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BUSINESS LOGISTICS IN MODERN MANAGEMENT

Proceedings of the 21st International Scientific Conference

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Faculty of Economics in Osijek

JOSIP JURAJ STROSSMAYER
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Osijek, Croatia 2021

JOSIP JURAJ STROSSMAYER UNIVERSITY OF OSIJEK
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C O N T E N T

FOREWORD

Supply chains all over the world are facing the most complex logistical challenges in the history of mankind. It started with enormous shortages, continuing with worldwide exceptionally challenging distribution of COVID-19 vaccine, to massive post-COVID-19 consumer demand, paired with limited supply of crucial elements needed for our everyday life. In addition, all of these effects have expanded asymmetrically throughout the world. There has never been so much media attention and conversation on logistics, and both the public and governments have never sought so much support and help in the logistics sector. In the meantime, logistics and supply chain professionals are looking for innovative or sometimes even forgotten, but efficient solutions to ensure as normal as possible functioning of the global economy. In this constant quest for further development of logistics and supply chain practices, substantial support is given by the academic community.

After two years under pandemic restrictions and after an online version of 20th conference in October 2020, current 21st international scientific conference Business Logistics in Modern Management 2021 (BLMM2021) was finally held again in person at Faculty of Economics in Osijek, on 7th and 8th October 2021. It was organised by Faculty of Economics, J. J. Strossmayer University in Osijek, and this allowed the long anticipated physical reunion of academic community of logistics and supply chain scientists. BLMM2021 and its book of proceedings present highlights of academic work in the area of supply chain and logistics mainly from Central and Eastern Europe, but also beyond. While Organising and Editorial board received 45 papers, only 33 scientific papers successfully passed review process and are published in this book of proceedings. Altogether, 90 authors, coming from 10 countries (Bulgaria, Czech Republic, Egypt, Germany, Hungary, Nigeria, Poland, Serbia, Slovenia and Croatia) are represented in this publication.

Proceedings of BLMM2021 consist of 33 scientific papers divided in seven chapters. Those chapters were also headings of conference sessions where authors delivered their presentations and, as a fine tradition of BLMM, fruitful discussion was developed. First chapter titled *Logistics response to the COVID-19 pandemic* provides array of effects of COVID crisis on logistics activities in different sectors, as well as novel solutions for stabilizing logistics and supply chain processes. Chapter *Logistics theory, simulation and education* contributes to logistics theory of omni-channel logistics and connection between bullwhip effect and balanced scorecard. This chapter also covers interesting areas of simulations in civil and military logistics and productions, as well as interactions of business organisations and logistics education. *Efficiency in networks and logistics processes* is a title of the next chapter, comprising of papers dealing with efficiency issues in production networks, transportation, storage, distribution and shipment marking operations. Analysis of regional value chains of Croatian neighbouring countries, logistical challenges in wine, maritime, forwarding and food sector in Nigeria, Croatia and Hungary are topics covered in the fourth chapter titled *Local and regional supply chains*. Today's logistics activities and supply chain integration is not possible without implementation of contemporary information technology – from Industry 4.0 to real-time location systems, drones, blockchain and artificial intelligence. They are covered in papers of the fifth chapter

titled *Supply chain technology trends*. Following chapter labeled *Packaging and procurement logistics* proposes algorithms for event detection in packaging vibration testing, highlights importance of transport packaging in diary industry and deals with procurement issues of logistics outsourcing and small-scale public contracts in Czech armed forces. Finally, seventh chapter *Urban and sustainable logistics issues* begins with review on closed-loop supply chains researches, and continues with sustainable development of smart cities for all groups of their citizens, and reflections on public passenger transport estimations.

As a distinct added value of the BLMM2021 conference we were honoured to hear prof. dr. Herbert Kotzab, Professor and Chair of Logistics Management from University of Bremen, Germany. As a keynote speaker, prof. Kotzab presented lecture titled *How sustainable are individualized home delivery options – the case of electronic grocery retailing!* This was second plenary lecture of prof. Kotzab at a BLMM, and a proof of successful cooperation between prof. Kotzab and Faculty of Economics in Osijek.

