AI in Marketing

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Lecture 55- AI in Logistics Management-II

Welcome to this NPTEL online certification course on artificial intelligence marketing and now we will talk about module 55. So as you can see that in these two modules we are talking of AI in logistics management and this is the second part of it and module 55. Now these are the things that we will talk about in this module. So to start with we will study logistics industry 4. Then we will explore the technological elements of logistics 4, discuss key challenges facing logistics 4 and explore AI driven transformation of supply chain management. Logistics industry 4.0, logistics is being transformed through the power of data driven insights. In logistics data availability exponentially increases with the increased use of sensors and a key question is how to efficiently and effectively ensure data quality. Industry companies are trying to adopt innovative IT solutions to improve intra-operational processes and achieve end to end visibility within the supply chain. The impact of industry 4 on logistics is depicted in the figure on the next slide.

So this is logistics industry 4. Planning operations commercial and support. This is IoT, cloud logistics, big data, AI, robotics and blockchain. So now you see that here in planning big data and AI are making a difference. So substantial impact and significant impact substantial impact.

So in planning big data has substantial impact and AI has a significant impact. Then in operations IoT has substantial impact, cloud logistics have significant impact. Again big data, AI, robotics and blockchains all of them have substantial impact in operations. In commercial cloud logistics big data and AI have significant impact while blockchain has substantial impact. In support again IoT, cloud logistics, big data, AI they have significant impact while blockchain has substantial impact.

Now let us look at the logistics industry 4.0 elements. The first is internet of things that is IoT. IoT technologies virtually correct physical objects by sensors and allow them to receive, restore and send information which may improve decision making process. In logistics IoT can be used to enhance vehicles, infrastructure and services and driving improvements for transportation system operators and users.

The key opportunity from using IoT is real time connectivity which offers potential to improve quality of services and increased control. However the total cost of implementation are still high and issues like security concerns and lack of legal regulation presents major concern for decision makers in logistics companies to opt for the implementation of IoT. The development of low cost IoT networks and decrease in sensor prices may shift the current trend. Cloud logistics, cloud logistics refers to new business model called logistics as a service. By using LAS logistics practitioners have the opportunity to use innovative IT solutions customized for logistics industry.

LAS is changing the form and function of information technology infrastructures making supply chain information collaboration easy and feasible. LAS also offers easier way to establish efficient and effective logistics processes which significantly decrease cost and increase time savings. As pay per use politics and scalability are particularly suitable for small and medium sized logistics companies to be competitive on the market. Today more than 50 percent of logistics providers use cloud based services and further 20 percent are planning to do so in the near future. However the three potential obstacles may inhabit LAS adoption.

The first is the security concerns. The second is compatibility with other IT solutions within logistics company and the third is the performance issues. The next is big data. Big data is the data characterized by four V's and those four V's are volume, variety, velocity and value. Big data has already changed logistics industry by transforming large scale structured and unstructured data into values information for logistics managers during decision making processes.

There is a huge potential in turning unused data into competitive advantage on the market. Forecasting of market demand and new business models customized for customers are some of the examples of advantages achieved by implementing big data in logistics. The advancement of big data analytics along with AI will allow real time route optimization, holistic forecasting of fleet capacity and demand for goods and reduction of risk through the supply chain network. The biggest threat to the wide adoption of this paradigm in logistics are security issues. The next is artificial intelligence.

AI technology is an integral part of almost every IT system today. It is closely related with IoT technology which allows data collection by sensors, cloud computing technology and big data paradigm. AI can be observed as a set of technologies interrelated with the aim to solve complex problems. Typically, AI technology consists of three types of components. One is sensing, processing and learning.

Sensing component refers to data obtained usually from sensors from the physical world. Processing component refers to the set of algorithm implemented in various software solution with the aim to process data. Learning component refers to capturing patterns of

structured and unstructured data. In logistics, AI can provide optimal solutions for vehicle routing and consequently cost reduction, ensure productive forecast for demand, accelerate decision making and increase customer satisfaction through the personalization of logistics services. The strongest challenge is high implementation cost for a logistics company.

The next comes robotics and automation. Robotics is a science field closely related with AI and further with IoT, cloud computing and big data. Robotic has the great potential to be implemented in dynamic environments such as production and warehousing. According to DHL research, 80% of warehouses are manually operated today which leaves plenty of opportunity for automation. In highly automated warehouses, autonomous vehicles are used for the realization of transport processes.

