AI in Product Management

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Lecture - 36
New Product Development using AI (Part 1)

Welcome to this NPTEL online certification course on artificial intelligence in product management. Now we are talking about module 36, which is new product development using AI, and this is part one of that. This is in two parts: new product development using AI, modules 36 and 37. So, to give an overview, in this module, we will understand the concept of product development, product development frameworks, and product development plans. Then we will explore how AI helps in the product development process. We will discuss how to integrate AI into the product development process and explain product modifications, line extensions, adding or dropping a product, and how to get new ideas.

So, to give an introduction, in modern product development, where multidisciplinary collaboration is crucial, artificial intelligence emerges as a powerful tool, redefining innovation, quality, and efficiency. AI is integrated at every stage of product development, from research to refinement. It acts not only as an efficient task automator but also as a collaborator, fueling creativity and innovation throughout the process. AI tools are rapidly growing in number and integrating into business operations. As reported by PwC, enterprises advanced in utilizing AI and machine learning in product development are termed digital champions.

They witness over 30% of their revenues generated from fully digital products or services, setting a benchmark in technological assimilation. So, this is from the Digital Product Development 2025 PwC 2020 report. Digital champions use AI and ML to improve efficiency and accelerate development timelines in areas like digital prototyping and product lifecycle management. Within the expansive global markets, AI is making significant strides. It is poised for substantial growth.

Projections indicate that by the year 2024, AI is anticipated to elevate its market worth to an impressive half a trillion US dollars. The meteoric rise underscores the profound impact of AI on industries ranging from automotive and pharmaceuticals to education and

manufacturing. Amplifying the necessity of its integration into contemporary product development cycles. Armed with AI, companies are witnessing significant returns on investments and enhanced efficiencies, as substantiated by a study from Markets and Markets projecting the AI development market to soar from $86.9 billion in 2022 to $407 billion in 2027. The symbiosis between AI and IoT platforms also heralds a new era of product development, necessitating agile adaptation to the relentless pace of technological advancements.

Let us now consider the example of Procter & Gamble to understand how it is harnessing AI to enhance its product development cycle. So now we are talking about how P&G is using AI in product development. Procter and Gamble is an American multinational consumer goods corporation. The company is well known for its fabric and home care, family care, beauty, healthcare, and grooming products. P&G owns several of the most well-known brand names in the world, including Pampers, Tide, Gillette, Always,

Head & Shoulders, and many more. As per an article written by CIO Vittorio Cretella and published on P&G blogs, P&G's R&D department researches and implements in-house across departments. Regarding his strategy, he wrote that P&G is focusing on scaling AI initiatives by clearly articulating their business purpose, building organizational AI fluency and skills, and standardizing AI development through P&G enterprises for speed and efficiency. Specific business areas Mr. Cretella mentions where AI and machine learning have been and are being integrated include distribution and retail, media planning and buying, product and packaging innovation, and manufacturing and back-office operations.

P&G has effectively harnessed artificial intelligence to enhance its product development process, addressing significant challenges in capturing accurate consumer behavior. Traditionally, P&G relied on self-reported data from surveys, focus groups, and discussion panels, which often led to discrepancies between reported and actual consumer behavior. This data gap skewed insights used for innovation and product development. To bridge this gap, P&G's R&D team turned to AI, leveraging real-time usage data collected from its smart products such as the Oral-B I-O toothbrush. These products are equipped with sensors that monitor actual usage patterns, allowing P&G to gather granular real-world data.

For instance, the Oral-B I-O toothbrush revealed through AI algorithms that users revealed through AI algorithms that users typically brush for an average of only 47 seconds, significantly shorter than the two minutes they reported. This approach extends to other

P&G products with similar data collection capabilities, including Olay Skin Advisor, Febreze's new Airia smart scent diffuser, and Lumi by Pampers. Now, this has been discontinued.

P&G utilizes AI and machine learning technologies to process real-time sensor data through predictive analytics, data mining, and pattern recognition. The Internet of Things, that is IoT, analytics further examines customer interactions, generating valuable insights that inform product formulation and development. The insights generated from the data analysis led to a new ingredient combination, provided real-time feedback to R&D engineers, and yielded a deeper understanding of consumer behavior. According to Cretella, end users can access these insights via platforms like Google Cloud's BigQuery, while tools such as Dataflow and Vertex AI streamline the development and deployment of machine learning models. Cretella notes that AI-driven modeling and simulation techniques

Have drastically reduced the time required for algorithm development, cutting the process from months to weeks. This rapid iteration has led to improved product development cycles and more timely and accurate consumer insights, ultimately enhancing P&G's capability to innovate and meet consumer needs effectively. Through this integration of AI, P&G not only mitigates the challenges associated with traditional data collection methods but also establishes a more responsive and data-driven approach to product development, paving the way for successful innovation tailored to actual consumer behavior. Now, we will look at the product development. So, do you know the market size of generative AI in product development was valued at US dollar 71.9 million in 2023?

