

that are too strenuous and would be safer if performed by machines rather than humans.

4. Decentralized decision: Having machines make their own decisions and perform tasks without the need of humans to interact as much with them, this would prove beneficial to save on time and money by enabling humans to focus on more important tasks and only interfere when they are absolutely needed to.

As of now, we are amid Industry 4.0, so it would make sense that most companies are adjusting to what is quickly becoming the norm for surviving. Since it started in Germany, it would make sense that many German based companies have already shown a high level of initiative and are well on their way to be leaders in their fields.

## 1.2 Logistics

The Gartner definition of logistics is "the management of a complex set of tasks that encompasses the physical flow of materials and products from source to the destination." This describes the process of how a company handles the goods and makes sure that all the data is correct as they travel from their point of origin (supplier) to their destination (buyer) where they might in turn be reutilized to create something new.

Managing multiple supplier and sources of goods can be tricky especially in industries such as automotive parts industry where suppliers' locations vary greatly, and transportation cost are always increasing.

Pfohl (2001) defines logistics as "activities of goods transformation planning, management and its tempospatial control (…), which will enable the most effective

translocation from the point of dispatch to the point of reception". In turn, Bozarth & Handfield (2007) gave importance to the information circulating between the point of departure and the point of arrival. They both give emphasis to the **tempospatial** transformation. Jünemann's (1989) on the other hand defined logistics as "the science of planning, con-trolling and steering the systems based on the flow of material, staff, energy and information", this lacked the aspect of space in the logistics process.

Logistics started for military purposes and then evolved to influence the economy over time (Rutner, Aviles & Cox, 2012). The non-military uses mainly started for agricultural purposes to transport produce. What mainly affects the innovation of logistics?

Advancements in technology and IT services, improvement infrastructure for transportation purposes, political, social, economic, and environmental factors. Through the years, all these various factors have had in one way or another a positive impact at improving the logistics process.

## 1.3 Logistics 4.0

Logistics 4.0 describes how the process of transporting goods from one place to another will be treated and affected in the Industry 4.0 reality.

Since we know that there are a lot of factors that affect how a good is transported, and especially for perishable goods that need to be handled more carefully, it has become more and more important to implement a better system of making sure everything runs smoothly and effectively. Logistics 4.0 will utilize the IoT to produce real time data using sensors and cutting-edge technology as well as ensuring the data protection according to the GDPR as set by the EU. (Forbes, 2018)

The aim of Logistics 4.0 is to decrease errors and make sure that the data being shared is secure and accurate between the supplier and buyer. It will not disregard the need for human interaction in managing these processes as some might believe, we will always need human to make sure that the system is functional and to interfere in case of a system malfunction. (Barreto, Amaral, & Pereira, 2017)

The term Logistics 4.0 has a more specified meaning than industry 4.0 although sharing many similarities. Jeschke (2016) defined it as process that are related between separate members using big data. In the short term. As for the medium term , it's a self-regulating and autonomous system inside another system. Other definitions by Timm and Lorig (2015) mention that it is consisting of multiple subsystems which are affected by the surrounding subsystems.

Logistics 4.0 is not a new paradigm as it not a science per se, it is a set of rules and solutions.(Szymańska et al, 2017) When talking about logistics 4.0 it is important to understand that this concept is due to the ,more than ever before, connected nature of our society and with the advancement of technology. It all starts when the production process and the IT system are integrated so that the data flows freely inside the company and the suppliers. With the rise of automated manufacturing factories, "smart" factories, these manufacturing suppliers need to step up their IT and how involved they are in the production of the products. (BCC, 2015)

Logistics 4.0 combines both process and technical aspects which are related to the supply chain process and the tools that are used to support the supply chain processes.

It aims at increasing the productivity of the supply chain actors and performance. Supply chain is built upon decentralized structures (Dussmann Group, 2016). These objectives can be realized by vertically integrating the actors in the subsystems of the

organization (Czaja, 2016) and horizontally by integrating the entities (Wang, Wan, Li & Zhang, 2016).

Some of the advantages of the Logistics 4.0 concept are: decreasing human work, implementing a common standard linking logistical functions and including the most recent advancements in technology (Berger). However, disadvantages include a higher cost of investment and IT support.

## 1.4 Supply chain

The term Supply Chain came around the 1970s and then grew in popularity after that. But what is supply chain?

Supply chain is present in all industries, it's the need to transport goods from suppliers to buyer with the use of various transportation, storage and management methods. The industry is large and encompasses many actors from the ports. Trucks, customs, governmental bodies, storage providers and many more. It is very much a relationship based practice and as suck must be regulated.

In recent years, supply chains have grown in complexity and with technology advances, new supply chain methods have risen. The use of software and internet of things has changed the industry and reduced margins significantly.

Supply chain managers have to always be aware of the next trend and be on par with the competition because it is changing every day. These disruptions in the industry have significant effects on the freight cost and lead times especially if you are shipping across borders and sea.

So what are managers supposed to do?

- Optimize margins with data and connectivity:
- Maintaining good relationships and strong communication with all moving parts both internally and externally.

- Ensuring the correct and secure flow of information is vital for complex systems.

Basically, supply chain managers need to be highly reactive in cases of any breakdowns in the supply chain process. All while maintaining the same level and agreed upon budgets and constraints. Here is where the relationship management comes into play, maintaining a rapport with all people involved will be very useful in cases of urgency.

The industry and the supply chain manager point to two very different sides of the value chain in a company, from here is the issue of the term supply chain. Because it defines the ever-evolving relationship between the two parties.

It is the process starting with the procurement until the good are received in the destination. From one side, the industry is looking at increasing the revenues, the manager is focused on reducing costs and improving forecasts for future goods.

It is important to consider supply chain as a concept and not a group of actors or processes working together towards a certain goal. Many external issues affect it and might not touch the industry. Such as political issues which might increase freight costs in general or reduce taxes on goods.

# Chapter Two: Supply chain management

## 2.1 Supply Chain Management Definition

Supply chain management (SCM) is managing the supply chain activities to increase customer value and make sure you get the most of your product. So, what exactly are supply chain activities? All the way from product development, to production, logistics and the flow of information needed to tie all these together.

SCM is based on two main ideals:

- The product reaching the end user and is the result of multiple entities working together along what is referred to as the supply chain.
- Supply chains have been around for a while now, but most organizations were only concerned with their own activities and not considering external factors along the supply chain. And thus, this would lead to ineffective practices and reduced efficiency.

So, how are these players connected?

The first way they are connected is via physical flows related to the movement and storage of the product.

The second is the information flow that are vital to have all players coordinated and aligned with the requirements and what needs to be fulfilled.

## 2.2 Beergame

One way to explain Supply Chain Management is via a simulation game created in the 60's by Jay Forrester at MIT to study system dynamics. It is a role play simulation game where players face traditional supply chain problems by becoming one of the roles along the supply chain. By simulating a typical supply chain process, the players can see how problems can arise and all the risks associated with the process from beginning to end.

The original purpose of the game was to find the effect of systems structure on people's behaviors, but it can also be used to show how information sharing, SCM and collaboration along the supply chain can affect the productivity of the whole process.

In the game, participants make up a four-stage supply chain (retailer, wholesaler, distributer and factory). The purpose is to produce and deliver units of beer: the factory makes the product and the rest deliver the units until it gets to the customer at the end of the chain. The aim of the players is to fulfil the orders by placing an order to the upstream party after them.

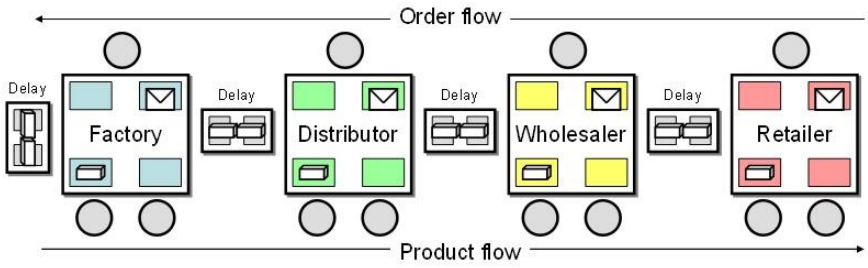



*Figure 2 Flows in Beergame Source: Beergame.org*

The order flow goes from the customer demand to the retiled then it goes upstream until it reaches the factory where they have to fulfil the order and then send back the product in the reverse flow until it reaches the customer and thus ending the product flow.

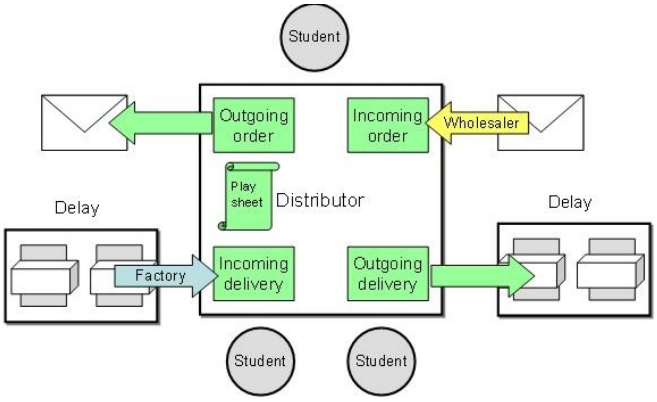



*Figure 3 Distributor Table Setup Source: Beergame.org*

This is an example of the table setup where three students are acting as the distributor. They receive the orders from the wholesaler, then send out the order to the factory on the left. After that, the factory sends back the order and there exists some delay in providing the product it is recorded, it then goes back to the wholesaler. This delay is because in the rules of the game, taking into consideration logistic and production delays that happen in real life, each delivery takes two rounds to reach the next stage.

