AI in Product Management

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Lecture - 38
Transforming New Product Development : The impact of AI (Part 1)

Thank you. Welcome to this NPTEL online certification course on artificial intelligence and product management. Now we are talking about module 38, that is Transforming New Product Development. And we will see the impact of AI on that. So, we are talking about this module, Transforming AI Product Development, and the impact of AI. We will continue with the same discussion in module 39 also. To give an overview, this module examines the impactful role of AI in new product development, particularly in the early stages where ideas are generated and assessed by treating NPD As an information process, we highlight how data analysis enhances decision-making and efficiency.

AI technologies like machine learning can improve idea generation, concept refinement, and market research. Real-world case studies will illustrate successful applications of AI in NPD while addressing challenges like ethical considerations. The module aims to inspire participants to explore integrating AI into their product development efforts. To start with the introduction, Artificial intelligence is said to revolutionize all aspects of businesses, particularly in new product development. The current approach to new product development has remained largely unchanged for decades, resulting in a disappointing success rate of only 30 percent for new product projects. However, the AI revolution is poised to alter this landscape significantly.

Leading early adopter firms have demonstrated that AI offers numerous applications in NPD, delivering substantial benefits, including a 50% reduction in development times. The exploration begins at the idea stage and continues through the entire new product process up to the product launch period. Some examples are particularly striking. Unilever operates a $120 million lab staffed entirely by robots dedicated to creating and testing new personal care products. Nestle employs a concept generator that scans multiple data sources to generate new product concepts, and Moderna developed an AI-based drug discovery tool that contributed to the mRNA COVID-19 vaccine.

Digital twins utilized by companies like GE, Siemens, and Tesla play a crucial role in the development and post-launch phases, enhancing customer satisfaction. While AI may still seem like science fiction to some, it has now become a reality. The numerous applications of AI in NPD have already initiated dramatic changes, improving the speed, efficiency, and quality of NPD for these early adopter firms. The transition requires more than a piecemeal approach to AI adoption. It necessitates a holistic transformation guided by a bold enterprise-wide strategy created and championed by the business's leadership team.

Now let us look at the coming revolution. Artificial intelligence is said to transform all aspects of business, particularly new product development. Business historians looking back a hundred years from now are likely to identify this decade as a pivotal moment for AI, like the early days of the industrial revolution or the electrification era a century later. Both periods brought significant positive changes to the world. Currently, the approach to new product development resembles the methods used since Thomas Edison opened his first R&D laboratory in 1876.

Unfortunately, the success rate for new product projects has remained disappointingly low, with only 30% achieving commercial success. However, the advent of the artificial intelligence revolution is expected to change this. Leading firms have begun adapting AI to various areas such as enhancing efficiency, business agility, and productivity. Notably, 35% of early adopters report that the primary benefit of AI is increased innovation, making it the most significant improvement realized. For instance, Nestle has boosted its product development pace by 60% over the past six years through the use of AI.

CTO Stephen Palzer emphasizes that AI and machine learning are vital tools in product development. Concept research, formulation development, plant breeding, clinical data mining, raw material quality assurance, improved process control, and early problem detection are just a few of the ways that AI is already being applied throughout the enterprise. But what counts as AI? Since the widespread availability of ChatGPT, the stories about AI have proliferated in the media. However, there is some confusion about what constitutes AI in the context of NPD.

For example, does a basic phase forecasting algorithm based on statistical analysis qualify as AI, or does a portfolio optimization routine using linear programming? Probably not, according to ChatGPT. So, to clarify, the question was posed to artificial intelligence itself: What is AI? AI refers to the simulation of human intelligence in machines that are programmed to think, reason, and perform tasks that typically require human intelligence.

AI enables computers or machines to mimic cognitive functions such as learning, problem-solving, reasoning, perception, and decision-making.

The goal of AI is to create systems that can perform tasks independently, adapt to new situations, and improve their performance over time without explicit programming. So that is from ChatGPT. AI can be implemented through various techniques and technologies, including machine learning, natural language processing, computer vision, robotics, and expert systems. Machine learning plays a significant role in modern AI development, allowing systems to learn from data and enhance their performance through experience. In business terms, AI can be defined more simply as a prediction technology that reduces the cost of prediction.