We would like to thank Ministry of Science and Education of the Republic of Croatia for their support in organisation of 21st BLMM Conference. Besides, we continue with inclusion of Proceedings of BLMM into leading scientific databases which evaluate each annual issue of this publication individually. We are sincerely thankful to all authors who decided to participate in BLMM Conference in these challenging times. Special appreciation goes to our team of reviewers who considerably improved the quality of papers through selfless sharing of their expertise. Finally, Editorial board, Honorary program committee and Organisational committee made it possible to complete the entire process of organising and effectuating the Conference.

In Osijek, October 7th, 2021.

Davor Dujak,
Editor

I. LOGISTICS RESPONSE TO THE COVID-19 PANDEMIC

THE IMPACT OF THE INTERNET OF THINGS AND ARTIFICIAL INTELLIGENCE ON THE SUPPLY CHAIN

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Abstract

With the development of new technologies, increasing internet speeds and the more complex demands of customers in the market, many logistics companies are finding ways to increase the level of their services. Other goals include reducing business costs, shortening delivery time and very good so-called "customer experience". The Internet of Things finds application across the entire supply chain, from the manufacturing process and warehousing to transportation and trade. By using such networked devices, greater control over limited resources is achieved, and the most important thing - time. One of the great advantages can be noticed when maintaining machines because the machine can easily communicate when it expects an error or risk of failure. Devices and machines also exchange information with each other, thus raising the productivity of the processes of which they are a part to a higher level. Other features that networked devices can improve include inventory recording and management, product lifecycle management, customer demographics, and consequently new marketing opportunities. On the other hand, artificial intelligence becomes an obligation to use. By using it, the optimization of the resources offered by the Internet of Things is achieved. As today's life unfolds in dynamic times when the time interval between the arrival of new and the departure of old technology has been reduced to a minimum, people find it difficult to adapt if they do not follow the idea of lifelong learning. Artificial intelligence brings with its machine learning and autonomous machines, which will be used in shipments to the customer's final address. Some of the concepts of artificial intelligence applications are fully automated warehouses, autonomous fleet, forecasting market needs and creating successful new products. In the same processes, there will be a need for better-

educated staff to cope with today's complex and demanding tasks - which is both a challenge and an opportunity for new motivated professionals.

Key words: market, technology, Internet of things, artificial intelligence, supply chain

1. INTRODUCTION

A supply chain is a network between a company and its suppliers to produce and distribute a specific product to the final buyer. This network includes different activities, people, entities, information, and resources. The supply chain also represents the steps it takes to get the product or service from its original state to the customer. Companies develop supply chains so they can reduce their costs and remain competitive in the business landscape (Kenton, 2020). There is no escaping the fact that the customer in today's marketplace is more demanding, not just of product quality, but also of service. Customer service may be defined as the consistent provision of time and place utility. In other words, products do not have value until they are in the hands of the customer at the time and place required. (Cristopher, 2011)

It is a great deal of excitement around the Internet of things right now. This research paper will dive right into some trends within the industry and explain how the Internet of Things (IoT) has been and will continue to completely alter the supply chain. There are some real-world applications and how the integration of IoT is going into the supply chain.

2. HOW IOT IS REVOLUTIONIZING THE SUPPLY CHAIN

Today's consumer IoT devices consist of numerous different technologies, but really what we are looking at is Amazon Alexa - lots of different systems that allow you to communicate via the internet to have updated and successful technologies. There are different items like a drone that has numerous sensors on it, constantly collecting data about its environment to be able to fly an unmanned vehicle. You have smart refrigerators that can send you grocery lists while you are at the store. You can reorder your food while you are sitting there in your living room. It has come quite a long way a figure that is out there – right now 50 billion devices are connected to the Internet. We have come a long way from the toaster being connected to the Internet, and the word IoT is not going anywhere.

2.1. Challenges

What happened in the industry, and what the main issues were before IOT came about? The first one is the lack of visibility. The most common issue there is that

within the warehouse, a lot of times the main question tends to be - where the stuff is and so. With IoT we can answer that question, we can provide that end-to-end visibility and particularly sensitive products. If they are time-sensitive, if they are perishable, if their impact is sensitive etc. Having that information of where is my stuff becomes increasingly more important. Particularly with consumers today, they want their products same day or next day delivery. To be able to offer that customer service aspect that is a benefit of IoT as well.