The game is played in weeks where each round is a week.

The players need to do the following steps each round:

1. Do an inbound for the incoming orders
2. Process incoming deliveries
3. Register the deliveries and orders in the play sheet (inventory)
4. Ship out the deliveries
5. Agree on an amount to be ordered.

Deciding the amount to be ordered is the **only** decision that players can make throughout the game basically. All other variables are made for them.

The game has certain rules that have to order must be met, either directly (if they have enough inventory) or in the next rounds.

They must also consider inventory storage cost (0.50 EUR per week for each item in stock and 1.00 EUR for items on backlog) so the goal of the players is to keep costs down and minimize excess spending.

The best strategy is to keep as little stock as possible. The players can communicate, they can only exchange the order amount, they are unaware of the of the stock level or customer demand, only the retailer knows this information.

The demand is determined in advance and doesn't vary greatly, the levels of the supply chain are set a certain amount.

To induce the bullwhip effect, the external demand must be stable for a couple weeks before it increases suddenly and then stays stable for the rest of the game.

Even a one unit increase in the demand can cause a bullwhip effect and an unstable order pattern within the supply chain.

### 2.2.1 Bullwhip effect

This occurs when there are coordination issues in the communication between the actors in the supply chain. It mainly happens when the order amounts moving upstream in the SC towards the production end. If the demand is stable, the smallest change in the demand from the retail side, can drastically change in the upstream side, the effect is that the amounts will be very unstable, very high one week then zero the other one.

The term was first used around the 90's when P&G found unusual and increased order amounts in their supply chain for diapers.

This can lead to a lot of inefficiencies in the supply chain:

- Increased stock level
- Decreased customer service
- Negative use of capacity
- Multiple issues with the demand forecasting
- Increases costs and decreased trust within the organization

So, by using the Beergame as a sample supply chain management simulation, we can see just how important the flow of information is in the supply chain. One way to do so is by introducing digitization to the process that would benefit the most from it.

## 2.3 Simple traditional procurement process

Let us understand what is meant by procurement. In any organization, they must obtain products and services from another party. This cycle goes through multiple steps from knowing the needs of your client to reach the other side of giving this product or service as requested.

The company must keep in mind their handling of funds during the procurement process as well both in weak and strong economies. The following are the steps that companies take when implementing a procurement process:

- **Recognition of customer needs**

  The company requires a new product for a client, it might be an item that must be reordered or a new one to be produced.

- **Using a specific identifier for the product**

  Having the correct product is very important for the company, especially if it is part of a bigger product or service. Some companies might be using Part numbers as identifier (which is the case for the client mentioned in this dissertation). This identifier is used to determine the specs of the item and if the company had already ordered this in the past, it would be easier for them to reorder from their systems.

- **Sourcing options**

  The company must know where they are getting the product from. They probably have trusted sources and suppliers they had used in the past. Otherwise, the

company will look for a new supplier using a purchase order (PO) or by using sources such as points of sale, or online vendors.

- **Price of product**

The company looks in the details of the product and figures out if the cost will be suitable for them or not depending on their commodity needs or a specific product custom for them.

- **Sending a PO**

The PO is an important document that is used between the customer and the supplier indicating what product they require and how many items they require at a certain time, it also includes information regarding the weight, color, details, specifications, and incoterms specific to this product.

- **Delivery of the product**

The PO must be sent to the supplier traditionally it was via email, mail, fax, or even personally. As previously mentioned, the shipping method and incoterms are specified in the PO. The supplier must confirm that they received the correct PO with all the correct information from the customer.

- **Expediting the product**

Making sure that the product is delivered within the time frame set by the purchase order is an important step in the procurement process especially if there happen to be any delays or if other processes depend on its arrival to proceed.

- **Getting and inspecting the goods**

The product is delivered to the company, then it is up to the receipt to make sure that the product is in the condition it was ordered in. After the company inspects the product and accepts, they are required to pay their dues to the sending party.

- **Payment and invoicing**

The buyer must possess 3 important documents to complete the request, which are the invoice slip, the delivery note and the PO. These documentation gives proof from both parties and as such, if there exists any misalignment it must be taken care of prior to the buyer pays for the goods. Payment is usually made in cash, credit, wire transfer, etc...

- **Maintaining a record**

When it comes to auditing purposes, companies must provide valid documentation of their purchases to verify the transactions they carried out during their year. A valid PO would one of these documents, as well as warranties.

## 2.4 Problems of supply chain in recent years

Globalization and being able to manufacture and sell products

Being able to produce products around the world has enabled companies find new opportunities and find new sources of income. But it also comes with its own costs and issues and added complexity.

The market volatility is growing because of the increase of competition, more regulations, and the political factors that affect market fluctuations.

Customer demand is becoming more personalized and an increase in customer expectations is noticed, where they expect to buy and receive products from anywhere and delivered anywhere.

Their need for the newest and brightest product leads to a growing need for research and development costs, which in turn makes current product have a short life span.

What retailers are doing to combat is to create an ecosystem of channels between themselves and the consumer as well as personalized experiences, but this step is

costly, and they need to be aware of the implications it will have on their business model as they go into an omnichannel one.

## 2.5 Digitization of supply chain

Accenture has identified that in today's global atmosphere; a truly differentiated supply chain operation must include digitization and be able to adapt to the changes from external forces.

One way that organizations have changed up their supply chain is by introducing big data and data analysis so that a better integration is achieved. These tools give companies the chance to change or increase shipments, get better forecast for the demand ,and improve revenue streams.

Making sure that you understand the behavior of customers is very important when managing inventory. Capturing how the customer will react to different sources makes sure that there is enough of the product to go around and will be received well by most; having this information will enable the companies to adjust the shipping strategies they had in plan.

Understanding customer behavior is an important factor in inventory management. Accurately predicting how specific audiences will react to various elements ensures that there are enough products on hand for sales.

By collecting information from a variety of sources, companies can make appropriate adjustments to their shipping strategies.

Companies will also be able to use these tools to make their operations more streamlined and decrease the bottleneck effect.

Tracking the good along the supply chain can help pinpoint the location of the bottleneck and thus help businesses know where to focus their efforts at improving it. It is important to note that for these goals to be achieved, the company must have a unified view on their mission and end result. Having a disjointed team will lead to

more problems and less coherence in managing and solving issues fast. So, when all members of the organization are working towards a common goal, it is easier to reach a certain goal because they are all committed to have a successful product on the market for the audience to admire.

By sharing the data gathered in this process, employees have a greater role to play and provide valuable feedback to top management which in turn should utilize this for their benefit.

Luckily, with all these advancements in the tech field, this is now more achievable using warehouse management systems that make inventory storage easier to control by providing accurate data in real time scenarios which would reduce the errors one might face using traditional methods.

Using similar services in different parts along the supply chain would also improve overall the process and the result immensely by creating new strategies using data that is both accurate and secure passing through all the stages of the supply chain.

Accenture estimates that **by 2020** more than **70%** of supply chain officers believe that the supply chain will be a critical aspect of a better customer relationship in their company.

When supply chain managers across various locations and industries were asked by Accenture on how they are embracing the new advancements of IT and technology; they found that although these advancements are appreciated; they're still struggling with fully adopting and nurturing a digital workforce. This has led to having unutilized value of the these services.

Most organization can improve their reverse logistics methods. Although online purchases have been more frequently used in recent history, but there are also a lot of requests for return by customer and that channel is not always the best equipped for this case. This has led companies to better understand and find a smarter way of planning their inventory needs and the demand of customers.

Having an omnichannel supply chain will make companies more options and better look at how the product travels from one point to another. Orders related to every channel is managed by a warehouse management system, which enables the company to see exactly what is being ordered and what needs to be fulfilled.

By using data analysis, companies can then pinpoint where they can cut costs and improve their performance according to various factors. For example, IKEA knew that using a light weight packaging material means lowers cost of transportation and they looked at the employees for solutions. The various departments in the company were able to work together and come up with the best design to maximize value in their supply chain. And that's where the idea of the flat pack came from

## 2.6 Material Requirement Planning

### 2.6.1 MRP definition

Material requirements planning (MRP) is a system used to calculate the products required to make a good. It is among the most used systems for automating manufacturing processes; It has 3 main steps:

1) Knowing how much inventory of the material you have already
2) Deciding the amount you still need
3) Scheduling the production using these products

It was developed by Joseph Orlicky, who worked at IBM as an engineer, in 1964 after he analyzed Toyota's Production System that was used as a model for lean production. Black and Decker built the first computer-based MRP system that year.