It is projected to reach US dollar 1593.1 million by 2033 with a combined annual growth rate of 37.4% from 2024 to 2033. So, this is the generative AI in product development market. This is how you see that this is growing. So, product development, also referred to as new product management, encompasses a series of steps that include the conceptualization, design, development, and marketing of newly created or rebranded goods and services.

This process covers the entire journey of a product from the initial idea to its market launch and beyond. The primary objective of new product development, or NPD, from a business perspective, is to meet consumer demands while fostering, maintaining, and expanding a company's market share. From the customer's viewpoint, the goal is to ensure that the product delivers value as a quality good or service, recognizing that not every product will

resonate with every customer or client segment. Defining the target market is a crucial early step in the product development process. Organizations should engage in quantitative market research throughout all phases of design, including before product conception, during the design phase, and after the product launch.

Some organizations establish dedicated product development centers to facilitate this process. For instance, Alphabet Inc., the parent company of Google, has opened a product development center in Nairobi, Kenya, to better serve a growing base of internet users. Establishing dedicated product development centers like Alphabet Inc. in Nairobi is a strategic move that aligns well with the growing influence of AI in product development. These centers allow companies to tap into local talent and insights and foster innovation tailored to specific regional needs. In the context of AI, such centers can focus on developing AI-driven solutions that address local challenges. For example, they might

create tools that enhance internet access, improve education through personalized learning experiences, or develop applications that support local businesses. By leveraging AI, these centers can analyze user data more effectively, identify trends, and iterate on products rapidly, ensuring they meet the needs of the diverse user base. Being close to emerging markets helps tech companies better understand user behavior and preferences, allowing them to train AI models that are culturally relevant and more effective. This localized approach can lead to more innovative applications of AI technology that resonate with users, ultimately driving growth and adoption.

Now let us look at the various product development frameworks. While product development is inherently creative, it necessitates a systematic approach to effectively guide the processes involved in developing testing and launching of new products. Organizations such as the Product Development and Management Association and the Product Development Institute assist businesses in selecting the most suitable development framework for their new products or services, thereby structuring the actual development process. One such framework is the fuzzy front-end approach, which outlines the early steps in the development process while aligning product development teams.

The flexibility to determine the most logical sequence of their specific products. So, five key elements of the FFE product development process are, first, the identification of design criteria. Brainstorming sessions are conducted to identify potential new product ideas. During brainstorming sessions aimed at identifying new product ideas, AI can play a

pivotal role by analyzing vast amounts of market data. Consumer feedback, and emerging trends.

AI-powered tools such as natural language processing and sentiment analysis can sift through customer reviews, social media, and forums to highlight unmet needs or pain points, thereby guiding your ideation. AI algorithms can identify patterns in existing products, helping to pinpoint innovative design opportunities and areas where technology can create new value. The second is idea analysis. Once a product concept is identified, AI can assist in a more thorough evaluation of its feasibility and relevance. AI-driven market research tools can conduct in-depth analysis of competitive products, consumer behavior, and market conditions, providing insights that traditional methods might miss.

Machine learning models can simulate market responses, predict product performance, and assess the potential impact of different design choices. Helping decision-makers understand the viability of the product concept from multiple perspectives. AI can also assist in performing concept studies by quickly analyzing large data sets to assess customer preferences, market demand, and potential profitability, ensuring that the ideas align with business goals and have a solid foundation in market realities. The third step is concept genesis. In this stage, where an identified market opportunity is turned into a tangible product concept, AI can significantly enhance the process by providing data-driven insights and automating key aspects.

AI tools can analyze vast amounts of market data, customer sentiments, and emerging trends to identify gaps and generate innovative product ideas that align with consumer needs. Predictive analytics can assess the feasibility of different concepts, simulating potential market outcomes and helping prioritize the most promising ideas. AI also accelerates rapid prototyping through generative design and virtual simulations. allowing for quick iterations and testing of concepts.