Almost all companies would agree that tracking goods is one big issue. For example, there is 700,000 square foot facility, and WMS or ERP system is doing a great job tracking while the assets are in storage, but once they come out of storage and you are looking for that consolidation or that shipping - that period once those products are moving within the warehouse; you do not have the tools to track them. Unfortunately, a lot of people do not have an answer to this, but with IoT companies can find one specific item that they are looking for, they do not have to spend time, effort and money sending one person out looking throughout an entire 700,000 square foot facility to find that one particular item. With IoT companies can offer alerts, they are a great option as well if they have items that need to be alerted upon movement or a specific action that happens. They can know that right at the time when it happens. Real-time feedback and connection are the new standard. This means that companies are being able to have alerts if something wrong happens in the supply chain. When a problem happens in the supply chain, it is used generally one of two ways that someone finds out; employee running around frantic looking for that warehouse manager trying to get that person to realize they got an issue, their products are not there when they need them to be, or it is a customer calling and complaining saying company did not deliver at the time and place as promised. With IoT companies can completely alter the supply chain and provide that end-to-end visibility that customers are looking for.

2.2 Specific Trends within the Industry

Some of the reasons that companies are using the Internet of Things today in the supply chain and materials handling industry is because of the complexity of the processes, previously it might have been a lot more difficult.

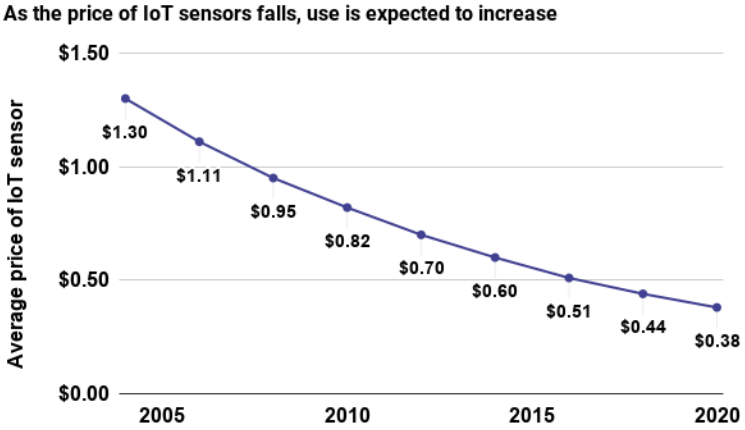
The first technological trend that is speeding up the implementation of the IoT is mesh networks. Mesh networks is essentially the ability of devices to talk to each other without having to go through a middleman, like a router for example. When you are at home, basically what you have is a router, and then your phone is connected, your voice assist and your laptop are connected, and then that is how they are connected to the internet. One of the problems that you can see here is that if the router dies, then you don't have access to the Internet any longer. There is a unique point of failure in this type of network topology. In a mesh network, every device can talk to each other. For example, there is a laptop ‘A’ that wants to talk to voice assistant ‘B’, instead of having to go through a router it can go through another laptop ‘C’ which

then relays the messages to another laptop or voice assistant. This still looks a little bit like the router architecture, but it can be a little more complicated. One of the things that are nice about mesh networks is that you can integrate new devices in real-time. You do not need to do configuration and to set up the Wi-Fi. You have the capability of immediate integration into the network, where it gets interesting is if smartphone 'D' has connectivity to the Internet, then it can relay messages from other devices to the internet. One of the other nice things about mesh networks is that they can be self-healing, for example that battery from your laptop 'A' died, and it no longer can relay messages from one to another device. In this case, for example, there is phone 'E', then that phone can still relate the message over to laptop 'C' which then relays the message out to the internet. There is no need for any specific node to be fully functional because they are all connected to each other, and as long as there's a path out to the internet then you immediately have Internet connectivity. You may be asking yourself why mesh networks are no more heard of, the answer to that is segmentation. Mesh networks have been heavily segmented by different vendors implementing different protocols, everybody has their own way of doing it. Obviously, this lack of openness did not really allow for widespread innovation, but there is a technology that all our phones have, most of our laptops will have, and a lot of other devices have, and that is Bluetooth. As version 5 of Bluetooth mesh networking is supported, this means that all the new phones coming out here within the next year or two, all the new devices coming out will have Bluetooth 5 enabled. They will be able to talk to each other and other companies that have mesh networks created like that.

