AI in Marketing

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Week-7

Lec 32-AI for Value Creation and Product Development

Welcome to this NPTEL online certification course on artificial intelligence in Marketing and now we will talk about module 32. In this module as you can see from this slide, we are talking about using artificial intelligence for value creation and product development. So this is the module overview. We will start with understanding what is value. Then we will move on to understand the current scenario of AI adoption by the industry. Thereafter, we will understand how to digitize product development and then how is AI benefiting product development process.

Now let us start with understanding what is value in marketing. Value is all the perceived benefits tangible and intangible minus all the perceived cost again tangible and intangible incurred in obtaining, using and disposing of the product or service or any offering. So it is perceived benefit all tangible and intangible minus perceived cost again tangible and intangible while you are obtaining, using and disposing of an offering. And this is customer perceived value that is CPV.

As you can see that this is the total customer cost and this is the total customer benefit. This benefit is made up of, of product benefit, service benefits, personnel benefits and image benefits. While the costs are made up of monetary cost and these three are non-monetary cost, time cost, energy cost and psychological cost. So total customer benefit, the perceived monetary value of the bundle of economic, functional and psychological benefits customer expects from a given market offering because of the product, service, people and image. Total customer cost is the perceived bundle of cost customer expects and incur.

Customer expects to incur in evaluating, obtaining, using and disposing of a given market offering including monetary, time, energy and psychological costs. Customers perceived value is thus based on the difference between benefits the customer gets and the cost he or she assumes for different choices. The marketers can increase the value of the customer's offering by raising, increasing economic, functional or emotional benefits and or reducing one or more of the costs. Now we will look at the adoption of AI for value creation by industry. In 2019, start-ups raised $16.5 billion for AI-based new product development. One in ten firms uses ten or more AI applications like chatbots, process optimization, etc. The size of the connected products market will be between $519 billion to $685 billion due to AI and ML-enabled services. Consolidation of Internet of Things platform market due to rapid advances in AI-based apps, products and services. The advantage is 14% of enterprises who are the most advanced using AI and ML for new product development earn

more than 30% of their revenues from fully digital products or services and lead their peers in successfully using nine key technologies and tools.

PwC found that digital champions are significantly ahead in generating revenues from new products and services and more than a fifth of champions, 29%, earn more than 30% of revenues from new products within two years of information. Digital channels have high expectations for gaining greater benefits from personalization as well. The following report from PwC compares digital champions' success with AI and ML-based new product development tools versus their peers. So as you can see on the right hand side, so this is the overall sample and this is the digital champions. So with co-creation, the gains are 76% process simulation, 74% product portfolio management, social listening 67% and product life cycle management is 52% and these are in the last three years and these are today.

Similarly, on the right hand side where we have digital champions, so this light pink is in three years and the dark are today. Again, you can see that for value co-creation for digital champions it is 4% and 71%. For process simulation it is 82% and 14% and for digital twins it is 61% and 19% and product life cycle management it is 61% and 10%. So there has been an increase, overall increase as you can see from the from this slide there has been an overall increase also. Most are using at least a few key tools to some extent and the majority of digital champions are already using most tools.

Product development teams most advanced in AI and ML achieve greater economies of scale, efficiency and speed across these three core areas of development. Tools fostering co-creation stand out as the tools currently getting the broadest uptake with nearly two-third of companies using them already. And around half of the companies already use product portfolio management, process simulation and digital prototyping. Far fewer companies are using agile product development methods, digital twins or PML software although interest in all of these is growing. Digital champions are noticeably ahead in implementing these technologies with more than 60% using all three.

Product development teams most advanced in AI and ML achieve greater economies of scales, efficiency and speed across these three core areas of development. And the three core areas of development is the first is concept and specification, the second is design and development and the third is test and go to market. Now on this on the x axis we see least effective tools and the most effective tools. So at the first stage that is concept and specification the least effective tool is the digital prototyping and then the most effective is product portfolio management and in between we have product life cycle management and co-creation. So co-creation is coming from social listening, product life cycle management, process simulation then there are digital twins.

At the second stage that is design and development the most effective tools are co-creation, digital twins and agile product life cycle management, data analytics and AI, digital prototyping. At the third stage the least effective tool is the product portfolio management

that is digital prototyping and the most effective tool is data analytics and AI. Now let us look at the digital twin and the case of Electrolux. Electrolux is a leading global appliance company that places the consumers at the heart of everything they do. Through their brands including Electrolux, AEG and Frigidaire the company sells more than 60 million households and professional products around the world.

Developing products that meet customer needs in each of Electrolux more than 150 markets is not easy. A decade ago the company met that challenge by using a wide range of diverse product development tools around the world. Today Electrolux is achieving greater efficiency in product development through its global implementation of one of the comprehensive PLM tool across the company. Engineers in all of Electrolux locations can now easily share information relevant to the development of product from technical documentations to specifications, article acceptance, engineering changes and more. So they can drive great consumer experience more quickly.

The technical backbone helps Electrolux to get the most out of the company's implementation of a modular product architecture. Global modular platforms are helping the company spread successful launches from one market to another with adaptation to local preferences. Local engineers in each country can easily access digital twin of Electrolux product masters and translate these into specific modules which are tailored to the requirements of each individual market. In addition to mirroring all of the information about the product's physical characteristics, these tools also include any software that has been integrated into the product, the results of any lab testing etc. so that there is one single source of truth about a particular product category.

Suppliers can be connected via the platform too so they so that they receive the latest information about any engineering changes immediately and are always up to date. The third digital twin technology is used in the following four stages of the operations. The first is the design that is product development twin. The second is plan and make, production and supply chain twin. The third is maintained operational asset twin and the fourth is manage that is product lifecycle twin.