Where predictions are currently made, such as in market forecasting, AI will make these processes faster. More accurate and significantly cheaper. For problems that do not traditionally involve prediction, AI will transform tasks such as creating designs for a new concept car into prediction models, anticipating how a creative artist might approach the drawing based on specific instructions. Prediction is central to decision-making under uncertainty, which is a crucial aspect of any new product project, highlighting AI's transformative role in NPD. AI's role in NPD until now

The earliest applications of AI in NPD can be traced back to the 1960s with the introduction of computer-aided design systems. These systems allowed engineers to design products on computers, significantly reducing the time and cost associated with NPD. In the 1970s and 1980s, Expert systems were developed to mimic the decision-making capability of human experts, enabling evaluations of the feasibility of new product ideas. As the 1990s and 2000s approached, AI's importance in NPD continued to grow.

Data mining and predictive analytics emerged, capable of analyzing customer data from diverse sources such as social media, online reviews, and surveys to gain insights into consumer preferences and make highly accurate predictions. MPT is an information process, straightforward yet insightful, describing the new product development process from idea to launch. It comes from a GE executive: the new product process is simply a set of tasks designed to gather information to reduce uncertainty and thereby Manage risk. This information model is illustrated in Figure 1, which is on the next slide. So, this is what this model is. So, we started with activities or tasks, information-gathering activities by the project team.

The next stage is the analysis of information gathered to validate assumptions, reduce uncertainties, and manage risks. The third stage involves results, deliverables, assessments, and predictions such as a business case, engineering drawings, or a project plan. Then it proceeds to the decision point: go or kill. If the decision is to go, the next steps are reviewed, and a decision to continue investing is made. Next steps are agreed upon. So, this NPD process is viewed as an information process, a series of tasks assigned to gather information that reduces uncertainties,

enables predictions, and manages risk. AI is ideally positioned to revolutionize this information and risk-reducing process. Project teams can carry out various tasks such as conducting market studies, performing lab tests, and executing field trials to gather information. They analyze this information, integrate their findings, and make predictions, which may include developing a business case or engineering drawings for the new product. Subsequently, a management team decides whether to continue funding the project or to terminate it.

The information collected by the teams leads to reduced uncertainty, informed predictions, and validation of key assumptions regarding aspects like product design and project economics. This model Repeated throughout the process, from idea generation to launch, forms the foundation of the stage-gate process, which aims to minimize uncertainty and mitigate risk. AI focuses on information, uncertainty, and risk reduction, as well as prediction gathering, analyzing, integrating, and forecasting. Therefore, AI is ideally positioned to transform this NPD information process.

Now, positioning AI within NPD. To understand the various applications of AI in new product development (NPD), it can be helpful to consider its role based on its position within the NPD process. Is AI primarily utilized in the early stages, such as idea generation, or in later stages, like planning the launch? Another approach to conceptualizing AI's role is through the lenses. Of its function as either an originator or a facilitator, the framework is derived from a recent model proposed by Brem et al.

. The originator role of AI pertains to the creative aspect of product development, where AI serves as a tool for innovation and invention. The facilitator role focuses on enhancing existing processes and methods, making them more efficient and effective. This role leverages AI's capacity to integrate and manipulate data in novel ways. Figure 2 on the next slide illustrates this AI NPD model, mapping various functions and applications of AI.

The vertical axis represents the originator-facilitator dimension, while the horizontal axis indicates the stages within the NPD process. The remainder of this module will explore these applications, primarily focusing on physical or manufactured new products. So, this is that model. So, here we move from facilitator to originator, and these are the stages of the new product development, with this being the front end and this being the back end. Here we move from 0 to 10 and again from 0 to 10.

And these are the various things that need to be done throughout these stages. AI and idea generation. Companies are increasingly utilizing AI-powered idea generation tools to develop new product concepts. These tools employ machine learning algorithms to analyze vast amounts of data from various sources, including customer feedback, social media, and market trends. This analysis helps identify market gaps, emerging customer needs, and areas of untapped potential.