The second trend is cellular networks. The first system which was known as the car phone, the mobile telephony system in 1949 was not really improved until 1969 with the improved mobile telephone service. That is about a 20-year gap. Then the world got 1G in 1984. That is about 16 years as the world turns into the new millennium. In the current century, technologies keep improving, and we have seen 2G, 3G, LTE, 4G, and nowadays 5G. The world is having exponential growth in the deployment of cellular networks and in the improvement of cellular networks. Today the world has tens of thousands of different towers all over the globe, and this allows everyone to have internet connectivity pretty much anywhere in the world.

The third trend is sensors. Of course, we had sensors before, but the most important factor is the decrease in the cost of sensors. From 2004 up until 2020, that is about a 16-year run, the average cost for a sensor was $1 and 30 cents in 2004, today in 2020 is 38 cents for the same average sensor. What this means is that there is roughly a 23% costs reduction year-over-year for IOT sensors. (Leonard, 2019)

Figure 11. Price decrease of the sensors



Source: Leonard, M. (2019). The declining price of IoT sensors means greater use in manufacturing [available at: https://www.supplychaindive.com/news/declining-price-iot-sensors-manufacturing/564980/, access: May 22, 2021]

This means companies can start putting sensors on everything. They can for example have a shipment that someone is trying to track, and they want to get information about that shipment, like what kind of impact has it had, what has a temperature been, what kind of humidity has been exposed to etc. If you want to make thousands of these devices, if you had a dollar and 40 cents per sensor you know you might think about it twice but if you are looking at 40 cents per sensor then you know that enables you to build those solutions a lot more visibly.

These three trends apply to a variety of industries, everyday things. It is applicable to supply chain, to materials handling, to manufacturing, sense the world around us and build all kinds of applications from it.

2.3 Applications of IOT with Examples

Some specific applications with examples in IoT technology is corresponding to what we are seeing in warehousing and material handling, and there are three key areas. The first is management - both labour and equipment. The second is maintenance and the third is safety.

Starting with labour, it is safe to say that labour is a big headache for a lot of people right now. Labour is very expensive, it is very hard to find, and then perhaps even harder to hold on to. With these challenges with having labour, the goal is getting as much out of the operators or the employees, and a lot of companies are looking on IoT to help them with these issues. Within a warehousing activity, major functions such as picking or put away, the most common technology that is used is RF technology where workers are scanning at the start of a task and scanning at the end

of the task, and that way they are confirming that tasks are complete, and then also they can track productivity from their operators.

This technology is limited because it does not show what happens between point A and point B. With IoT, companies can track where their operators or their employees are in the facility. This is not a way to hold employees more accountable because companies know could look back and see what they are doing, but to understand tendencies across operators. If there is one operator that is picking forty lines an hour and there is another operator picking 80 lines an hour, companies can look back at what that slower operator is doing; from the pick path for travelling, and kind of understanding where they might be going wrong. Companies can use that as an intelligent way to identify where they need additional training. That is kind of within a particular function where we see IoT being applied, but also, we can see an increase in productivity in labour across functions. If there is another area within the warehouse that is still being bogged down by a lot of work, information is going fast so other employees would know where to help. There are sensors on all kinds of conveyors and that is communicating real-time data to them, and they can collect that data and basically create a visual representation of where the work is in their facility.

This kind of human-machine interfaces where managers can see the conveyor system area of the facility, and if some sensors are being blocked, all that information and those visuals can be accessed through mobile devices because they are connected to each other on the internet. A supervisor who oversees a couple of zones the workers are done with their obligations, he can quickly pull up a tablet and transfer workers from one area to the other with more needs. With these tools, labour is becoming more flexible, better, and quicker. The supervisor does not need to walk over to other area to realize that they did not actually need help.

Companies can utilize their labour a little better. Another way is data that they are collecting in terms of the productivity and the transactions they are doing. All that data is being fed to one centralized area, and one thing that IoT is doing now is that it is trying to take the raw data and do a lot of that heavy lifting for companies that is going to supply them with charts and graphs that are automatically generated in terms of labour productivity. If they want to change a certain strategy on Monday, they will know and see the effects from their productivity through those charts that are automatically generated. They can get a lot quicker feedback in terms of how their operators are working.

In equipment management, material handling equipment is quite expensive, but it is necessary, and it is hard to get away without it. Companies are seeing IoT to play a key role in trying to maximize the performance of their material handling equipment, both from a fully automated technology and from a more manual technology.