The fourth step is prototyping. In this stage, where a rapid prototype of the product concept is created, AI can significantly streamline the process and enhance efficiency. AI-driven generative design algorithms allow for the automatic creation of multiple prototype variations based on specified parameters like cost, material constraints, and performance codes. These algorithms can rapidly generate optimized designs that might not be intuitive to human designers.

offering novel solutions and speeding up iteration cycles. AI-powered simulation tools can test prototypes virtually, assessing functionality, user interaction, and durability before

physical models are built. By analyzing vast amounts of real-world data, AI can predict how a prototype will perform in various conditions, allowing for faster refinement and reducing the risk of costly design errors. AI-enabled 3D printing technology can quickly produce physical prototypes, speeding up the feedback loop between design, testing, and modification.

The fifth stage is product development. In this stage, where the actual creation of the product takes place, AI can greatly enhance the efficiency, quality, and scalability of the process. AI-powered automation tools can streamline manufacturing workflows, optimizing production schedules, inventory management, and supply chain logistics to reduce delays and costs. AI can also enhance product design refinements by continuously analyzing data from prototype testing and market feedback, suggesting design improvements and adjustments in real-time.

AI can also monitor performance metrics, quality standards, and customer feedback, providing insights that allow for continuous improvement and alignment with market expectations. Another notable framework is design thinking, which incorporates iterative steps that might be followed in a specific order to encourage creativity and collaboration. So, this framework involves five steps: empathize, define, test, prototype, and then again test. So, let us look at these five steps.

The first is empathize: gain a deeper understanding of the problem from various perspectives. In AI projects, this may include user research, feedback collection, and gaining insights into the experiences of users to empathize with them and view things from their perspective. The next is define: clearly articulate the scope and true nature of the problem. In AI projects, this entails specifying the AI solution objectives, scope, and desired results, as well as identifying critical challenges and opportunities that should be addressed. The third is test: gather feedback to refine and improve the solution. For instance, in AI projects, brainstorming sessions will involve idea generation techniques and exploration of various AI algorithms, models, or approaches that can effectively respond to identified challenges. The fourth step is prototype.

Tangible representations or prototypes of an AI solution should be developed based on selected ideas from the ideation stage during prototyping. This could also incorporate such things as creating mockups or wireframes for testing concepts related to AI interfaces or algorithms. The fifth step is testing again. In this stage, prototypes are tested through gathering feedback as well as evaluating the viability and effectiveness of an AI solution.

User testing and usability testing involve making incremental adjustments based on customer feedback and ensuring the AI solution meets user needs and achieves their goals. AI is enabling the next generation of frameworks that reduce time to market while improving product quality and flexibility in meeting unique customization requirements for every customer order. AI is making it possible to better synchronize suppliers, engineering, development ops, product management, marketing, pricing, sales, and service to ensure higher profitability of a new product succeeding in the market. Leaders in this area include BMC's autonomous digital enterprises.

So, BMC's ADE framework shows the potential to deliver next-generation business models for growth-minded organizations looking to run and reinvent their businesses with AI and ML capabilities and deliver value with competitive differentiation enabled by agility, customer-centricity, and actionable insights. Now, let us look at this ADE framework. This framework is capable of flexing and responding more quickly to customer requirements than competitive frameworks due to the following five factors. The first is its proven ability to deliver a transcendent customer experience. Second is automated customer interaction and operations across customers.

Distributed organizations see enterprise development ops as a natural evolution of software development ops, creating the foundation for a data-driven business that operates with a data mindset and analytical capabilities to enable new revenue streams, and a platform well-suited for adaptive cybersecurity. Next, we will talk about the product development plans. The approach to product development varies across organizations, but a general plan typically includes the following steps. The first step of any product development plan will be to identify product needs and the business case. So, the first step is to identify product needs and the business case.

Organizations can assess interest in a product through methods like test marketing and surveys. This ensures that there is a solid rationale for developing the product. Aligned with the underlying business model. The second step is to create a product vision. This step involves defining the product's purpose, functionality, target audience, and design.

Establishing these details not only clarifies the project's scope but also assists project managers in formulating guiding principles for the initiative. The third is to draft a roadmap. Once the project has been conceptually envisioned, a detailed roadmap or action plan is developed. This roadmap helps to outline specific goals and timelines, allowing implementation teams to create schedules, break the project into manageable sprints, and

generate product iterations. The fourth is to implement the roadmap with the roadmap in place.