However, Lean manufacturing and MRP are not the same, some say that MRP helps Lean manufacturing. MRP, in some ways, is a push system where the inventory is decided in advance and the goods are made to fulfill. Whereas Lean manufacturing is

a pull system where you don't make any good unless you have a real and accurate demand.

Orlicky's ideas grew in popularity and by 1980's there were a lot of commercial and homemade MRP system programs. After he died in 1986, they published a second edition of his book in 1994, and the most recent republishing was in 2011 with an update regarding how to use MRP for Demand Driven Planning systems using actual real sales data instead of a forecast which is referred to as Demand Driven MRP (discussed Later on in the chapter) and it is a new pull method which is quite unconventional compared to Orlicky's principles for MRP systems.

MRPs use Data from the Bill of material (BOM) which a list of the necessary material components used in making the product as well as their quantity; it also uses the information of the inventory of the components you have in stocks and the schedule of the production to calculate the quantity needed and the timing according to when they are needed during the manufacturing process. It is beneficial when used for discrete manufacturing, where the final product is distinct and thus is countable like subassemblies or cars; as well as process manufacturing which ends in bulk products like soft drinks, detergents that are not countable that can be broken down to their parts.

### 2.6.2 MRP vs. ERP

What started as an add-on of MRP, created by Oliver Wight in 1983, called manufacturing resource planning (MRP II), expanded planning by including other resources of the company like financial data, product design, cost management, capacity, sales and operations as well as many others.

In the beginning of the 90's, Gartner coined came up with the Enterprise Resource Planning (ERP) to indicate a more inclusive and general type of MRP which considers the other functions of the company like accounting, finance, HR, SCM all in a

centralized format. It expanded to other industries like banks, retailing, that probably didn't need an MRP service, it is worth to note that MRP remains a big factor in ERP software utilized by manufacturers.

### 2.6.3 The main objectives of an MRP system

- The first objective is obviously making sure the material and product are readily available when the production line needs them making sure that the manufacturing process is on schedule.
- Another goal of MRP is a good management and optimization of inventory, making sure that the company has an adequate amount of inventory when the product is being made.
- Improving efficiency using accurate and as much real time data as possible by optimizing labor and equipment.

### 2.6.4 Traditional MRP systems

The MRP used in the 50's and 60's cannot keep up with today's demands but in a world with increasing uncertainty and market volatility, it faces many problems:

- High accountability of the forecasts providing wrong information
- Needs planners to intervene when the forecasts are wrong or misguided
- Believes that changes made in the production at the last minute would increase the cost and incur a high percentage of loss for the company.
- Suffers from the bullwhip effect
- Doesn't take much into consideration actions that would mitigate risks.
- Utilizes manually constructed and usually complex sheets for making decisions.
- Doesn't consider cases where a safety level of stock is required to absorb the demand and supply volatility along the ends of the supply chain.

Consequently, companies face the following problems

- Superfluous inventory
- running out of stock that is needed urgently
- not smart in utilizing inventory decreasing unnecessary costs
- unsatisfied customers
- Material planners always trying to combat the next urgent situation to fix errors
- having to send products urgently and thus incurring added transport costs

So, now that we know that traditional MRP is turning obsolete in today climate, what can companies utilize instead?

### 2.6.5 Demand Driven Material Requirement Planning (DDMRP)

Demand Driven MRP is a new innovative execution and planning method, it is a planning vehicle developed from the Demand Driven Institute. It adds on to the MRP and DRP foundation and utilizes the advantages from the pull-based methods Lean, Six Sigma in addition to the Theory of Constrains. The DDMRP agenda is to design, set up and manage supply chain to make a better flow generated by the customer demand orders.

The supply chain is divided into various interdependent units each with its own MRP run. What connects these entities are the inventory buffers acting as shock absorbers for variability and protecting the flow of information and goods.

The DDMRP engine uses decoupling points at various levels of the supply chain to:

- Create independence between the units in distribution and manufacturing
- Unlink the rate of utilization and the rate of supply.

At every decoupling point, the system utilizes a special equation formula to:

- Calculate the supply orders

- Assist planners intervene and catch risks to the goods flow.

The positive effect it will deliver:

- Improved inventory control
- Better customer service
- Decreased supply chain costs
- Decreased obsolescence
- Accurate demand-based processes
- Decrease of planner's firefighting
- Increased performance considering seasonal variabilities or demand spikes

Considering how important DDMRP is to the company and understanding the importance of accurate information flow from one end of the supply chain to the other; companies are looking more and more into digitization.

Using services and technology that can better understand the needs of the customer and the safe transfer of information is key.

So, what is one way that companies can use to ensure that their data is handled safely and can be reliable enough to not mess up their MRP engines?

# Chapter Three: Innovation (Project at Accenture)

## 3.1 Accenture

Accenture provides a wide array of services and solution from strategy, digital, consulting, technology, and operations. It is considered a leader in the technology services. Their services encompass more than 40 industries, with about 380,000 employees in more than 120 countries, Accenture strives to improve how businesses function and operate in this changing world.

## 3.2 The project

This project is concerned with multiple actors that will have to interact very closely together for the implementation to run smoothly and effectively.

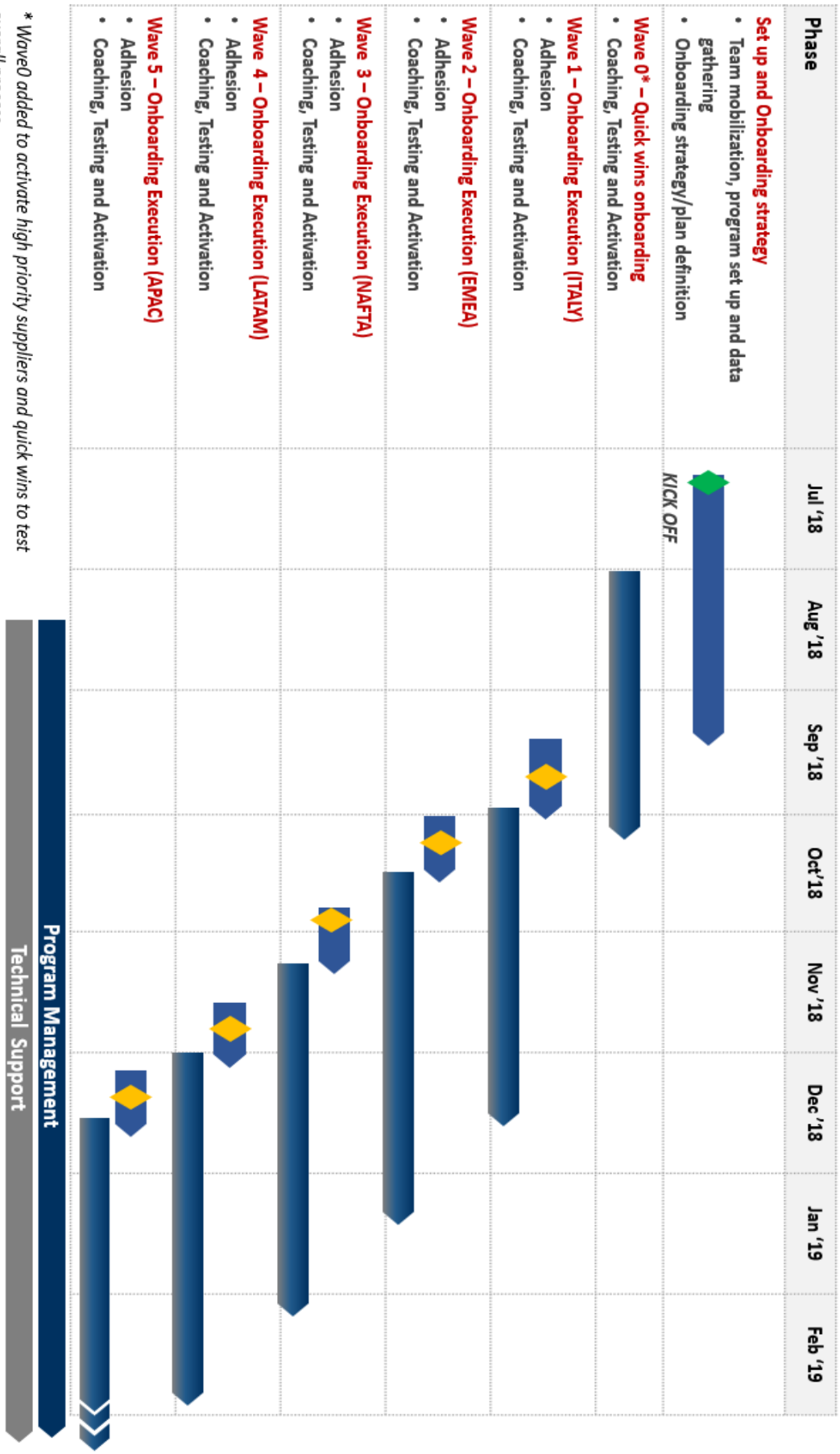
It is on a global scale, with all the business lines and plants of the client involved. As Accenture, it is our job to coordinate and make sure that all players are doing their job, so we can fulfill the requirements set up in the proposal at the beginning of the project.