Autonomous vehicles provide higher speed, precision, safety and tracking capability than to forklifts, hand-pallet trucks and higher rack pallets. Also, autonomous vehicles can be reprogrammed, permanently operational without human intervention, modular and easily integrated with other robots and devices. Compared to traditional warehouses, highly automated warehouses provide a high degree of flexibility and lack of the need for installation of fixed infrastructure. However, significant resources needs to be invested in the implementation. Still, technological advances may decrease required resources in the near future.

Next comes blockchain. A blockchain is a decentralized, distributed and public data ledger that is used to record transactions across many computers, so that any involved record cannot be altered retroactively without the alteration of all subsequent blocks. Blockchain technology basically allows shift from a centralized to a decentralized and distributed database system. The greatest potential of its application in logistics lies in global trade, where solutions that reduce supply chain trade barriers can increase global GDP by nearly 5% and the global trade by 15%. The potential advantages also include increased transparency, traceability and speed of good deliveries, decreased overall cost and digitization of all key documents such as invoices with stakeholder participation.

However, since logistics industry is highly fragmented, the adoption of blockchain technology in various industries will be very costly and unpredictable. Also legislations regarding the subject need to be defined more thoroughly in the near future. Next comes implications for SCM. The adjoining conceptualization shows in which direction the transformation of supply chain management will occur. Here are digital and physical worlds and inter-corrections between them.

So here we have the physical world and here we have the digital world. So then we have digitization, analytics, connectivity and sensors. Repurpose, reuse or dispose and store.

Suppliers, inbound logistics, manufacturing, outbound transportation, distribution, customers. Forecast, locate, collect, test and decompose, store, reuse.

So this is how it goes and it shows how the things are connected in the digital world. Forecast to locate, to transfer, to collect and transfer, test, sort, decompose, store, reuse and dispose. Here we have suppliers, inbound transportation, manufacturing, outbound transportation, distribution and customers and they are all connected to each other in the digital world. In virtual world, this concept implies an integration of data networks and ICTs and in the physical world this means establishing personalized transport services and optimized distribution of goods. Autonomous vehicles and robots are some of the examples of innovative ICT solutions that enable self-control of logistics subsystems and their mutual interconnections.

Sensor data are collected in the physical world along with the entire closed-loop supply chain. Traditional technologies such as radio frequency identification or global positioning systems also produce a vast amount of data. Furthermore, there are some other data sources relevant to supply chain management. For example, digital click streams, camera and surveillance footage, imagery, wikis and forum discussions that usually produce unstructured data. In total, there are tremendous amount of data that needs to be processed instantaneously through the connectivity layer data analytics improve decision making and add value to logistics services.

The key challenges for logistics industry 4.0. Logistics industry 4.0 concept has numerous opportunities to transform logistics industries by data-driven insights. The explosion in data size is inevitable today due to the necessity for data collection from multiple sources including autonomous vehicles, robots and other smart machines.

Research have highlighted three key challenges for logistics companies. The first is data collection, storage and processing. With the constant increase in the amount of generated, structured and unstructured data, the need for different ways for data storage and processing is also growing. Investments in innovative ICT solution equipped with sensors are growing with the increase in their additional performance and in their capacity to collect, store and transmit data. New algorithms and models are constantly being developed.

Decentralized databases for data storage are being replaced with a centralized database system. However, there is still a lack of regulations for data management. As a result, redundant data is stored in different sectors of the company and additional costs are needed to eliminate them as much as possible. The second challenge is data security and lack of standards. In the complex and highly fragmented, logistics industry companies need to share data constantly to keep logistics processes optimized.

One of the advantages is to keep the stock level at minimum. However, security issues are major concern for decision makers. A security breach may be defined as the incident in which a logistics company loses sensitive data. Unauthorized access to sensitive data may cause high cost from more than one perspective. For example, production plan may need to be re-evaluated and trading partners may lose trust.

Security standards and norms are also a condition of achieving a high number of network partners without regulations small and medium size companies will have to adopt to standards of the large company of which they are a supplier. The third key challenge is lack of digital strategy. Along supply chain and value creation chain as well, data need to be vertically and horizontally integrated and available for all parties involved. Vertical integration refers to integration of various ICT solutions in the complex information system. Horizontal integration refers to the integration of processes between stakeholders along the supply chain.

So these are the two integrations that we are talking about. This includes the exchanging of data between different sectors such as supply, production and sales of several logistics companies along the entire closed loop supply chain. Therefore significant institutional and corporate investments need to be implemented to achieve retail supply chain in the back end. Now let us look at AI driven transformation of supply chain management. The supply chain is the web linking together multiple functions including logistics, production, procurement and marketing and sales.

Integrated planning enables companies to balance trade-off across functions and customize earnings before interest, taxes, depreciation and amortization. That is EBITDA for the organization as a whole. The figure in the next slide gives an overview of future of supply chain. So this is the future of supply chain. Digital and AI will enable end-to-end transparency and faster decision making.