Iterations of the product can be developed, reviewed, and refined. This process helps identify weaknesses and product development teams. With opportunities to address and enhance the product, the fifth is continued development and assessment. Development teams prioritize gathering and analyzing customer feedback to ensure their product meets user needs and expectations. By incorporating insights from real-world usage, they can identify areas for improvement, implement new features, and fix issues that may enhance the overall user experience. So now, how can AI help in the product development process? AI can analyze vast amounts of data from social media, customer reviews, competitor information, and market research reports to identify unmet needs and consumer trends. This helps pinpoint innovation opportunities and inform early brainstorming.

AI tools can assist in rapid prototyping by generating multiple design variations based on predefined parameters and user feedback. In addition, AI can analyze user interactions with prototypes to identify areas for improvement before full-scale production. AI can automate repetitive testing tasks, analyze sensor data from product testing to identify potential problems, and even predict how a product might perform under different real-life conditions. AI can be used to personalize product launches and marketing efforts based on customer demographics and preferences.

AI can also analyze continuous user feedback and product usage data to identify areas of improvement and inform future iterations of the product. How to integrate AI into the product development process? Incorporating AI into the product development process fosters innovation, boosts efficiency, and enhances competitiveness. By conducting Thorough market research, assembling a highly skilled team, and strategically integrating AI throughout the development stages, companies create an environment conducive to developing products.

that align closely with market needs. This approach not only showcases innovation but also ensures the product reaches market-ready excellence. Let us begin with market research. Embarking on the journey of AI-integrated product development requires a solid foundation built on a comprehensive understanding of the current market landscape. The process begins with rigorous market research focused on identifying a unique product concept that addresses unmet needs and distinguishes itself from competitors.

Utilizing analytical tools like SWOT analysis allows for a deeper understanding of the niche, providing valuable insights to drive the creation of a product that is both innovative and closely aligned with market demands. The stage also involves A thorough examination of competitors, assessing how AI is being utilized in existing products, and gaining insights into the evolving preferences and expectations of the target audience. Curating the ideal AI development team. Building a team with the right expertise is essential for successfully navigating the complexity of AI integration.

Organizations should first evaluate their existing resources to determine if their team possesses the necessary skills to implement advanced AI processes. If there is a gap in expertise, outsourcing can be a strategic solution. Collaborating with external software development companies or freelancers can help bridge the gap, providing access to specialized knowledge and experience. However, it is crucial to carefully select External partners, ensuring they bring a deep understanding of AI technologies and a strong commitment to advancing the project toward success.

Outsourcing is crafting strategic partnerships. When considering outsourcing, companies have several avenues to explore. Freelancers offer flexibility and can be a cost-effective option, but they may be managing multiple projects simultaneously, which could impact their focus and commitment to a specific endeavor. In contrast, specialized software development companies provide access to a carefully vetted pool of talent with extensive experience. These companies often have seasoned project managers who can oversee the development process

with strategic insight, ensuring that AI integration aligns perfectly with the product's vision and objectives. Their structured approach and resources can help drive the project forward efficiently and effectively. The next step is to structure AI integration within the development stages. So, decision-making regarding the stages of product development where AI will be integrated is crucial for maximizing its impact.

With a comprehensive understanding of the market and the specific needs of the product, it is important to strategically identify the phases, ranging from design and testing to marketing, where AI can add the most transformative value. By carefully selecting these stages, companies can ensure that AI integration enhances the product's capabilities, optimizes workflows, and improves overall product viability. This thoughtful approach not only strengthens the product's performance but also boosts its market appeal, positioning it for greater success. The next step is product modifications.

Phases like continuous quality improvement, redesign, and updated styling indicate a need for product modification, which can be categorized as clearly better. For example, upgrades, which are changes that may attract some customers but not others, or inferior changes, such as using cheaper ingredients. Evaluating the desirability of a product change hinges on the reaction of three customer groups. One is loyal customers, occasional customers, and current non-customers. Tailoring products to meet specific customer requirements is a powerful strategy for enhancing customer satisfaction and achieving higher product profit margins.

AI plays a crucial role in facilitating this personalization while minimizing complexity. By utilizing AI-driven predictive analytics, companies can identify trends and forecast demands for specific features, allowing for the design of modular products that can be easily customized. Dynamic product configuration tools powered by AI guide customers through the personalization process, streamlining their experience while ensuring manageable product architecture. Additionally, AI continuously analyzes customer feedback to inform real-time iterations on design and components, further aligning products with consumer preferences. For example, Dell employs AI in its build-to-order model, enabling customers to select from various components efficiently. Overall, integrating AI into the early development phase supports a high level of personalization while optimizing supply chain processes, making it a cost-effective approach. A notable example of product modification using AI is Nike and its approach to customizing athletic footwear through the Nike by You program, which was formerly known as Nike ID.