The duration of the project is expected to be around 6 months- 1 year.

Below you can see a waterfall of the activities and the multiple waves that were divided to achieve the most result across all suppliers.

This was a provisional chart and it was updated later to meet the actual progress of the project. The project was first expected to take around 6 months to complete, but as it progressed, and problems arose it was quickly apparent it would take a year to complete.

EDI is really the most basic step in the road to digitalization of the company's supply chain. It is however an important one because if the information and the method of transmission is not up to par and not as accurate and secure it wouldn't be able to manage more complex and future implementations.




** Wave0 added to activate high priority suppliers and quick wins to test overall process*

*Figure 4 Waterfall of the project Source: Accenture*

The project is aimed at all the client's business lines, as they supply various components in the automotive industry. The business lines are the following:

| Business line | Lighting | Exhaust | Engine | Elect. Sys | Shock Abs |
|---|---|---|---|---|---|
| **Relations in scope** | 227 | 40 | 36 | 97 | 26 |
| **Relations addressed in FULL EDI** | 119 | 15 | 12 | 75 | 8 |
| **Relations addressed in WEB** | 104 | 25 | 20 | 15 | 17 |
| **GR in scope** | 269.970 | 47.766 | 13.755 | 83.283 | 45.101 |
| **GR in scope (% of total GR in scope)** | 58,7% | 10,3% | 3% | 18,1% | 9,8% |

*Table 1 Percentage of supplier per Business Line*

Lighting having the most amount of relations then followed by Electronic systems, Exhaust, Engine and then shock absorbers. Each plant usually supplies one of these business lines, but it is not uncommon for the same plant to be receiving from multiple ones at the same time.

There are other business lines in the client's business, however, these probably do not have a high enough GR with the suppliers to warrant it being included in the program.

### 3.2.1 Goods Received (GR)

The Suppliers chosen to participate in the program depended on their goods received index. This index indicated the number of Part numbers that the supplier has within a certain period, in our case it was been June and September.

To better explain how this number is reached, the following simple example:

To calculate the GR of Supplier X during the month of September:

Week 1: 1 shipment of PN1(1 piece), PN2(500 pieces),PN3(1000 pieces); number of PN: **3**

Week 2: 1 shipment of PN2(2000 pieces), PN3(1000 pieces); Number of PN: **2**

Week 3: 1 shipment of PN3(100pieces); Number of PN **:1**

Week 4: 1 shipment of PN4(300piece), PN 5 (400 pieces) ; Number of PN: **2**

The GR for supplier X for the month of September is 3+2+1+2 = 8

It is independent of the quantity being shipped, it more related to the quantity of separate PN being shipped, because from the client side the inbound process is the same if it is for 1 piece or 1000 pieces.

So, the client requested that we consider only suppliers with a GR higher than 100 as to start with the ones with a higher amount of PNs being shipped during the designated period.

As such, Accenture agreed to onboard 200 suppliers from the client's supplier list.

## 3.3 Actors involved

### 3.3.1 Accenture

Accenture played a very important role in the project as to coordinating between the client and the its suppliers and the external tech support to make sure that all the parts were moving smoothly and coherently.

With a project of this scale, it was best to divide the project into waves according to the geographical location of the suppliers.

Our team was composed of 6 members, 3 of which were interns including myself.

The role that Accenture played was crucial to the success for a project of this scale; with so many moving parts communications could be lost, and information forgotten. At times, we served as a checks and balances for the client, their provider and the suppliers.

After the client introduced the problem and what the proposed solution of the project would be, Accenture then formulated a game plan and route for tackling the issues and situations to be managed along the timeline.

### 3.3.2 The client

The client for this project is a leader in the automotive spare parts industry. Their main goal of this project was to enhance the communication between the suppliers and the plants that they are servicing. On the short run, it would maximize efficiency and reduce errors; on the long run, it is useful to make sure that the assembly line doesn't suffer from any mishaps or errors in calculation int the MRP.

The client's central team in charge of this project had to hand over to us as Accenture all the necessary information we needed to fulfill its request. They also were also the ultimate reference for when an issue was to arise.

We were provided with certain referents for each department to communicate with for issues on ICT, logistics, Sales, and of course a central overlooking referent.

It was on them to provide us with all the documentation needed and technical information necessary to implement the project.

Training sessions were held between Accenture, the client and their IT supplier at the beginning of the project to provide an overview of the workflow and introduce all the team members from both parties.

It was also decided ahead of time; which party would be responsible for each task/follow up and the method of communication to be used.

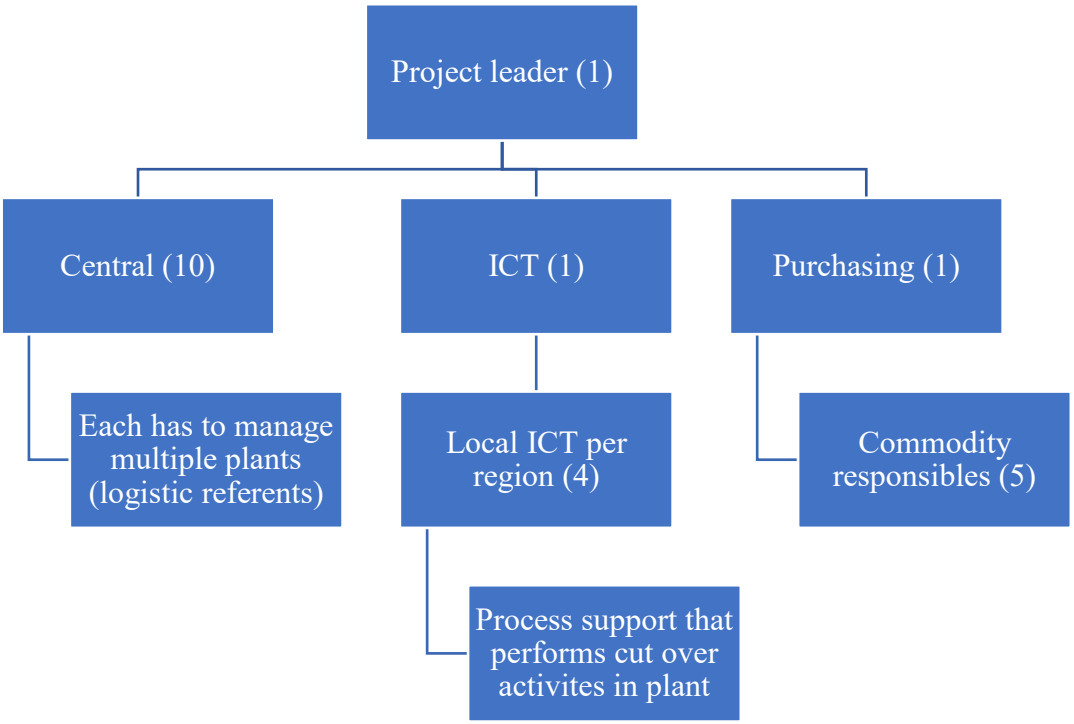



*Figure 5 Hierarchy of Client personnel in project*

The central team is composed of around 10 personnel in the client's central office in Italy. Each one of the central team is managing 4-5 plants and are communicating with the logistic referents of the plant to coordinate better.

ICT team is made up from one main figure that overviews all activities, they then communicate with the local ICT referent that are specific to regions which as APAC, LATAM, NAFTA and EMEA which are then communicating to the process support personnel which do the actual work of the inbound of goods and correct receipt of the ASNs in the plant system.

The purchasing team is also composed of one main figure and then it referring to the commodity personnel that have multiple suppliers depending on the commodity they are managing (Plastics, Lighting, electronics…) and they useful in then the suppliers are being troublesome to communicate with or require a level of pushing from the client's side.

### 3.3.3 Client External tech provider

The client has an external tech provider that was also there to support the project from a technical standpoint.

This relationship was very important as the we utilized a portal related to this provider to communicate the set up and consequent implementing of the project. They were also in charge of any technical difficulties or roadblocks we faced with the suppliers.

### 3.3.4 The Suppliers

This is probably the most important relation for the project because if there were no suppliers, there wouldn't be a project to begin with.

As suppliers are many and in various locations, speaking different languages, and with different business approaches; it was very important to build a solid relationship with them from the beginning to make sure we stayed on the same page and were able to transition smoothly from the way they were doing things to this new approach.

If a supplier was resistant to the project we would keep trying to convince them, however in some cases we needed the help of the client to step in and exert some pressure on them to make sure they fully comply with the project.

#### 3.4.5 Pareto Analysis

A pareto analysis was conducted to figure out that 200 suppliers were the optimal size to have the project be at since it would already have reached 75% of the total GR managed by the client. The 80/20 rule applies here and is very evident to we did not need to perform the project over all 500+ suppliers to achieve a very good result.

