

AI in Product Management
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Lecture - 26

AI Tools for Demand Planning

Welcome to this NPTEL online certification course on artificial intelligence and product. Now we will talk about module 26, which is AI tools for demand planning. So now we are talking about module 26, which is AI tools for demand planning. To give you an overview, in this module, we will start with what demand planning is and how it is different from sales forecasting. We will also discuss why demand planning is important and the problems with traditional demand planning methods.

Then we will understand how AI can improve demand planning and what factors affect the accuracy of AI-based demand planning. Finally, we will discuss how to implement AI-based demand planning and the best AI-based tools for demand planning. So, what is demand planning? Demand planning is a supply chain management process that enables a company to project future demand and successfully customize the company's output, be it products or services. According to those projections.

So, it is the linchpin of an effective supply chain, which makes it doubly important to business. Demand planning seeks to achieve and maintain An effective lean supply equilibrium, one in which store inventories contain just as many products as demand dictates, but no more. Finding that perfect balance that exists between sufficiency and surplus can prove especially tricky. And although maintaining that balance is a major concern of demand planning, so is the constant effort to help shape demand through the effective use of promotion.

Effective demand planning Typically requires the use of demand forecasting techniques to accurately predict demand trends and carries added benefits such as heightened company efficiency and increased customer satisfaction. How is demand planning different from sales forecasting? So, demand planning and sales forecasting are closely related concepts, but they serve different purposes. Focus on different aspects of business operations. Here is how they differ. The first is purpose. Now, let us look at demand planning. It focuses on predicting and managing customer demand for products or services across the entire supply

chain. It aims to align inventory levels, production schedules, and supply chain resources to meet future demand efficiently. Demand planning considers factors like market trends, promotions,

seasonality, and external events. The next is sales forecasting. It specifically focuses on predicting future sales volume for a particular product or service. It provides an estimate of how much revenue or units a business can expect to sell over a specific period. Sales forecasting primarily helps in setting sales targets, managing cash flows, and guiding marketing and sales strategies.

The second factor is scope. Again, let us look at demand planning. It has a broader scope as it integrates multiple aspects of business operations, including supply chain management, production, inventory control, and customer service. It involves cross-functional collaborations between departments like sales, marketing, and supply chain. The next is sales forecasting.

It has a narrower scope and is primarily concerned with sales numbers. It provides estimates based on historical sales data, market conditions, and internal factors like sales team performance. Sales forecasting is usually handled by the sales and marketing teams. The third area of concern is the focus on the supply chain.

Now let us look at how it happens in demand planning. It is heavily focused on aligning the supply chain to meet future demand. It ensures that raw materials, production capacities, inventory levels, and logistics are all aligned with expected demand to avoid stockouts or overstocking. In sales forecasting, it is not directly concerned with supply chain issues.

It focuses on predicting how much a business can sell, but it does not explicitly address how those sales will be supported through production and supply chain processes. The fourth area of concern is the time horizon. In demand planning, it typically works on both short and long terms. The horizon may include long-term strategic planning, for example, 12 months to 5 years, to manage supply chain capacities as well as short-term adjustments. Quarterly or monthly adjustments are made to react to immediate changes in demand.

Sales forecasting usually has a shorter time horizon. Often focusing on a weekly, monthly, or quarterly basis to predict immediate sales numbers. It helps in setting sales quotas and short-term revenue projections. Why is demand planning important? The first is that it improves forecasting accuracy.

Accurate demand planning helps businesses better predict customer needs, leading to improved sales forecasts. This ensures that businesses are prepared for fluctuations in demand. Reducing the uncertainty and the risk in the supply chain. Second is optimizing inventory levels. Proper demand planning ensures that companies maintain optimal inventory levels, avoiding the costs associated with overstocking.

For example, storage costs, product obsolescence, and stockouts. For example, low sales and customer dissatisfaction. Then comes enhanced customer satisfaction by anticipating demands accurately. Businesses can ensure that products are available when and where customers need them. This improves service levels and customer satisfaction, leading to repeat business.