Nike uses AI to analyze customer data, including preferences and purchase behavior, to understand trends in customization. AI algorithms analyze successful designs and customer feedback to suggest modifications that are more likely to resonate with consumers. This allows Nike to iterate on existing designs quickly. Based on real-time consumer data, the next step is line extensions. Introducing product variants, known as line extensions, is a common strategy to capitalize on established brand equity. Many brands consist of product families designed to appeal to different market segments. For example, variations like lemon-scented sauce and flavored seltzer can attract diverse customer preferences. However, while some product variants succeed, such as fruit-flavored seltzer, others may fail, as seen with Caress's Touch of Yogurt shampoo.

Relying on AI-based techniques to create and fine-tune propensity models that define product line extensions and add-on products that deliver the most profitable cross-sell, and upsell opportunities by product line, customer segment, and persona. It is common to find

data-driven new product development and product management teams using propensity models to refine the products and services with the highest purchase probability. Too often, propensity models are based on imported data built in Microsoft Excel, making their ongoing use time-consuming. AI is streamlining the creation of

fine-tuning and revenue contributions of upsell and cross-sell strategies by automating the entire process. So, the picture below is an example of the propensity model created by Microsoft Power BI. So, these are the drivers and responses. And next is adding or dropping a product variant. Adding a product variant.

Adding a product variant can help attract new customers, but it raises concerns about customer switching and potential cannibalization, which can be either beneficial or detrimental. Companies must estimate profit implications, considering customers' lifetime value and the contribution margins of different product versions. Customer confusion and brand dilution are significant risks, especially when the new variant differs substantially in quality. Producing a variant of similar quality is generally more accepted by customers than creating a high-quality version.

Lower-quality variants may sell easily but can negatively impact brand loyalty and equity. Customers often prefer a streamlined selection of products with clear distinctions, as too many choices can lead to decision fatigue and confusion. Delaying their purchasing decisions. Operational considerations also play a crucial role in the decision to add a variant. While flexible manufacturing can help mitigate costs, expenses related to labeling, inventory, and demand forecasting still arise.

When to drop a product variant? So, the decision to drop a product variant often one with slow sales or low profits, contrasts with the decision to add a variant. Factors to consider include customer reactions to the removal of the old version, as well as associated costs and operational implications. One key difference is that eliminating a variant reduces the number of products contributing to overhead costs.

However, if an allocated costing system is in place, removing one version may negatively impact the cost and thus the profits of the remaining variants. The act of discontinuing a variant can send a significant signal to the market. It may be perceived as an admission of failure, leading customers and distribution channels to view it as a sign of decreased commitment to the product category. Let us now see how Netflix used AI to add and drop a product variant.

So Netflix added the product Bridgerton. Netflix used AI To analyze viewer data and trends, predicting that a period drama with romantic elements would resonate with its audience. The show became a massive hit, driving new subscriptions. They dropped the product The OA.

Despite a dedicated fan base, Netflix canceled The OA after analyzing viewer patterns and engagement metrics, which indicated it was not attracting enough new viewers compared to other projects. Now, how to get new ideas for new products? Ideas for new product modifications and extensions can originate from various proactive and reactive sources. Proactive efforts include customer analysis, understanding customer usage and needs through surveys, focus groups, and observation of product interactions in controlled environments or competitor analysis, identifying competitors' offerings and innovations, as many new products are adaptations of existing ones.

Active search, exploring new products and processes in different sectors for potential incorporation. Category analysis, monitoring social trends and technologies via media and trade associations. The brainstorming utilizing structured methods like TAUBER, HIT method, or creativity templates, which encourage innovative thinking by redefining current products and their attributes. In addition to these active approaches, several sources often provide ideas, including feedback from customers and non-customers, insights from employees, especially sales staff, suppliers, distribution channels, and operational personnel,

R&D teams, designers, and entrepreneurs. So, to conclude this module, we have discussed the concept of product development, product development frameworks, and product development plans. Then, we discussed how AI helps in the product development process and how to integrate AI into the product development process. Finally, we have also explained product modification, line extension, adding or dropping a product, and how to generate new ideas. These are some of the sources from which the material for this module was taken.

Thank you.