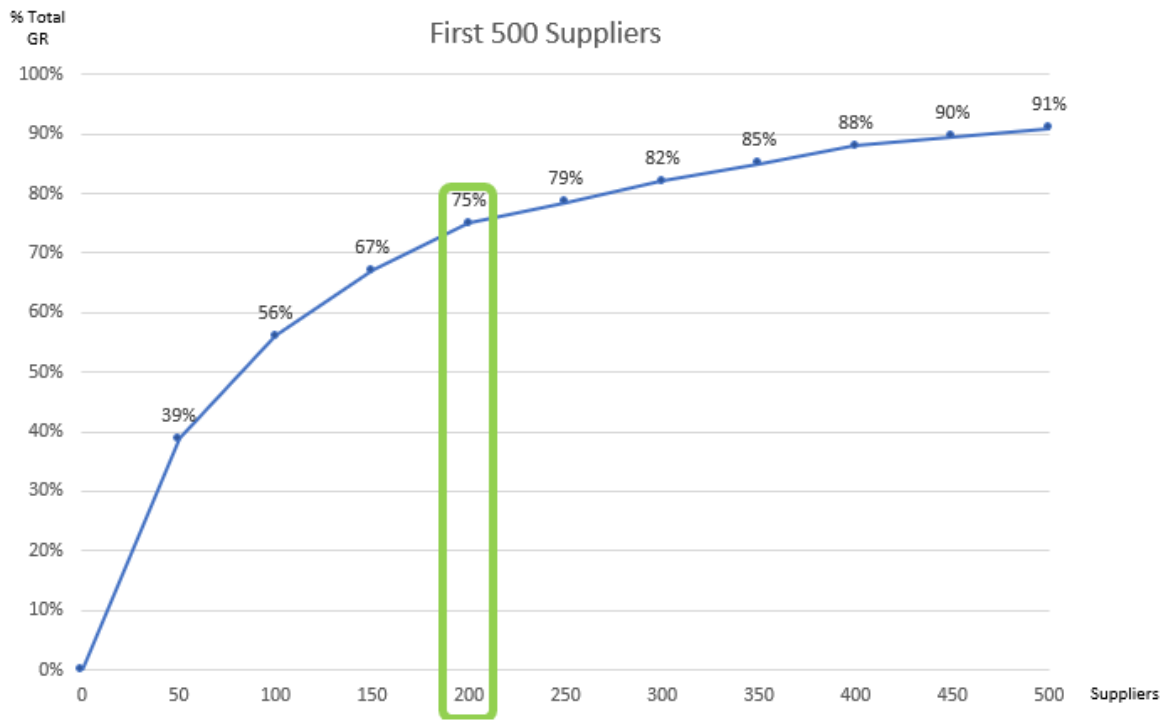



*Figure 6 Pareto Analysis*

## 3.4 AS-IS

First, let's discuss what the client was doing before the project commenced.

The client has multiple plants around the world and hundreds of suppliers that provide the parts necessary to complete the final product in these plants.

During the MRP calculation phase in the supply chain, the client would request a certain amount or units of a product, the supplier would them supply the requested amount and ship it according to the specified incoterm between the supplier and the plant.

These communication of quantities and shipping and arrival dates used to be transmitted via email, phone, excel sheets, fax…

All these methods of communication were deemed accurate and reliable at some point, but there would always remain a certain level of human error as these were manually filled out and sent towards the plant planners.

They decided to switch to a more standardized method of transmitting the delivery plans and to receive the Advanced Shipping Notice (ASN), which is very useful in making sure that the parts needed are available when the assembly is required and are found at the right time in the right place.

What are the Disadvantages of this traditional method?

- More prone to errors
- Less reliable
- Less environmentally conscious
- Not efficient
- Manual

## 3.5 EDI

EDI stands for Electronic Data Interchange; within supply chain management it focuses on the digital transfer of business interactions such as the PO (Purchase order) or the invoices. EDI has been around for a while and was first introduced for military use to transfer protocols between parties.

The main component of this project is the ASN.

Which ideally would be sent using the EDI channels that the supplier and the client's tech support would set up.

EDI transmissions have certain standardized formats set by international standards.

Each company can decide which format to use and adapt it to fit its personal purpose and is determined depending on the industry or the agreements with its partners. EDI

traditionally has been used by retailers, suppliers, distributors, 3PL, etc. to exchange the important information mentioned above such as invoices, delivery notices, ASN, etc.

The main benefits of adopting EDI into your organization are the following:

- Less human errors
- Less use of paper documents
- Better view of delivery requirements and what is being delivered
- Better relationship between supplier and buyer
- Faster transactions and more secure data transfer

There are many standards being implemented today, the most prominent being:

**EDIFACT:** The main standard backed by the UN

**ANSI X12:** Most commonly used in Australia, US, and Canada

**TRADACOMS:** Mainly used in UK

**ODETTE:** Widely used for the Motor industry

**VDA:** Mainly used in German companies

The client has chosen to use the EDIFACT, ODETTE, and VDA standards with its suppliers and has supplied us with the latest guidelines set by them to share with the suppliers to make sure both sides are aligned and all data that need to be included are present.

The client has provided guidelines for both the messages sent via EDI towards the suppliers in format DELFOR D96A and D97A for EDIFACT, DELINS OD3 for ODETTE, and VDA 4905 for VDA as well as the guidelines needed to construct the ASN message towards the plants in DESADV D96A and D97A for EDIFACT, AVIEXP OD3 for ODETTE, and VDA 4913 for VDA.

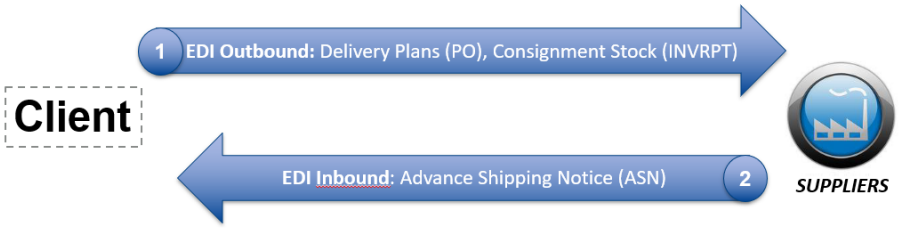



*Figure 7 Flows of the project Source: Accenture*

These are the flows between the client (Plant) and the suppliers, where you can see that the first step is to make sure that the supplier is correctly receiving the delivery plans correctly before they can carry on and send the ASN towards the plants. This is vital to ensure that the information they are transmitting are correct and reflect the actual quantities and deliveries they have.

### Setting up EDI channel and connection:

To set up an EDI connection, there needs to be some steps set up in advance from both client and supplier side.

From client side, they have on board their technology support which has taken over this aspect and is prepared to set up the necessary connections and ensure all setups are made in a timely manner.

One of the main points from supplier side is finding an EDI provider which is usually like an internet set up where you would use the bandwidth you have to send and receive information.

They usually have subscription services as well as your regular ISP (Internet Service Provider) so either monthly, yearly, or even per use transmission.

To set up the EDI can be done in two methods:

- Having an inhouse set up where the company's internal ICT team would set up the channels and make sure the information flow is correct in receiving and sending data.
- A service usually referred to as VAN (Value Added Network) would be able to install and manage this externally for the company as it is done with our client.

So while the setup of these channels is initialized, the main indicator is something referred to as the UNB code which is like the virtual mailbox of each party that they use to communicate with each other through.

It is usually a code that both parties agree on and can be composed of alphanumeric characters. When the supplier provides the UNB with the client's tech provider, then they can set up the channel and configure it to send the test delivery plan and confirm that they received it correctly.

### How much does it to set up this channel and to transmit the data?

The initial cost to set up everything from supplier side is around **€1k-€3k** for the setup, training, integration and infrastructure.

After that, it is reasonable to say that to send and receive and process the documents via EDI is around €0.05 each way.

This cost can be reduced considerably if the service is set up in house as in not using an external EDI service provider.

It also differs if they are using a monthly, yearly, or per transaction service, it of course depends on the needs of the supplier and if they already have some sort of connection with another client other than the one we are servicing or if they are not yet ready to implement this technology into their own ERP systems.

### What are the main differences between these formats?

Mainly the Language used, and the 'grammar' used is what differentiates the formats.

1. **DESADV** are written in a way that they utilize tags and the user should compile them with the correct information depending on the field.

   Below is an example of the message and its structure:

UNA:+.?*'

UNB+UNOC:3+UNB CODE+190220:0141+00000000000083'

UNH+247346022+DESADV:D:97A:UN'

BGM+351+Delivery document number+9'

DTM+137:Delivery document date:102'

DTM+132:Estimated time of Arrival:102'

RFF+AAS:71246725'

DTM+171:20190219:102'

NAD+BY+Plant ID::92++ '

NAD+ST+PU21::92'

NAD+SU+Supplier ID::92+'

LOC+11+PU21'

TDT+12+M+++PICK::92'

EQD+TE+ '

CPS+1++1'

PAC+146++CTN90'

LIN+++PART ID:IN'

PIA+1+000000000000039420:BB'

IMD+++:::7507 PY21W 12V21W BU 420'

QTY+12:1260:PCE' *Quantity being shipped*

DTM+94:20190219:102'

RFF+ON:7700001250:00020' *PO number and PN position*

UNT+84+247346022' *End of the message*

UNZ+1+00000000000083'

2. **AVIEXP** also utilizes tags and the user needs to compile it with the relevant information. The main difference with DESADV would be that some tags include multiple information in the same line whereas DESADV each tag is for a specific piece of information.

