ARTIFICIAL INTELLIGENCE IN THE LOGISTICS INDUSTRY

The recent examples of great successes and innovations globally prove that that it´s the hyper-connected, truly digital organizations who will strive ahead of the competition, thanks to their ability to react and predict market changes. A recent Oracle study shows that 46 percent of tech-savvy business leaders report positive revenue growth, compared with only 29 percent of tech-challenged leaders.

With the right tools at your disposal, you can be the change leader that will create a business ready to disrupt. And one of them is Artificial Intelligence (AI).

Paired with other advanced technologies such as Internet of Things (IoT) and Machine to Machine (M2M), AI could have a positive impact to your activity, such as enhanced productivity, better speed/response times and the ability to see end-to-end across the value chain. Additionally, it could improve accuracy in deliveries, increase quality of your products/services and lower the costs. Moreover, it can provide easier ways for anticipating customer needs.

But in order to cope with all these changes, you may need some help. Therefore, you may have to think about outsourcing and/or fleet leasing, for example. All in all, smart logistics means reaching an unprecedented level of collaboration, so be ready to extend your partnership with suppliers, customers, and other players across the logistics, supply chain and transportation value chain.

WHAT IS AI?

Artificial Intelligence (AI) is a term used for referring to the "intelligence" demonstrated by machines, in contrast to the natural intelligence displayed by humans and animals.

To put it more concretely, AI makes it possible for computer systems to learn from performing repeat tasks, adjust to new inputs and perform like humans. In order to do that, most AI-related products are using technologies such as deep learning and natural language processing. This way, computer systems can be trained to accomplish specific tasks (such as problem solving) by processing large amounts of data and recognizing patterns in the data.

There are three stages of Artificial Intelligence:

1. AI that is customize experiences, learns and "mimic" what humans do in order to provide solutions *ad-hoc (*this is the current situation)

2. General AI, which means that machines will have the same "intellect" as ours

3. Super AI, which means that machines will have a superior "intellect" than ours
AI is used in many fields, from automotive (e.g. self-driving car), to healthcare (e.g. virtual nurses) and logistics.

AI IN LOGISTICS

In a 2016 study carried out by Crisp Research AG among IT decision-makers, logistics was found to be one of the sectors with the greatest number of companies already making active use of machine learning processes and other AI-related tools. In fact, at that time, 41.7% of the leaders from this sector that participated at this study said that their companies already had initial experiences and AI-related prototypes. This signals that the maturity of the tools and frameworks is sufficient to be considered for productive use in the company. The view in the market has shifted significantly. Businesses are seeing more and more potential for in-house applications and are increasingly actively engaged in machine-learning prototypes and potential use in production environments.

This is partly due to the fact that the logistics sector has become extremely competitive due to the changed requirements (e.g. e-commerce). Now, traditional companies have to make strategies that have also a digital component. On top of that, they have to address new challenges such as same-day delivery and constant goods availability. This is way there is a need for an urgent reorganization of logistics companies' existing business models and strategies.

A report published by DHL in 2018 concludes that AI could be a great solution for adjusting rapidly to this new environment and for manipulating a great quantity of data: "One answer to this is the large-scale automation of all logistics processes and their integration into and management by a standardized IT system. Such a system, however, is still based on inputs from human operators, even if individual process steps already run largely autonomously due to the integration of sensors, etc. This is where the phenomenon known as the "curse of dimensionality" comes into play: as

the size and complexity of logistics operations increase, or with the necessity for time-critical decisions, even previously established mathematical optimization algorithms fail. The time frame in which to reach a decision becomes shorter and shorter, while the size of the problem simultaneously increases. Through the use of AI technologies, logistics providers are not only able to differentiate themselves from the competition, but also to increase their returns. Intelligent analysis of the data volumes that arise at all stages of the supply chain makes it possible to detect previously unseen inter-relationships, develop realistic scenarios for the near future and design the overall flow of goods to be much more agile and less susceptible to disruption. Even today, AI technologies are being used in a range of applications. These are often as yet isolated solutions, but the trend is clearly towards integration".

Ideally, all of these solutions should be linked together and coupled with other technologies such as IoT, Machine to Machine and Big Data Analytics. The ultimate result should be an ecosystem with a seamless flow of products and information from one end to the other. And this fits perfectly in the logistics world: the network-based nature of the industry provides a natural framework for implementing and scaling AI. But remember: all of this should amplify the human potential of your employees. Yes, AI is good, at least for now, for doing repetitive tasks - so it is time to come up with a strategy for all these job replacements, in order to emphasize creativity, innovation, critical thinking and other human attributes. Also, keep in mind that AI and other advanced technologies have the potential to create new roles.

THE WAR FOR TALENT

In order to successfully implement a project in the field of artificial intelligence, well-trained specialists are required. These usually include data scientists, data engineers and platform operators.

Platform operators are responsible for operating the IT landscape. This includes all well-known activities related to the operation of platforms and data centers.

The *Data Engineer* initially performs an important task in the field of data pipelines or even ETL processes. Without data in a Data Lake, an expert cannot build models. As a result, the data engineer takes care of the data management processes, including lifecycle management, the big data platform, and the distributed algorithms and systems, when the models need to be distributed and scaled accordingly. In addition,

the Data Engineer has in-depth knowledge of software engineering, distributed systems and algorithms.

The *data scientist* uses the prepared and provided data, creates analyzes, evaluates facts and finally generates the models for the products and services. This requires deep mathematical knowledge and profound knowledge in artificial intelligence.