The fourth is that it reduces operational costs. Demand planning minimizes inefficiencies in production and supply chain management by aligning resources like labor, materials, and equipment with actual demand. This reduces unnecessary production and transportation costs. It facilitates better decision-making. Data-driven demand planning provides businesses with valuable insights into market trends, customer behavior, and seasonal fluctuations.

This information supports better strategic decisions regarding product launches, marketing campaigns, and capacity planning. It enables supply chain agility. With an accurate demand plan, businesses can adjust their supply chain operations quickly in response to changes in demand or market conditions, making them more agile and competitive. Support financial planning. Accurate demand forecasts enable businesses to create more reliable financial plans, including budgeting and revenue projections.

This helps companies allocate resources effectively and meet financial goals. Minimize waste. Demand planning reduces excess inventory and overproduction. Minimizing waste in manufacturing and logistics aligns with sustainability goals and helps businesses improve their environmental impact. Now, what are the problems with traditional demand planning methods? The problems with traditional demand planning methods are the existence of data silos, inaccurate forecasts, and a lack of responsiveness.

Traditional demand planning methods often struggle with the efficiency and effectiveness of supply chain operations. These challenges primarily stem from outdated practices, technological limitations, and organizational silos, which can lead to inaccurate forecasts and a lack of responsiveness to market changes. What are the common challenges and limitations? The first is data silos.

Traditional demand planning often operates in silos where information is not shared effectively across different departments or stages of the supply chain. This lack of integration leads to inconsistent data for planning and forecasting, resulting in inefficiencies and increased chances of error. Inaccurate forecasts: traditional methods frequently rely on data and linear forecasting models that may not account for complex market dynamics or sudden changes in demand patterns. This can lead to forecasts that

do not accurately reflect current market realities, causing either overstock or stockouts. Lack of responsiveness. Traditional demand planning methods are often rigid and lack the agility to respond quickly to market changes. This sluggish response can be detrimental in fast-paced industries where consumer preferences and the competitive landscape evolve rapidly. Bullwhip effect.

A significant issue in traditional supply chains is the bullwhip effect. Where small variations in demand at the consumer level cause progressively larger fluctuations in orders and inventory upstream. Poor information flow and forecasting practices exacerbate this effect, leading to inefficiencies and increased costs throughout the supply chain. Impact on Business Operations and Profitability: The limitations of traditional demand planning methods can have profound impacts on business operations and overall profitability.

Increased costs due to inaccuracies in demand forecasting can lead to excessive inventory holding costs, wasted resources, and increased operational expenses. Additionally, the bullwhip effect can cause significant inefficiencies and cost escalations across the supply chain. Reduced customer satisfaction because of failing to meet customer demand due to stockouts or delays can lead to decreased customer satisfaction and loyalty. Conversely, overstocking resulting from inaccurate forecasts can tie up capital that could be used more effectively elsewhere. Lost sales and market share due to the inability to respond swiftly to market changes can result in lost sales opportunities and diminished

competitive edge, as competitors who are more agile can capture market share by more effectively meeting customer demands. Operational inefficiencies of traditional methods that do not utilize advanced analytics or real-time data are often less efficient, leading to suboptimal production schedules, increased lead times, and a higher likelihood of errors in order fulfillment. Now, how can AI improve demand planning? AI improves demand planning by introducing real-time data processing, adaptive learning for demand forecasting, and integration with inventory management. Artificial intelligence has

significantly transformed demand planning by introducing capabilities extending far beyond traditional methods' reach.

These advancements enhance the accuracy and efficiency of demand forecasts and integrate seamlessly with modern technologies like the Internet of Things to revolutionize inventory management. In the next slide, we will bring into specific improvements AI brings and explore real-world examples of AI successfully enhancing demand planning outcomes. So the first is real-time data processing. AI excels in handling and processing large volumes of data in real time. This capability allows businesses to react swiftly to changes in demand patterns as they occur.

Unlike traditional methods that rely on historical data, AI algorithms can instantly adjust forecasts and analyze current market trends, consumer behavior, and external factors such as weather conditions or economic shifts. This real-time processing helps companies to be more agile, reducing the risk of overstocking or stockouts. The second is adaptive learning for demand forecasting. AI systems employ machine learning techniques that enable them to learn from past data and continuously improve their forecasting accuracy. These models adapt over time, becoming more refined and accurate as they process new data. This adaptive learning capability is crucial for industries with volatile demand patterns and unpredictable factors. AI models constantly adjust their parameters to provide up-to-date forecasts for market conditions.