For instance, LIGO uses market insight tools based on ML to analyze emerging trends and predict growth areas for products by leveraging publicly available internet data. such as likes or clicks on trending videos or memes. Social media AI scanners monitor the broader social web, which includes social media channels, forums, blogs, comment data, reviews, and news media. These tools search for insights relevant to specific products and industry sectors, capturing information such as share of voice, customer sentiment, demographic and psychographic characteristics of the audience, and competitive intelligence. By doing so, these AI tools reveal

customer preferences and dislikes, identify pain points, needs, and wants, and even generate new product ideas. Some of the top-rated AI scanners in this sphere include U-Scan, Brand24, and BirdEye, according to Capterra. The idea of a new range of skincare products on liver aging from Unilever originated from AI. AI-powered algorithms analyzed social media data, identified emerging skincare trends, and highlighted customer needs and preferences, thus pinpointing a market opportunity. Nestlé has developed an AI concept engine that transforms insights gathered from scanning into concept proposals, which are then evaluated internally and subsequently by potential users.

Natural language processing is employed to analyze open-ended text responses. Extracting insights and trends from unstructured data such as customer feedback, survey responses, product reviews, and social media comments. For example, the Upside platform uses AI to generate new product ideas by analyzing open-ended responses from surveys and interviews. AI applications in this context include identifying key challenges or means that

users experience with specific products, as well as providing methodological support. Such as generating a first draft of a customer interview guide.

Another example is the Applied Marketing Science application, which scans thousands of user comments. And complaints on blogs to identify needs and desirable benefits in a product area, leading to successful new product ideas or concepts. Generative AI, such as ChatGPT or BARD, can create new data, content, or artifacts like those produced by humans. This type of AI can directly generate ideas for new products within specified markets or product categories when given appropriate prompts. A recent study on idea generation using ChatGPT yielded positive results, measuring the impact of ChatGPT in generating innovative concepts compared to traditional design methods like brainstorming and quizzes.

From a novelty perspective, ChatGPT performed surprisingly well, despite expectations that its knowledge base consists only of information about past events. However, it was found to be less effective in suggesting useful concepts. AI's roles in the concept stage. So, this is Figure 3, where AI plays a key role in the concept stage, undertaking the tasks that are typically for the stage but more efficiently and effectively. So, these are the concept stage tasks: market assessment, technical assessment, concept development, and business assessment.

Then we talk about market and tech assessments examples. So, the concept stage in NPD is part of the fuzzy front end of the process and is not intended to be definitive. This is stage one, stage two, stage three, four, and five, and there are various gates in between. At this stage, the focus is on defining the product concepts, developing preliminary designs, and performing an initial business analysis. Due to a variety of tasks and the wealth of available data, AI is instrumental in this early phase. It streamlines the process by providing insights and automating tasks, enabling teams to focus on refining ideas and making informed decisions as they move forward in product development.

So, let us look at the first, that is market assessment. AI facilitates the analysis of extensive market data, encompassing customer behavior, emerging trends, and historical information to provide valuable insights into market demand. By automating the labor-intensive process of collecting and analyzing user stories and customer feedback from concept tests, AI enhances project scoping. This automation allows teams to focus on interpreting the insights

gained rather than spending excessive time on data collection. AI can automatically gather and analyze data related to competitors, including their products, pricing strategies, customer reviews, and market positioning. This comprehensive analysis helps organizations identify potential opportunities and threats within the market landscape. Tools like ChatGPT are also capable of conducting personal analysis, further enriching the understanding of the external factors. The second is concept design.

In the concept design phase, AI algorithms play a crucial role by analyzing large datasets to generate insights that inform product design decisions. This process enables the creation of more tailored or personalized products that address the specific needs of individual customers or market segments. Generative AI algorithms are particularly useful as they can produce realistic 3D renderings of design concepts, allowing teams to visualize their ideas effectively. AI algorithms can analyze data and suggest modifications when necessary.