   Below is a sample file:

   UNB+UNOA:1++UNB code:AA+190111:1107+16'

   UNH+1+AVIEXP:3:0:OD'

   MID+MMW-384/01+190110:1107'

   CDT+5909000832404: '

   SDT+Supplier code: ++++PL'

   CSG+Plant code:++PL'

   DTR+MMW-384/01/2019+5909000832404'

   ARD+PartID:W01192.00:VW370+Quantity:PCE+4500023384/00960' *PO number and PN position*

   DAN+630+MMW-384/01+Delivery document date'

   UNT+18+1' *End of message*

   UNZ+1+16'

3. **VDA**: is a bit different than the others as it was mainly used as a standard by German companies and it mainly uses numbers instead of tags, there are some tags numbered from 711 to 719 and the fields to be filled out are according to the position in the line.

   The following is an example:

   **711**03Plant code 340000 0029700298Date of dispatch \avis VDA4913

   **712**0300009461 Freudenmann Date of shipment11160000825000067303 0052 01kfz KFZ-Kenn1807241116 1

   **713**038160107618072466 03 961 066

   In the end, the supplier must decide with their EDI provider which format and standard best fits their needs and their ERP systems for them to be able to send it without any issues.

Below you can find a division of the supplier who chose to adhere to each format.

| Standard | # of supplier |
|---|---|
| **EDIFACT** | 64 |
| **ODETTE** | 12 |
| **VDA** | 12 |

*Table 2 Supplier divided by EDI format*

It is not surprising that the EDIFACT standard is the most utilized as it the one used by the UN and backed by the UN. It is also the most regularly used by most service provider.

After that, we see that ODETTE and VDA are second at 12 each. It is worth noting that VDA is relatively foreign as it is related particularly to German companies who have chosen to adopt it.

## 3.6 Alternative

The alternative to sending the ASN via EDI channels set up by the supplier and the clients tech support is to utilize the client's webpage designed specifically to transmit the delivery plans to the supplier and for the supplier to fill out the correct information and send the ASN through it.

This was produced by the client and managed by their external provider as a workaround for the suppliers who are not able to implement EDI now.
Since the client is concerned mainly in receiving the ASN above all else, this solution was viable for some suppliers.
The user interface of the webpage is simple to use and we as Accenture were tasked with introducing the suppliers who must use it during the training phase.

| Adhesion type | # of Suppliers | % of GR |
|---|---|---|
| **WEB** | 120 | 52,40% |
| **EDI** | 85 | 44,70% |
| **Missing** | 6 | 2,90% |

*Table 3 Suppliers divided by Adhesion type*

120 suppliers chose to use the web portal, this was due to many reasons:

1. The supplier doesn't have enough resources to devote to the Full EDI implementation
2. The cost of the implementation is too high for them
3. They do not ship that much towards the client's plants and thus it made sense to use the web page option instead of investing for a low return.

As the web option is free of charge and only requires an internet connection, whereas the EDI implementation requires some significant amount of money to be invested which depends on the supplier's relationship with the client and how much they ship to them.

## 3.7 Phases

The project was divided into four main phases:

- Introduction
- Training
- Testing
- Initiation.

At the beginning of the project, a few big suppliers and suppliers that were already familiar with EDI and ASN in their normal operations were approached as a sort of pilot or quick win to test out the implementation of the project.

### 3.7.1 Introduction

It was intended to introduce the suppliers to the program and invite them to a dedicated meeting to better explain all the necessary activities that will take place and what is expected from them and from the client. This phase is subdivided into 5 main waves globally taking into consideration the suppliers' location of operations.

The waves are:

- Italy
- EMEA (Europe, Middle east and Africa) excl. Italy

- NAFTA (North America)
- LATAM (Latin America)
- APAC (Asia Pacific)

A meeting took place in each of these regions and an invite was sent out to all the suppliers that operate from that region in order attend. Of course, there was some push back from the suppliers and not everyone was so on board to adhere to the program from the get go, and that is where we as Accenture stepped in and had to implore to them the importance of the program.

In the end, around 200 suppliers have adhered to the program some of which chose to implement EDI and the others chose the webpage option as their resources were not enough to support implementing EDI in their companies.

Given that the client is based out of Italy and has a multitude of suppliers from Italy, it made sense to start off with the suppliers they are more familiar with and that supply them with goods on a regular basis.

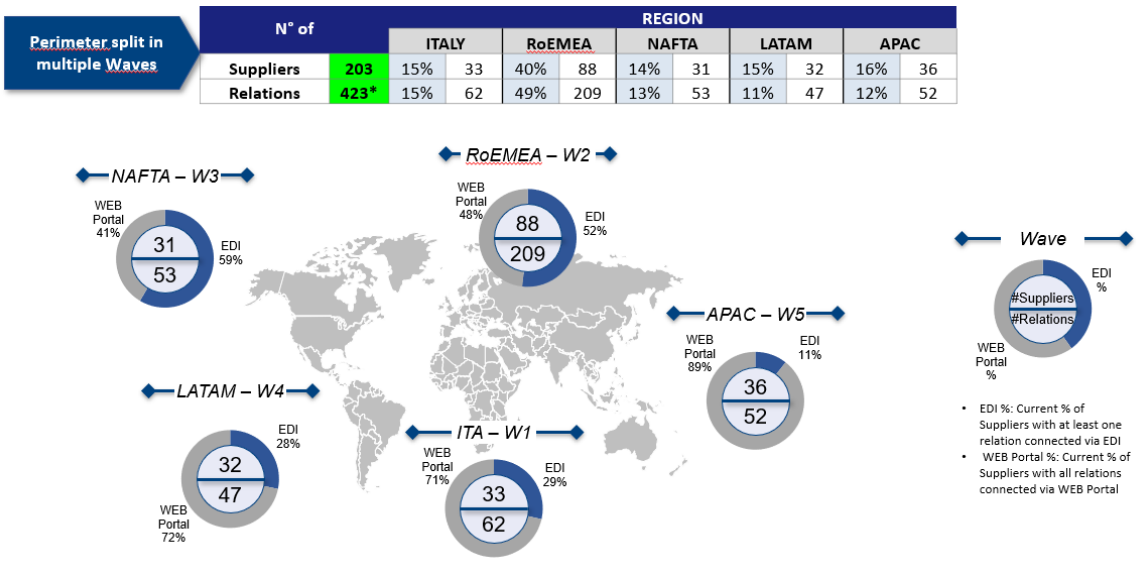



*Figure 8 Suppliers across the globe Source: Accenture*

The map above shows the number of suppliers chosen to participate in the program across the globe according to their regions. There are indicators of how many suppliers

and how many relations as some suppliers might have multiple relations with the client supplying multiple plants at the same time.

So that is why the relations are more than double the number of suppliers in the highlighted section of the table above.

Worth noticing that most of the suppliers are located in EMEA with the other three regions having around the same number of suppliers of around thirty.

It isn't that surprising given that most of the plants of the client and the client itself are based out of Europe.

### 3.7.2 Training

In this phase and after the suppliers were introduced to the project at the scheduled meeting in their region. After they chose to use the webpage of the client to send the ASN, we would schedule a dedicated call to introduce all the functionalities to the supplier and make sure that the method of entering the data was clear enough.

We would then schedule a preliminary date to send the first ASN via this webpage with the presence of the plant referents and someone from the client's central team to support in case of any errors.

After that, the plant would confirm the correct receipt of the ASN and then the supplier would have to continue using this method for the rest of the shipments.

### 3.7.3 Testing

This phase was dedicated to the suppliers who can implement EDI.

After opening a request with the client's technical provider to set up the correct channel, the supplier should confirm the correct receipt of the POs through the EDI channel depending on the format they chose whether EDIFACT, ODETTE or VDA. After that, they should start sending a test ASN message through the EDI channel and it would be up to client's technical provider and Accenture to make sure that the ASN the supplier had sent is coherent with the delivery note related to the delivery. Of course, this ASN is just a test message and is not being considered by the client's ERP system as an actual inbound of goods as to not interfere with the actual quantities and deliveries.

It was agreed upon at the start of the project that Accenture would be responsible for the functional checks of the ASN message and the technical checks would be up to the client's technical provider.

### 3.7.4 Initiation

If the supplier is going to send the ASN via the webpage then we need to schedule another dedicated call to send the ASN for delivery in real time.

As for the suppliers who will send via EDI, after the checks are okay from both sides we can move on to send the ASN to the quality environment of the plant and make sure that all fields are present and containing correct information relevant to the plant and supplier. Only after that step, we can schedule to go live with a real ASN via EDI from the supplier.

Making sure that the plant has completed all the cut over activities from their side to receive the message and perform all the necessary steps to process the message, the supplier will send the first ASN on an agreed upon date.