Integration with IoT for inventory management. Integrating AI with IoT devices has opened new avenues for inventory management. IoT devices can track inventory levels, monitor goods conditions, and even predict equipment maintenance. When fed into AI systems, this data can dramatically improve the accuracy of demand forecasts. For instance, sensors in a retail store can track foot traffic and product interactions, providing data that AI uses to accurately predict future.

Product demand. What factors affect the accuracy of AI-based demand planning? Factors that affect the accuracy of AI-based demand planning are data quality, model selection, and integration with the existing IT infrastructure. Integrating artificial intelligence into the demand planning process is a significant leap from traditional forecasting methods. AI's ability to analyze vast amounts of data, including external factors, enables the identification of complex patterns that human

analysts might miss. This capability leads to more adaptive and comprehensive forecasts, helping businesses navigate market complexities, optimize inventory management, and

achieve a more effective supply chain with reduced risk and lower costs. However, several critical factors influence AI effectiveness in demand planning, including data quality, model selection, and integration with existing IT infrastructure. Understanding and mitigating the risks associated with these factors is crucial for harnessing the full potential of AI in demand planning. So, the first factor is data quality. The accuracy of AI-driven demand planning relies on the data quality fed into AI models. High-quality integrated data from various sources, including historical sales,

market trends, and external factors like weather conditions or economic indicators, are essential for generating reliable forecasts. Mitigating this risk involves investing in robust data management practices and consistently cleaning, validating, and updating data. Model selection: Choosing the appropriate AI model is another critical factor affecting demand planning accuracy. The selected model must align with the specific characteristics of the business demand patterns and data structure. While some models may excel in capturing seasonal trends, others better suit products with irregular demand.

Employing the right model can result in accurate forecasts, leading to overstocks or stockouts. Businesses should conduct thorough testing and validation to identify the most suitable model, considering model complexity, interpretability, and computational requirements. The third is integration with existing IT infrastructure. Integrating AI-based demand planning systems with the company's IT infrastructure is crucial for seamless data flow and implementing AI-generated insights into operational processes.

Challenges in integration can create silos, hinder real-time data sharing, and reduce the responsiveness of the supply chain. To overcome these challenges, businesses should prioritize the compatibility of AI solutions with their current systems and plan for potential upgrades or adjustments to their IT infrastructure. Collaboration with IT specialists and AI solution providers facilitates smooth integration. Now, let us look at how to implement AI demand planning in supply chains. Implementing AI demand planning in supply chains involves strategic steps, from initial data collection to full integration and continuous improvement.

This process enhances the accuracy and efficiency of demand forecasts and ensures that the AI system is effectively adapted across the organization. Here is a step-by-step guide on how to implement AI in demand planning within the supply chain. The first is to define objectives and scope. Clearly defining the Aims of artificial intelligence support is crucial in demand planning for business needs.

This includes planning for inventory management, production, and finances. Decisions like facilitating products, demands, lowering out-of-stock, or optimizing stock entry must be made before the AI implementation. Step 2 is data collection and preparation. Compile pertinent information by assembling records of purchases, items in stock, offers, and any external element that may impact consumption. Refine and prime the information to guarantee correctness and uniformity.

This involves addressing instances of absent data, eliminating atypical elements, and standardizing the data. Step 3 is model selection and development. Determine the suitable AI and machine learning model that matches the traits of the demand data. Regression models, neural networks, and time series forecasting models are popular picks. Establish and educate the model by utilizing past data to construct them and ascertain their precision through cross-validation and other desired methods.

The fourth step is system integration. Successfully incorporating an AI system and ensuring it can work well with current IT infrastructure such as ERP, CRM, and supply chain management programs is important. Automating data processing within and outside the AI system is crucial so data can be gathered and responded to instantly. The fifth step is deployment and testing. Before fully implementing the artificial intelligence system, testing it in a contained setting or within a certain part of the logistic process is wise to observe how it performs and make changes as needed.