So here it is. Marketing and sales, unified and more accurate price and demand forecast enabled by AI, increased transparency and granularity on integrated margin by sales. Here it is procurement, full data integration with suppliers, optimization of raw materials recipes based on, based on forecasted prices. Now this comes planning, full transparency on execution through end-to-end digital control tower. Risk adjusted end-to-end margin optimization. Then comes logistics and distribution, dynamic optimization of routing, freight contracting and vessel sharing, reducing cost and environmental impact.

And then comes agile production and schedule. So all of them are connected to each other. So this is what the future of supply chain will look like. Transforming a supply chain is an ambitious undertaking and companies should be fully aware of the challenges. However, the potential benefits are significant. Companies that are able to

manage four specific areas in tandem will be positioned to achieve far greater visibility and better decision making, all powered by AI.

The steps for AI driven transformation of supply chain management and the challenges are shown in the next slide. So companies face common pitfalls along their planning transformation journey, leading to more than 60% of projects being late or over budget. So these are the areas of an AI driven supply chain transformation journey. And here we are talking of typical pitfalls. So these areas are value creation identification, strategy and roadmap.

Then there is design of target solution and vendor selection. Then comes implementation and system integration and change management, capacity building and full value capture. So typical pitfall less than 60% of recent projects were delivered either late or over budget. Value unclearly identified. More than one third of companies perform a value diagnostic.

Overlook design phase, few companies conduct a design of solution prior to vendor and solution selection, leading to suboptimal choices and value leakage. The next is the insufficient impact focus and execution rigor. 25% of supply chain leaders feel their objectives are aligned with system integrators incentive. And inadequate capacity building and change management. 13% of global senior executives say their companies are adequately prepared to address the skills gap.

So let us look at the first thing that is, so this is the first. Value creation identification strategy and roadmap. As a first step companies need to identify and prioritize all pockets of value creation across all functions from procurement and manufacturing to logistics and ultimately commercial. Less than one third of companies perform an independent diagnostic at the outset but this exercise can ensure companies have an accurate list of all the value creation opportunities. Clearly defining a digital supply chain strategy helps support the company's business strategy and ensure better alignment with its digital program.

In addition, a solution agnostic assessment enable companies to identify the process redesign, organizational changes and capabilities required to boost performance as well as create a strategic roadmap. The second is design of target solutions and vendor selection. The complexity of supply chains from demand forecasting to planning optimization and digital execution tracking means that finding one provider that can meet all of these needs is increasingly unlikely. Executives could recognize that the right answer for their company would not necessarily be the one recommended by the provider whose goal is often to push for a single end to end solution. Solution design and vendor selection can help support the digital supply chain strategy.

Often the best approach is a combination of different solutions from different providers implemented by different system integrators. Companies that select a suite of solutions must make integration a top priority. The third is implementation and system integration. Many companies have not had sufficient experience in implementing organization-wide technology. Once companies select solutions, the risks are falling behind the implementation schedule and coming in over budget while losing focus on the primary objective that was to properly address value creation levers from the first pitfall.

Only 25% of supply chain leaders reported feeling their objectives are aligned with the incentives of their system integrators. Companies should take a holistic approach to implementation and system integration. By optimizing the end to end value, companies can implement solutions that deliver value in the short term and are more sustainable over the long term. The fourth is change management, capability building and full value capture. Even while focusing on tech solutions, companies must attend to vital supporting elements such as organization, change management and capability building.

Research suggests this task is a common challenge. For example, only 13% of executives report that their organizations are sufficiently prepared to address their skills gap. To ensure adoption of new solutions, companies must invest in change management and capability building. Employees will need to embrace new ways of working and a coordinated effort is required to educate the workforce on why changes are necessary as are incentives to reinforce the desired behavior. So to conclude, Industry 4 is reshaping the logistic industry in the way that many processes are being digitally transformed. When new technology is introduced in a company, resistance of change is almost inevitable due to the need for transformation of processes and working habits.

Key challenges facing the progress of digital topics in logistics include high cost of technology, lack of trust in data security and lack of regulations and standards. The lack of trust in data security will be more difficult to deal with because it introduces risks and uncertainties. Supply chain management has never been more formidable but help is on the way. AI will be able to provide teams with deeper insights at a much higher frequency and granularity than ever. However, this visibility alone will not be enough to capture more value from AI-based supply chain solutions.

Any sizable technology investment must be matched by organizational change, business process updates and upscaling efforts. Only then will companies capture the expected ROI. And these are the 6 sources from which the material for this module was taken. Thank you.