Automated guided vehicles (AGVs) seem like becoming more and more possible because of IoT technology. The number of sensors required on AGVs to make them safe with humans, as well as to have the vision systems to pick products without bumping into things (Kumar, 2020). That is all being driven by advancements in sensors technology and then also companies can have large fleets of AGVs because

they can have them connected to each other through the internet, either communicating with each other or communicating through kind of a central controller - that they can have a large fleet to work effectively, kind of as a team, so they can choose the task to perform based on their current location. That is from a kind of a fully automated standpoint.

From a more manual standpoint, more and more sensors are being put on fork trucks so they can track certain metrics, such as the percentage time that they are using the truck versus it sitting, the percentage of time that truck is traveling with a load, versus with empty forks, and that gives them enough information to kind of ask themselves and start doing the analysis on do they have the right size of fleet, do they have too many trucks, because their utilization across the trucks isn't very high, or do they not have enough trucks, do they need on an average day versus a peak day. That gives them good insight into determining how many trucks they need to buy or how many trucks they need a lease across the year.

Another kind of important piece of information that companies can track with sensors on forklifts is the battery levels of the trucks. Batteries are also expensive and can be a huge issue if companies are not doing correct maintenance on them. Companies have sensors that can track the actual battery and the battery level on their truck to take away forklift to get serviced, they even can instruct their operator exactly when they need to go get serviced. That way they are maximizing the output with each charge cycle without doing serious damage to batteries.

2.4 Predictive Maintenance schedule

Maintenance is kind of an unavoidable inconvenience; it would be great if all systems are working at 100% all the time. Supply chain systems typically are very efficient when they are fully running and operating, but that is not the case or as often as everyone would like. One thing that IoT allows companies to do is to move from a preventive maintenance schedule to more of a predictive maintenance schedule. Preventive maintenance means they are typically doing routine maintenance based on a certain schedule that is determined by engineering estimates, and what companies see with that is that there's kind of two main issues with doing preventive maintenance based on engineering estimates.

One is that they are often very conservative to make sure that they do not have those costly breakdowns, and that is great from an uptime standpoint, but also it is taking more time in general from their maintenance staff, and then also resources in terms of spare parts.

Another issue is that these engineering estimates are not necessarily accurate because the variance of when a part might need a break, or might break, or might need a change is so high and dependent on their warehouse applications such as how many shifts are they operating, what is the temperature like, is it dusty like as a manufacturing environment versus a distribution environment.

Those are kind of the issues with a preventive maintenance but with the predictive maintenance equipment is communicating to them on what is the health of their equipment, it is telling them when that belt is wearing out or when they need a battery change. It basically allows them to do maintenance purely when they need to do maintenance. With predictive maintenance, companies will be able to catch those things more easily in less hours required on maintenance, less money devoted to maintenance, and then also more uptime.

Another piece on maintenance is the upgrades, and how companies are trying to more future proof their systems. Kind of a hot word nowadays is future-proof, and with all these systems being connected to the internet they can push upgrades, patches, any type of fixes that are on a software standpoint wirelessly, either through the original equipment manufacturer or they can provide it to do it on their own time.

For example, with smart cars, when they are plugged in at the night, there a manufacturer can run an update so that the next morning when you get in your car, it is an improved car. The nice thing about these automatic upgrades is that you can do them during off shift hours where you have maybe no one in the facility or maybe just one person in your facility watching it and manning it. It is not going to interrupt operation by having it during off shift.

Another piece on maintenance is that not only is the equipment communicating to them its health, but it is also communicating that health to the equipment manufacturer as well. They are getting useful information on the performance of their equipment based on the characteristics of their end-user. They can identify trends in the failures that are occurring and understand where their weakest points are in their systems, and that can be the key areas where they devote more engineering time to improve. Companies are moving forward to quicker responses on improving their equipment.