The best machine learning software and hardware will not do anything without the right experts and professionals to know it and get the results right. That the search for the right human resources is no easy task, is well known. The most recent global survey published by ManpowerGroup revealed that IT related roles are on no. 6 in the "hardest roles to fill" rank. Therefore, finding good professionals - whether in-house or externally, with the right AI skills - is all the more difficult. So you have to invest in your people strategy now!

DATA - A GOLD MINE

One of the most underutilized assets in the industry is the high volume of data that supply chains generate on a daily basis. AI is a great tool to leverage this potential. In addition, this technology offers logistics companies the ability to optimize network orchestration to degrees of efficiency that cannot be achieved with human thinking alone. For example, AI can help the logistics industry to redefine today's behaviors and practices, taking operations from reactive to proactive, planning from forecast to prediction, processes from manual to autonomous, and services from standardized to personalized.

TOP BENEFITS OF DISRUPTIVE TECHNOLOGIES
(according to a Forbes Insight study)

The following are considered to be the top benefits of transformative technologies, according to logistics, supply chain and transportation executives that have responded in the survey:

Productivity / Speed: Nearly two-thirds of respondents say they anticipate significant productivity benefits with the help of technology, such as better optimizing routes and equipment.

Workforce Satisfaction: Workers tend to experience greater satisfaction when they are given the right tools to enable optimum job performance.

Customer Satisfaction: Fifty-three percent of respondents believe technology will deliver significant benefits across the whole of the customer experience.

Uptime / Flexibility: Over half of survey respondents anticipate significant improvements in both uptime (53%) and flexibility (53%). "Key uptime benefits will derive from technologies such as IoT, supplemented by AI and human intuition. By having a clearer window into vehicle usage and performance, fleet managers will be better able to use preventive maintenance to avoid potential breakdowns", according to the report.

NEW TRENDS IN LOGISTICAL AI

In DHL's Logistics Trend Radar study, there are two trends that could shape the logistics industry in the future:

- **Anticipatory logistics**: "The forecasting of demand trends has effects on the entire supply chain, from manufacturers, who are able to ramp up production, to transport businesses that can have the appropriate number of vehicles in readiness, through to the retailers, who can order and store appropriate stocks in advance and adjust their personnel planning in response to the predictions. What is more, anticipatory logistics make it possible to detect risks in the supply chain at an early stage, from the likelihood of a vehicle or a machine malfunctioning through to seasonal waves of illness with impacts on staffing levels".

- **Self-learning systems**: "Machine learning is used to read handwritten documents (e.g. labels on letters or packages) and to detect recurring events in the warehouse or during picking, which can then be incorporated in specific picking rules. Prompt automatic reordering of items in the appropriate quantities can also be optimized using self-learning algorithms".

AI: THE EUROPEAN APPROACH

The European Commission has built its Artificial Intelligence strategy based on three pillars:

1. **Being ahead of technological developments and encouraging uptake by the public and private sectors**

The Commission is increasing its annual investments in AI by 70% under the research and innovation program Horizon 2020. It will reach EUR 1.5 billion for the period 2018-2020. It will:
- connect and strengthen AI research centers across Europe
- support the development of an "AI-on-demand platform" that will provide access to relevant AI resources in the EU for all users
- support the development of AI applications in key sectors

2. **Prepare for socio-economic changes brought about by AI**

To support the efforts of the Member States which are responsible for labor and education policies, the Commission will:
- support business-education partnerships to attract and keep more AI talent in Europe;
- set up dedicated training and retraining schemes for professionals;
- foresee changes in the labor market and skills mismatch;
- support digital skills and competences in science, technology, engineering, mathematics (STEM), entrepreneurship and creativity;
- encourage Members States to modernize their education and training systems.

3. **Ensure an appropriate ethical and legal framework**

Some AI applications may raise new ethical and legal questions, related to liability or fairness of decision-making. The General Data Protection Regulation (GDPR) is a major step for building trust and the Commission wants to move a step forward on ensuring legal clarity in AI-based applications.

European Commission welcomed the final Ethics Guidelines for Trustworthy Artificial Intelligence prepared by the High-Level Group on Artificial Intelligence published on 8 April 2019.

Case studies

1. LLamasoft: Demand Guru - Modeling Software For Accurate Demand Prediction
   It can predict demand patterns into the future using state-of-the-art machine learning algorithms—no deep statistical background required. Also, it will analyze seasonal demand, trend data & external influencers to rapidly and accurately forecast future market demand for short, medium & long-term horizons.

   It has an abundance of weather and economic time series datasets that can be used to identify cause and effect relationships to better predict future demand. Also, it makes correlations between external weather, demand and other influences. This way, businesses can identify ways to cut costs and increase operational efficiency across their supply chains.

2. Aera Technology
   Aera offers predictive analytics software based on machine learning (aided by domain experts) for applications in supply chain management. The company claims that its applications can help to automate planning and optimize existing supply chain flows for businesses.

3. Swisslog: The Learning warehouse
   Swisslog is claiming that thanks to complex computing operations, its warehouse systems learn to recognize patterns, regularities, and interdependencies from unstructured data and adapt, dynamically and independently, to new situations within the entire logistics system.

   Technologies such as machine learning and AI ae used for gathering experience, anticipating situations, and expanding existing know-how without outside help – in a few seconds. Or so it claims.

Sources and further reading

1. Artificial Intelligence in Logistics - DHL And IBM

2. Artificial Intelligence in Logistics - SSI Schaefer

3. Forbes Insight Survey

4. Career Magazine