## 3.8 Supplier side

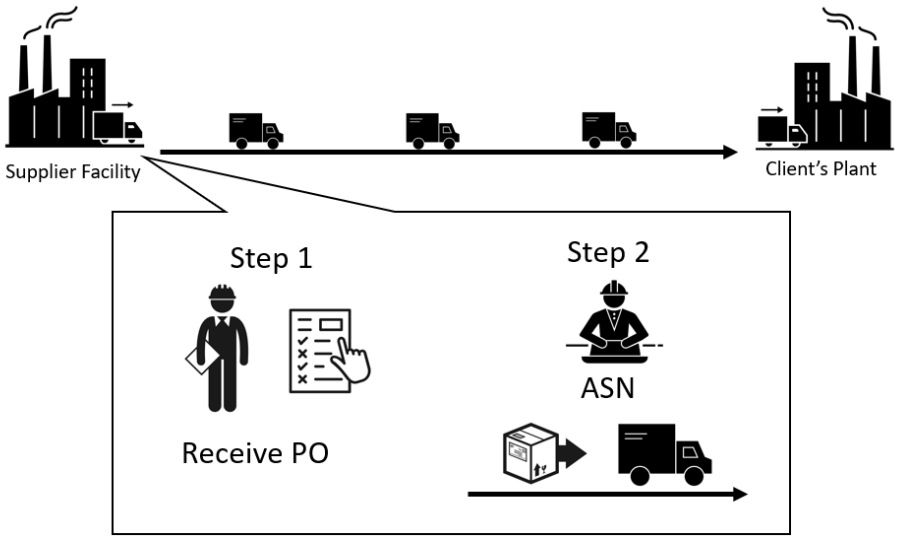



*Figure 9 Activities from Supplier side*

The above figure shows simply how the from the supplier side what are the activities that are changed due to this project from both flows:

- From the client to their system:

They will be able to visualize the PO directly in their system via the EDI channel, where they can control the information found and be aware of how much quantity of each PN is required and at what time the plant needs it.

- From their side to the client's plants:

They will have to send the ASN message towards the plant via either an EDI channel or via the webpage in case they are unable to use EDI. The ASN will have to be sent as soon as the goods leave their facilities and before they arrive at their destination and inbounded.

This is an important point because the ASN is useful to the MRP calculation and figuring out the flow of material and goods in the plant. They use this information to plan out the next deliveries and the assembly line depending on the product each plant is producing.

If the ASN arrives after the good are inbounded this would cause delays in the calculation and optimization of the flow of products to and from the plant to other parts of the client's supply chain.

## 3.9 Plant side

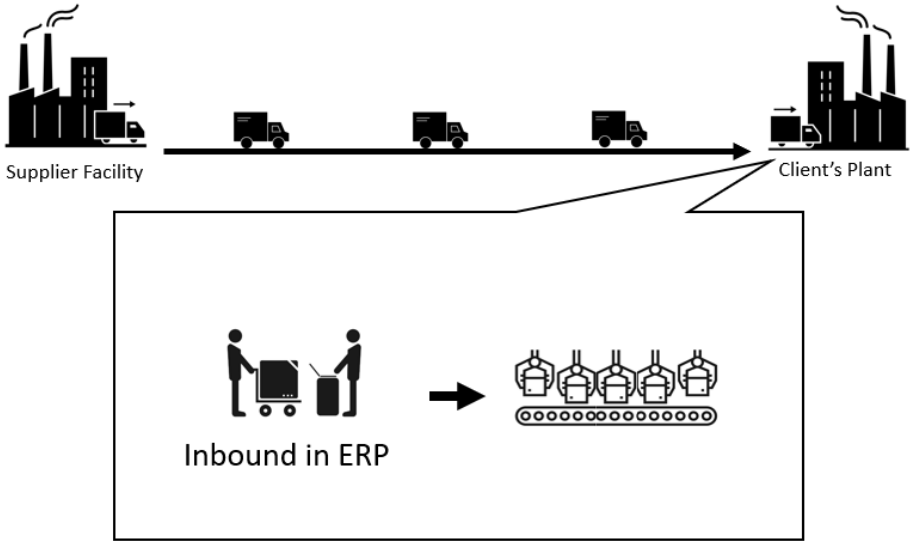



*Figure 10 Activities from Plant side*

From the plant side, they make sure that the goods and the PO are aligned, they must perform a list of cut-over activities that would ensure the transition from the old PO to the new and adjusted PO with the ability to read the ASN in their systems.
After they do receive the ASN from the supplier, they can continue with the inbound of the goods in the ERP machine of the plant. after that they can release new PO where the quantities are changed due to the goods that were received.

There are some activities that the plant needs to take before they can receive the ASN from their side to make sure that the input in the ERP machine is correct.

### 3.9.1 ERP

So how does ERP relate to EDI?

Since the client is using their ERP system to carry though the inbound of the good in their systems, the EDI channel enables the ASN to be transferred directly into the client's systems and then they can translate into a language that the ERP machine can read and correctly complete the inbound.

It is worth mentioning that the suppliers are not always using the same ERP systems as the client, but it does not create an issue because the EDI channels are able to make these systems communicate flawlessly and smoothly.

## 3.10 Cost

Let's have a look at the major costs from client and supplier side.

From client side, the external costs are:

- Accenture's cost was around €350K-400K for the entire project
- Technical provider has a unique contract with the client that is on a yearly basis which encompasses more than just this project.
    - EDI service the client is paying upwards of €30K/year for EDI services across all plants.
    - Maintenance the tech provider also provides general maintenance of the client's information and data as well as he EDI channels set up with
    - suppliers.

Internal Costs are:

- Personnel devoting a % of their jobs to the project.
    - Central 40-50%
    - ICT 40-50%
    - Purchasing 10%
- Administrative costs (Travel, food, accommodation, communication.) since this is a global project, the personnel are required to travel and go to the plants if needed or to solve urgent issues at a moment notice.

I would estimate that the whole project is costing the client around €750k-850k to keep all the activities moving and ensuring the smooth roll out of the project.

From the supplier's side, as I already mentioned, the most substantial cost is the initial EDI setup, but this cost could be less if they are already implementing EDI with other customers of theirs. But, in terms of the client imposing this cost on the suppliers and 'forcing' them to implement this, it can be argued that this is a standard by now and it is on the suppliers to keep up and ensure that they have according to the industry what is an essential part of the communication flows.

## 3.11 Benefits

### 3.11.1 Quantitative

**Zero lost items** because you know as much real time where all the goods are from the moment they leave the supplier's warehouse until they reach the plant.

**Zero re-labeling**, by knowing exactly what is in each shipment, you reduce the effort needed to relabel and correctly do the inbound of goods. Since errors were bound to

happen, re-labeling was a real issue for the client. This issue is expected to be eliminated completely with the implementation of this project.

**Zero re-packaging,** as the above benefit, making sure that the good being received are in fact the correct products that are needed, you eliminate the risk of having to repack them and do further steps in the inbound process which is valuable time that can be used elsewhere.

On average, the client estimated that they faced around **25%** lost items in the past and around **30%** of re-labeling and re-packaging. Having this project be able to reduce them to **0%** would be a great cost saver for the client.

A decrease in unnecessary storage costs is also a very major benefit that the client will find since they won't have to resort to last minute storage for the items that were shipped wrongly or ahead of time due to poor planning.

EDI obviously reduces paper use significantly, and it is a big expense for a company of the size of the client. EDI is paperless and does not require any other physical form of communication other than the screen of the client's ERP.

As of now, around **55%** of incoming deliveries are received without (ASN) from the client side according to the project status.

It would help them reduce costs of personnel that otherwise would have to work overtime to finish all these steps, the costs of replacing the lost items and reordering them from the suppliers. If we assume some numbers of costs for the products on average and the costs of personnel to be used for these situations, we can assume that around **€100k** can be saved per year for the client.

The project is expected to show even more results in the medium to long term because there is a certain learning curve for this type of communication service and with the resistance of some supplier it could be an issue in some cases.

### 3.11.2 Qualitative

The three most important aspects to consider when talking about supply chain are:

**Planning**

Manufacturing companies have to see that this step has become one of the most important steps for their supply chain to function effectively. Especially in the new digital era, it is more important than ever to take advantage of the possibilities that are present,

The three pillars of a good planning are:

1. Know what you have
2. Know what is in transit
3. Know what to order

And ASN can help in all these areas, by knowing for sure when and what goods you have, you can make a good plan to fulfill your orders effectively.

As mentioned in chapter two, the Beergame emphasizes the importance of communication in supply chain especially the planning stage of the chain. To know how much of a product you need and being able to predict when you will need it is very important to make sure the units present and needed are enough.

At the same time, they will for sure see a decrease in unnecessary costs in the short run as the suppliers are still adjusting to this new way of managing deliveries and is expected to increase with time with even more automated features that could be implemented in the future. This decrease encompasses the storage, expediting, and replacement costs that have arisen from ill-managed and paper-based flow of information previously used.

This will lead to a decrease in warehouse costs which is a very high cost given that companies in this industry are always looking at minimizing the material they use, and the amount of storage facilities is a high driver in this area.

Having less uncertainty and variability in the manufacturing process can lead to wonders when considering the costs, it means less contingency needed and less risk will be put on the project

**Inventory**

As mentioned before that this will decrease the inventory costs for the client by decreasing the unused items.