2.5 Safety improvements

Safety and material handling equipment (MHE) collision detection is another big step forward. In 2015 OSHA posted an article saying that every year there is approximately a hundred thousand US injuries that are related to forklift activity, which is quite high. If we assume, that was one injury per forklift that would be an 11% of all forklifts in the US would be involved in some type of worker injury (Michaels, 2016). That is very high, and companies were looking to IoT to help bring that down. There have been some capabilities for detecting collisions. If you go into a warehouse and talk to someone that has been in that warehouse for 10 or 15 years, they tell you where the most dangerous parts are in their facility based on experience, but you know any new employee would not going to understand where those kinds of hot areas are. With this capability, companies can collect information on where those collisions are occurring, and they can go back to those automated reporting. Automated generation of charts and heat maps can create more of a heat map of where

their most dangerous areas in facility. They can plan around those by changing the pic pass or just planning the routing a little more effectively.

Another thing with MHE is that companies want to make sure that when they have operators on material handling equipment, they are aware of the employees around them that are doing stuff not on equipment. With IoT they can set sensors, both to the equipment and in humans, to create certain notifications or alerts when there is a proximity between a piece of MHE and another piece or with an operator. Whether that is through sound or vibration they can notify them to know. If they are within 10 feet of each other they get a little extra alert or notification, that they can make sure that their operators are being careful when they are near people.

The last piece of safety is a little bit more on wearables that employees can wear to track real time their health. These things are very popular in the fitness industry for several years now, they are tracking the number of steps you take, your heart rate across the day, how much energy you are exerting etc. This is going to become more of an application in warehousing to better fit or better understand the company's employees' requirements in terms what is the frequency that authority need to give these operators breaks and how long should those breaks be, based on the function they are performing. Companies are giving operators the same break schedule regardless of function, if they are on a piece of material handling equipment versus doing a lot of walking. Their break schedule may need to differ, and we can look at how their energy being exerted across time can play into that.

Another thing is that companies can investigate their productivity a little more - so one way to understand if a new slotting method is more effective is how many steps is their operator doing and their old method versus their new method. It gives them more visibility into the health of their employees to make sure that they are safe. From a health standpoint especially, because they are spending so much time working at their facility in a day, and a lot of tasks in the warehouse are manually intensive.

2.6 Unmanned Aerial Vehicles

Small, nimble, and autonomous, a different kind of aircraft has taken to the skies in greater numbers over the last few years: drones. More groups, businesses and industries are learning to harness this technology's ever-growing potential as it becomes more accessible, with logistics companies set to benefit the most. From being used in warehouses to dropping off critical medical supplies in rural areas, drones are fast changing the face of global logistics from the first to the last mile. (DHL GmbH, 2019.) Drones, also known as Unmanned Aerial Vehicles (UAVs), are flying devices that can be remotely controlled by a person or a computer. It is mostly used in situations where manned flights are either too risky or difficult to operate. Drones are set to transform and revolutionize the supply chain, drones play an integral role in helping to streamline and speed up processes, lower costs and to reduce environmental impact.

According to (DHL GmbH, 2019.), the drone logistics and transportation market in 2022 has value of US $11.2 billion, and in 2027 it will be valued at US $29.6 billion. These are seen as game-changing applications such as transforming the warehouse, solving the last – mile delivery problem, reaching far – flung and rural areas. Drones can reduce human workload and perform tasks such as: taking stock of and managing inventory, transporting products from shelves to the picking station, raising safety levels and preventing inventory mismatches. One of the biggest challenges in modern supply chains is the last-mile delivery problem. A delivery drone can send a parcel directly to a customer or to a self-service parcel station within a specified time window, it is also used to provide relief to traffic congestion, especially in emerging markets with high e-commerce growth. Drones can reach remote, hard-to-access areas to deliver critical supplies, such as vaccines or rescue aid (Liao, 2019).

3. MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE

When is the topic about artificial intelligence (AI), machine learning is always included, and with them in combination, we have data, a lot of data. Companies are increasingly becoming data-driven organizations. When we think about lots of data, some milestones could be achieved, such as: growth in the business, for example market share increase, increased customer satisfaction, rate of experimentation on data, and growth of data.

3.1 Machine Learning

Machine learning is really the change in the way that companies are processing information, and the way they write computer programs. They used to write programs that they would tell a program exactly what to do. To look for a particular result, and then take an action based on that result. With machine learning what they do is they teach the program to look for patterns in the data, then they feed it with the data, and then it learns from the data that they feed it. It learns what patterns to find, and that allows companies to find all kinds of how to solve problems that companies cannot solve with just a single answer. An example might be looking at the letter ‘A’ written by a person, every person might write that letter slightly differently, and that is something that is very hard to answer. What companies see is when they apply those machine learning techniques, especially to domains that are very familiar for humans like speech or vision, then what they get is the ability to have machines that act more and have more like human characteristics, that is what companies would end up calling artificial intelligence. But why are these technologies today so important? There are three trends that are driving a transformation in the world around us today that are behind this.