This capability simplifies the exploration of various design scenarios, such as enhancing durability or reducing size. Making it easier to compare different product concepts based on factors like cost or weight. Visualizing these concepts helps stakeholders understand the requirements for product development and can also facilitate gathering customer feedback during concept testing. For instance, Mattel employees use OpenAI's DALL-E system, a generative AI image creation tool, to generate realistic images and artwork for new Hot Wheels car designs based on natural language inputs. Once a design is created, designers can make specific requests, such as 'make it convertible,' and the AI tool will update the image accordingly, all through simple text commands.

This innovative use of AI streamlines the design process and fosters creativity, making it easier for teams to iterate on concepts and refine their ideas effectively. So this is how Mattel is working with generative AI tools and this is how it works. The third is technical assessment. AI plays a crucial role in assessing the technical feasibility of new product concepts by leveraging its ability to analyze large datasets related to existing technologies. By evaluating current technologies and their capabilities, AI can identify potential challenges that might arise during product development.

For instance, it can assess the compatibility of new designs with existing manufacturing processes. or highlight technological limitations that could impede production. This predictive capability allows teams to make informed decisions early in the development process, thereby reducing the risk of costly modifications later on. Moreover, AI can

evaluate the resources required to bring a product to market by analyzing historical data from similar projects. AI can estimate the necessary materials, labor, and timeframes.

This assessment not only aids in understanding the overall feasibility of the product but also helps in project planning. Companies can allocate resources more effectively and prepare for potential obstacles by identifying what is needed upfront. Overall, AI's contribution to technical assessment enables teams to move forward with greater confidence, ensuring that product concepts are both innovative and practical. The fourth is financial and risk assessments. In the realm of financial and risk assessments, AI significantly enhances the speed and accuracy of modeling and forecasting. AI systems can quickly analyze historical financial data, market conditions, and consumer behavior to generate estimates for costs, revenue projections, and potential This rapid analysis allows companies to make timely decisions about whether to proceed with a product concept or adjust before investing substantial resources.

By streamlining this process, AI minimizes the time needed for financial evaluation, enabling quicker go-no-go decisions. AI can identify and evaluate potential risks associated with a new product and its development project. Through techniques such as predictive analytics, AI can assess market trends and technological changes that may impact the product's success. For example, ChatGPT can highlight significant market risks, including shifts in consumer preferences or competitive pressures. By providing insights into both financial forecasts and associated risks, AI equips decision-makers with comprehensive information to make well-rounded choices, ultimately increasing the likelihood of a successful product launch.

The fifth is regulatory and legal. AI also plays a vital role in navigating the complex landscape of regulations and legal considerations that accompany new product development. With a vast amount of information available, AI can assist in researching relevant regulations and industry standards that may apply to a specific product. This capability is particularly useful in heavily regulated sectors such as healthcare, food and beverages, and consumer electronics, where compliance is critical.

By automating the research process, AI saves time and reduces the likelihood of overlooking important legal requirements that could hinder product approval or lead to compliance issues later. AI can also add in the search for existing patents and intellectual properties related to a product concept, helping to mitigate infringement risks. By analyzing patent datasets and other intellectual property resources, AI can identify potential

conflicts with existing patents, allowing companies to make informed decisions about their product designs. This proactive approach not only protects organizations from costly legal battles but also fosters innovation by encouraging the development of unique product concepts.

Overall, AI's capabilities in regulatory and legal assessments enhance the efficiency and effectiveness of the NPD process, ensuring that new products comply with all necessary regulations while safeguarding intellectual property rights. So, to conclude, the integration of artificial intelligence in new product development is revolutionizing how businesses innovate and design. From idea generation to market assessment, AI enhances efficiency and accuracy, enabling teams to respond quickly to consumer needs and market trends. Its role in financial modeling and risk assessment allows companies to navigate uncertainties with greater confidence, while AI also aids in regulatory and legal compliance, protecting intellectual property.

As organizations embrace AI throughout the NPD process, the potential for innovation and efficiency continues to grow. This AI revolution is a paradigm shift that promises to reshape product development and business strategy. In the next module, we will explore the remaining stages of the front-end application or pre-development stages and examine AI's role in the middle and back-end of product innovation. These are some of the references from which the material for this module was taken. Thank you.