After acquiring reliable results, the system can be expanded to affect the entirety of the supply chain. The sixth step is to train and change management. The workforce must be instructed to operate the recently installed technology, decipher any generated data, and integrate such output into the business process. Simultaneously, managers need to handle employee opposition by outlining the advantages of artificial intelligence infrastructure and ensuring that influential individuals are part of the design and implementation process. Step 7: Continuous Improvement and Monitoring. To keep the AI system in check, it is important to regularly examine a set of predetermined KPIs that span forecast accuracy,

inventory levels, and service levels. With user feedback and data insights, defining and perfecting AI models becomes a never-ending process of improvement, which should continue to enhance its integration with all supply chain operations. Change management is crucial in the adoption of AI in demand. Planning involves preparing, supporting, and helping individual teams and organizations make organizational changes. Supplier

planners are advised to uphold open communication, where all parties are briefed on the upcoming changes, why they are happening, and how they may benefit.

Additionally, encourage employees to participate in the process to gain their perspective and feel engaged. Now, let us look at the AI-based tools for demand planning. AI tools for demand planning leverage advanced algorithms, machine learning, and predictive analytics to forecast customer demand, optimize inventory levels, and improve supply chain efficiencies. We will discuss some of the top AI tools used for demand. Now, the first is SAP Integrated Business Planning.

SAP IBP is a cloud-based tool that integrates demand planning with supply chain management, using AI and machine learning to forecast future demand based on historical data, market trends, and other external factors. The use case is that it is ideal for large enterprises looking for end-to-end supply chain and demand planning. The key feature is that it offers real-time demand and supply planning, predictive analytics for accurate forecasting, and scenario analysis and simulations. The second is o9 Solutions. o9 Solutions is an AI-driven planning tool that provides integrated business planning, including sales forecasting, supply chain management, and inventory optimization. Its AI engine analyzes large datasets to forecast demand and align business chain activities. The use case is that it is best for organizations needing detailed demand forecasts and real-time adjustments to supply chain activities.

Key features of this are predictive analytics and AI-driven forecasts, machine learning for pattern recognition in demand management, and real-time collaboration and scenario planning. The third is Kinaxis Rapid Response. Kinaxis Rapid Response uses AI to power its demand planning and supply chain management functionalities. It allows users to simulate different demand scenarios and adjust production plans in real-time based on forecasts. The use case is that it is suitable for companies with complex supply chains that require flexibility and adaptability in demand forecasting.

The key features include machine learning for demand sensing and forecasting, scenario modeling for demand and supply variations, and real-time planning adjustments based on external factors. The fourth is Relex Solutions. Relex Solutions specializes in demand forecasting and retail optimization using AI and machine learning algorithms. It helps companies optimize stock levels, improve inventory turnover, and predict demand with high accuracy.

Use case: it is best suited for retail and e-commerce companies focused on optimizing inventory and improving stock management. The key features are AI-driven demand forecasting, inventory optimization with real-time data analysis, and advanced promotion and seasonality forecasting. The fifth is Oracle Demand Management Cloud. Oracle Demand Management Cloud uses AI and machine learning to provide accurate demand forecasts.

The tool integrates demand planning with broader supply chain management functions to enable better coordination and agility. The use case is it is ideal for businesses looking for comprehensive cloud-based demand and supply planning solutions. The key features are AI for forecasting demand with improved accuracy, integration with supply chain and logistics for seamless planning, and advanced scenario analysis and real-time updates. These AI tools can help businesses improve demand forecasting accuracy, reduce stockouts and excess inventory, and optimize overall supply chain operations.

Depending on the size and complexity of the business, different tools offer various features like real-time updates, scenario modeling, and advanced machine learning forecasts. So, to conclude this module, we started with what demand planning is and how it is different from sales forecasting. We also discussed why demand planning is important and the problems with traditional demand planning models. Then we understood how AI can improve demand planning and what factors affect the accuracy of AI-based demand planning. Finally, we discussed how to implement AI-based demand planning and the best AI-based tools for demand planning.

These are some of the references from which the material for this module was derived. Thank you.