First trend is the growth of data; IOT and the number of connected things that there are in the world are driving a massive explosion of the amount of data that we

and companies must work with. Data is what fuels these algorithms and the insight the intelligence companies can create. There is also an increasing number of things that are born digitally, more data that is born digitally, companies can easily get to the data and use it.

The second thing is cloud maturity, as the cloud has come and become a mainstream technology, companies were able to build systems in a different way. They do not have to design for the biggest scale on their own networks, they can design applications and then use the cloud to scale much greater levels than they would if they were paying for all that upfront. That allows companies to bring a lot more computational resources to bear on the problem.

The third area is, an outcome or a cycle of the other two, the maturity of the algorithms is getting better and better. Companies are able to do things that they couldn't do before. An example might be speech recognition, it is here for a long time, but there's always that background noise or it is a different accent that throws the models of the algorithms they write off. Now companies are starting to get much better algorithms that can handle all kinds of things. There might be the garbled sound of a voice coming in through, for example a drive-through, but algorithms can still recognize the speech on the other side.

3.2. Artificial Intelligence

Once upon a time artificial intelligence and these things were on TV shows, and movies, usually not even earth-based, started back up in space, because on earth we could never figure how this works. Today we have systems like Cortana or Google Now in our pocket and ask about anything in the world and get intelligent responses.

Fundamentally how it works; if you take the example from earlier in this paper, that you are trying to write a program that recognizes the letter 'A', one way to do that would be to write down the letter 'A', scan it in, and then tell the program: this is the letter A, whenever program see's this, the program can say that it sees the letter 'A'. The problem is the reality of trying to solve that problem. In the scenario where millions of people are writing those characters, and everyone would be different, so they write a program that does not look for that exact answer. What it does is, it looks for the patterns and they feed it, they might feed it a million or hundreds of thousands of examples of the letter A, and it will learn from those. Then what it is doing as it looks at those, it finds the commonalities in that, and in those images, it builds a model that it can use. When the process passed it another image program can say: "that looks like the letter 'A' based on what I've learned about that".

3.3. Practical Applications of the AI Technology

The businesses like predictive analytics, they want to predict when a machine is going to fail if they have expensive machinery that is connected. It could be an airplane engine, or it could be an elevator they want to know well before there is any

problem with them. Managers want to know about that, predictive tools are a big thing that we see in supply chain management. Managers could forecast demand scenarios, and they want to know how much of each of the units they might be selling, is it going to be needed in each area. The better they can forecast that, the more efficiently they can serve they customers, and make sure that exactly what they want is what they get at the time they want it. Those are very common things that we see common use cases. Understanding a customer and being able to make recommendations that are relevant to that person is having a deeper understanding of what people want as they use their products. That is another very common use case of artificial intelligence and machine learning as they are being infused into the workplace.

Once upon a time there was resistance because of technology and even the idea of artificial intelligence is seeming crazy to many people. The thing that drives that change in the mentality to embracing these things is the result of more active and accurate understanding of how the products are going to behave, and better serve the customer. That becomes compelling for people. The engineers who are inspecting engines inside of airplane through the process that is called engine maintenance, they want to be sure that engine is always in the best shape it can possibly be. To run reliably and effectively is another common case, and to be able to predict the behavior of that machinery, and the behavior of the engine they can look at cases like that to be able to give feedback to the pilots and help them understand. They are constantly making trade-offs about how efficiently they use the fuel versus how effectively they land the plane. They can analyze those behaviors and the patterns, and then give them feedback on how effectively they do that.

Another example that we have is Schneider electric, and they do worldwide power management. They have giant solar arrays that they use to power all kinds of different organizations from cities to villages in remote locations. They have had a problem where they had dust that would come in, and land on the solar arrays. It would cause the solar panels to become less effective, and they did not necessarily know if a panel had broken, or it was just a dust storm. Knowing the difference between if they need to just send somebody out there with a squeegee, versus do they need to send somebody out there with a repair truck. Having the right information can have a massive impact on their cost, but also their ability to supply these people with reliable sources of energy. (Schneider Electric, 2018) The spectrum of using of this technology is quite interesting.