We can also see that it will decrease the products that are out of date quickly, or perishables, products that are phased out by increasing the visibility of the products managed by the client and suppliers.

It is also very important to know the discrepancy between what you have physically in stock in the inventory and how much you have in the books in an accounting side.

This factor will be facilitated very much by the ASN as it will increase the accuracy in the information in the accounting side of the client's financials.

**Customer relationship**

This is another important factor to consider because it is what the project is at its core. Making the relationship between the supplier and client more accurate and more efficient.

The project is from all aspects about communication and being able to communicate better and easier from both sides.

A better planning and a better customer relationship work together to better the inventory management and in turn increase the efficiency of both client and supplier.

### 3.11.3 Suppliers' side

Aside from all mentioned above, we can see some qualitative benefits from the supplier side.

- In the traditional way, you could estimate to pay around €50 to process a Purchase Order (PO) and if a company has 100 PO per month all these would add up to a lot of money.
- Whereas with EDI, it would cost much less to process these documents at around €3
- When you consider the personnel, the training, the errors that would happen; it makes sense for companies who are larger to implement this because in the long run it is saving them money.

Some suppliers have already communicated to us how easier it has become and less tedious from their end to communicate the orders and deliveries to the client's side.

A few have also reported to the client that they saw a reduction in unnecessary shipments and errors that otherwise would have been numerous.

Considering that some suppliers are managing the shipment to the plant is also an important aspect as it is an added level of information that the client would like to know to be as close to real time monitoring as possible.

The lead time between the plant and the supplier is also of note because it affects when the good will arrive and the ASN would give the plant a heads up when taking into consideration when the parts will be present and when they can be used.

That being said, we can identify a couple of scenarios of suppliers in the project:

1. Already implementing EDI with other customers:

We have noticed a fair number of suppliers have indicated that they have already set up this type of communication with other customers of theirs and that the client is also a bit behind on this technology.

It is usually the bigger companies that have multiple relations with the clients that fall under this scenario. As they are so big that they might even be bigger than the client themselves, and they have been in the industry long enough to know that they need to always be on the cutting edge and with the new and improved advancements.

2. New to implementation

Some suppliers have never heard of EDI and ASN before this project which leads them to question whether they even need it in their daily operation and what kind of added value this would have for them.

It is usually with the smaller to medium size company as well as some larger ones who have to consider the cost to benefit ratio that this project would have on them.

3. Refused to participate

These suppliers have communicated no interest in implementing this technology in their systems and they would like to not participate in the program. Some of the reasons they provided are:

- Not enough resources
- Have other projects with higher priority in the pipeline
- Their other customers are not requiring this technology

Another Point of view that can be considered is the size of the supplier and their willingness to participate in the project and implementation of EDI and sending ASN.

However, I do not possess the complete information of the size/revenue of every supplier and I can just provide some observations and assumptions.

- The larger companies have indicated that they are interested in this as it would surely benefit them as well very much and as mentioned previously they are probably also implementing this with other customers of theirs.
- The medium sized companies have usually been open to the project but some have questioned it use and have chosen to utilize the web page option as a transitory step before EDI.
- Smaller size companies have more times than not chosen the web page option and opted out of implementing EDI. This may be because they have probably not that many customers and they are not necessarily in need of such a communication channel to send and receive this type of information urgently.

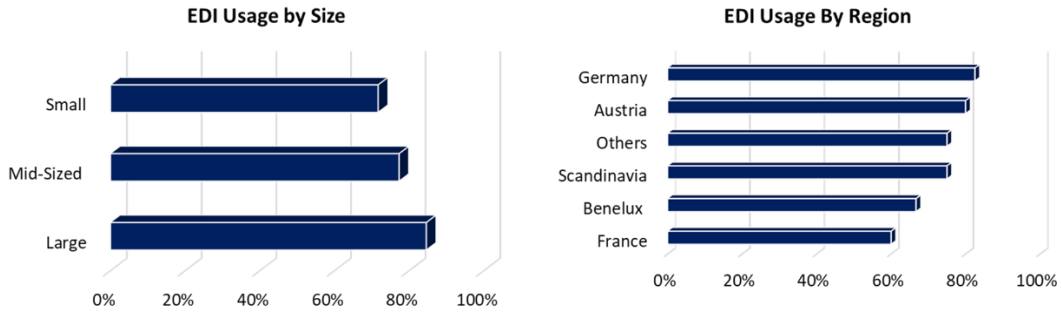



*Figure 11 EDI depending on company size and region Source:Accenture*

The above figure is based on previous data from other projects that were used to illustrate for the client a projection of supplier participation in the initiative.

## 3.12 Problems

Considering that the client is imposing a certain implementation on the supplier in terms of the EDI which takes some investment to implement at first, but the cost advantage is reported above. However, this caused some problems as it is reported below:

- The unwillingness of some suppliers in implementing the project.

This could be due to multiple reasons, some of which are:

- They are unprepared to implement a new change in their systems
- They do not have enough resources
- They are supplying multiple clients and do not see the purpose of introducing this functionality for just one of them

All these reasons are valid in the eyes of the supplier and it is their right to agree or disagree with the client's decision to implement this project currently. However, it is worth noting that EDI has been a standard in the industry and many other industries since a long time, and if they are unprepared or unwilling to embrace the changes that the world is presenting then they should make sure they have an advantage over other customers who might provide an additional service over them such as EDI

- Another problem the client faced was the location and personnel of the plants since these plants are located all over the world, each plant had to be introduced as well to the project and coached on how to handle and receive the correct data that is necessary from the suppliers. Things are never as simple as they are said. With different cultures and different methods of working in each plant affect the way they implement any new approach, it is obvious that some hesitance and lack of skillset is to be expected.

- Lack of communication between client central team and periphery ones in the plant. this issue was very apparent during the final phases of the project for some suppliers, the initiation. At that stage, it is crucial to have all parties aligned and working coherently. But, we noticed that there were some miscommunication or misguided information being transferred from one party to the other and vice versa. This kind of centralized project needs to have more involvement in the actors that will be affected which as well in this case, they were scattered all around the globe.

## 3.13 Observations

The client has been in the industry for a long time and this new implementation was long overdue, they had to rehaul their operation and make sure that they keep up with the bare minimum of the industry. Making sure that this functionality was the first step in their digitalization efforts.

It was not easy, and the road ahead is still difficult. With old management and new ideas, it might be strenuous on the top-level managers to comprehend what they must pour into the company to ensure homogeneity and harmony.

That it is why it is wise for companies like the client to begin with small steps towards a digital future, and Accenture is the perfect partner for this transition.

At Accenture, they have various companies that are aiming at a fully digitized future. And they have outlined the steps they should take into consideration when tackling this topic. Although it might be intimidating at first, the steps necessary are vital to survive in today's atmosphere.

# Chapter Four: Conclusion and next steps

## 4.1 Conclusion

This thesis handled the project of a client that is now starting to embrace the digital era and all that is includes. They wished that this implementation can open up doors for new and innovative prospects for their company later on.

As this project is really the building blocks for any digitalization for supply chain, communication is key, and this project is what communication in the digital age is, it would noteworthy to point out also that newer technology have also emerged such as cloud-based communication and more advanced. However, EDI remains a more universally agreed upon form of communication.

Although we faced a lot of issues and problems along the way of implementation, I would consider this project to be a success for the client and the suppliers alike, we were able to achieve as of March more than 50% of the total GR of the client.

They still have a long way to go but it is not as easy to change paradigms for some larger companies who are such as the client, and which has such a global presence which complicates everything much more.

The culture of the various regions was by far the most difficult aspect to overcome, as each region and country have their own way of doing things and different culture of problem solving. It has been  a very educational experience for me personally as I was able to observe how  a big company would handle such a project on a global level.

## 4.2 Future

A focus on the infrastructure of the company and the education of future employees are key aspects that companies especially in this industry need to be aware of.

Needing to embrace industry 4.0 technology and the use of data for day to day applications is growing and needs their immediate attention otherwise they run the risk of falling behind and being forced out of the industry.

This can be also addressed from the various parties such as government, industry associations, businesses that are aiming at raising the bar of the companies operating to ensure a global and complete efficiency can be reached.

Some of the actions they can do are the following:

- Upgrading tech infrastructure, like mobile and fixed broadband services. It should be reliable enough to withstand a real time data communication from both sides.
- Devoting resources to educate students and educators on the benefits of using the tools at hand at building something new. Fostering an atmosphere of creativity and innovation at schools and universities.

At the same time, with technology like RFID sensors that have been starting to show up at some companies in the industry to get a real time action of what is being delivered, being able to track the truck from point A to point B and making sure that all steps of the supply chain are being executed efficiently.

How this works is that once the pallet or box has been moved to the destination, tags present on them will transmit a signal to the warehouse with a real time visibility for the inventory to be able to record it. This would help extremely in situations when the company has inventory issues and needs to be able to provide the products at the correct time with the correct stock levels present in their inventory.

Of course this is more advanced than EDI and the communication channels used to transmit the ASN. It requires a more sophisticated input of technology experts in the company to be able to implement this in a logistics field.

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