The combination of augmented reality and AI can combine things with analytics from Cortana intelligence suite so organizations can visualize well what they are seeing inside the machine. For example, if some parts are damaged, the information is flowing through the engine, and they can even see overlay hotspots. The program can show you the most common areas of failure, and even give instructions on how to repair that engine based on the most common patterns that is known and seen. It is staggering, it is very cool, and very exciting.

Both growth in the business and increased customer satisfaction are wonderful outcomes and they are examples of result that businesses are achieving, that is making their customers happy. They do not necessarily predict what is going to happen in the future, but that one they are really trying to do.

It is focusing on transforming the way organizations work so that they can have more experiments on the data that drive the experimentation up higher and higher and become increasingly data-driven in the decisions they make, because that allows them to see things. To use the machines to find patterns that they might not otherwise find.

4. CONCLUSION

As the technology is rapidly developing in many new ways, customers and business are improving and stabilizing their relationships. It is also important to say that many new jobs are created because of new trends and applications. Jobs are expecting to be with more ergonomic practices, to increase productivity, health, and safety.

The Internet of Things is running through all segments of life today. The cities we live in, aided by technology, are becoming smart cities, and making it easier for us to have a hectic lifestyle. The Internet of Things is widely accepted in all industries and is relied on by many both legal and natural persons. Logistics has always been one of the most important branches of business, management, and space management.

Today, it requires many improvements and constant innovations to meet the needs of users at the right time and in the right place. The business uses various information systems with logistics modules that facilitate business. The best example of such a system is SAP and its MM module that covers the entire logistics process. In practice, we also find logistics management and WMS warehouse management system.

The application examples listed in this article cover a wide range of AI applications for the entire supply chain. But turning logistics processes in operational business into autonomous and predictable processes will certainly pose a challenge. The transition to intelligent logistics will take several more years. Knowledge of the importance of AI for the enterprise, consistency in leading towards this goal and the appropriate culture of the enterprise is required to apply the ongoing development process in which artificial intelligence is currently located.

Automation used to mean big stupid machines doing repetitive work in factories. Today they can land aircraft, diagnose cancer, and trade stocks. We are entering a new age of automation unlike anything that's come before. Things used to be simple. Innovation made human work easier, and productivity rose. Which means that more staff or services could be produced per hour using the same number of human workers. This eliminated many jobs, but also created other jobs that were better which was important because the growing population needed work. So, in a nutshell, innovation, higher productivity, fewer old jobs, and many new and often better jobs. Overall, this worked well for most people and living standards improved.

Our jobs are now being taken over by machines much faster than they were in the past. While new information age industries are booming, they are creating fewer and fewer new jobs. In 1979, General Motors employed more than 800,000 workers and made about $11 billion US dollars, in 2012, Google made about $14 billion US dollars while employing 58,000 people (Galactic Advisors, 2020.).

Here, Google is an example of what created new jobs in the past: innovative new industries. Old innovative industries are running out of steam. When cars became a thing 100 years ago, they created huge industries. Cars transformed our way of life, our infrastructure, and our cities. Millions of people found jobs either directly or indirectly. Decades of investment kept this momentum going. Today, this process is largely complete. Innovation in the car industry does not create as many jobs as it used to. While electric cars are great and all, they won't create millions of new jobs. The Internet created new industries, but they're not creating enough jobs to keep up with population growth or to compensate for the industries the Internet is killing. Innovation in the Information Age doesn't equate to the creation of enough new jobs, which would be bad enough on its own but now, a new wave of automation and a new generation of machines is slowly taking over.

Robots will be able to do everything better than us. Nearly half of all jobs in the U.S. are in danger of being automated over the next 20 years (Benedikt Frey & Osborne, 2013.). Occupations that require repetitive and predictable tasks in transportation, logistics and administrative support were especially high-risk. In addition, robots don't need health benefits, vacation, or even sleep for that matter. But the debate over whether robots will take over all our jobs is by no means settled. After all, someone must program the robots. In the niches like IT, customer service and advanced manufacturing industries will add workers over the next two years because of automation. It's hard to imagine that robots could replicate human characteristics, like empathy or compassion that are required in many jobs.

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