Now let us look at the first design that is product development twin. It is a replica of the product during the product development process. It allows digital testing and simulation of the product's performance to optimize the performance as well as behavior of a product in advance. In the ideal state, the digital twin in product development will completely substitute the physical testing of the product. The second step is plan and make that is production and supply chain twin that allows simulation and tracking of all processes and therefore optimization of production and supply chain processes during the product development process as well as during serial production.

In the ideal state, all processes can be simulated in real time or before the actual process is conducted. What if and scenario modeling can be used to configure or optimize processes

to derive strategic, tactical and operational decisions. The third is maintained operational asset twin. It is a replica of the entire production and logistics related assets ecosystem as a whole, facilitates monitoring and managing of maintenance operations and assets in real or the right time. In the ideal state, location, condition, health and performance can be tracked and analyzed in the real time.

The fourth is managed at a product lifecycle twin is a real time 100% replica of the product at any given time includes all key information generated about the product along the entire product lifecycle. It facilitates to seamlessly retrieve all product related data. In the ideal state, product behavior can be completely simulated in advance along the product lifecycle. How to digitalize product development? The step 1 here is to understand and benchmark digital performance and capabilities. The first step should be gaining a comprehensive understanding of current performance in product development and engineering.

How our company's performance compared to competitors within each of the key capabilities and based on product development KPIs. In addition, we need to assess the current digital product development capabilities including differentiating capabilities and pain points challenging when it comes to digital performance. Which capabilities are must have and which capabilities truly differentiate our company from the competitors. For example, do we have a stronger understanding of our customers, or do we already use AI to gain better customer insights? Finally, we need to assess the current pain points around.

1. Digital tools 2. Data analytics 3. Partnerships 4. Digital methods and processes 5. Existing R&D organization The second step is to detail future capabilities, priorities and business case. Once we understand where we stand with digital capabilities, we need to detail which digital capabilities we need to build or enhance to ensure sustainable performance.

Key focus areas should be defined by carefully looking at our differentiating capabilities. What capabilities makes us different from the competitors? The key focus area should be focusing on the differentiating capabilities and our performance to our competitors and overall as our pain points as a whole. Digital capabilities must include data analytics and AI, agile development methodologies or implementing digital co-creation tools. To prioritize our focus areas and to ensure that we have clear targets during the implementation phase, it is essential to develop a detailed business case for each focus area. A robust cost-benefit analysis will then help us to prioritize the focus areas and to omit trendy technologies with limited benefits or of strategic value.

The third step is develop capabilities and tools in an agile and integrated way. During the next phase of the digital journey, the company needs to develop and implement digital solutions from capabilities to tools and methodologies in an agile way. For that, it has to start with the focus area that has the highest priority, then develop and implement the solutions incrementally until it reaches the targets. Set two-wick sprint goals that provide

with continual results and checkpoints so that it can change the development focus to achieve more benefits or fail fast if the value of the solution cannot be achieved. Low-fi prototypes that demonstrate the solution to users, scrum sessions and other tools can support the company in rapid and successful solution development.

A certain degree of flexibility within the target should be allowed as long as solutions continue to meet the key business requirement. The fourth step is to roll out and train engineers in digital capabilities and tools. Once we start implementing new capabilities and incremental solutions, it is also critical to set up a digital communication program that informs and educates the engineers about the digital changes and new ways of working managers. We will need to offer digital training courses both online and offline and face to face to train and employees as data scientists, digital design engineers or digital PLM. And in-house digital training academy paired with outside training providers enable a smooth digital transformation of R&D and engineering departments.

A challenging but realistic roll out plans needs to include the entire regional and global R&D and engineering organizations in a step-by-step approach. The fifth step is implementing with partners an agile and integrated product development ecosystem. As a final step towards becoming a digital champion in product development, the company needs to integrate its product development activities with those of the key development product and service partners and lead an integrated development ecosystem. So we are looking at this integrated development ecosystem not isolated development ecosystem. Through co-creation and joint product offerings with partners, companies will be able to offer customers fully integrated complete solutions rather than individual products and services.

Effective co-creation tools, common standards and simultaneous access to joint product development platforms will become part of this integrated digital ecosystem. Digital transformation is never easy but for most companies it is essential to stay competitive. To help the transformation run more smoothly, it is recommended to involve the key stakeholders and influencers throughout the entire process to ensure their buy-ins. All of these steps will help the company to move from traditional product development to a truly digital product development drawing on the strengths of digital tools, data analytics, agile processes and other key methodologies making the company agile, collaborative, AI driven and customer centric. Now let us look at this transformation traditionally to digital product development.

Now from long product life cycles to short product life cycles. So, the transformation has been from long product life cycles to short product life cycles. Product maturity reached during production ramp up and here the simulation prototyping enhances pre-launch maturity. W and V waterfall-based releases of entire systems and here it is agile with continual releases. Then we have customers interaction from 1 is to n.

Here it is individualized, personalized interactions and products. Then we have siloed data

model. Here we have one E to E product data network along the life cycle. Then we have the sequential development and design. Here we have ecosystem approach, parallel development and collaboration.

Here we have product and service improvements based on field performance surveys and warranty service information and here we have continuous product and service improvement through constant monitoring and prescriptive analytics. Then post launch cost savings and manufacturing improvement initiatives have both to pre-launch cost savings and manufacturability improvement. So, this is the digital product development, and it consists of digital tools, data analytics, partnerships and ecosystems, methods and processes and the organization. So see how all this things have transformed to this. Then we come to the product and technology portfolio.

These are the various steps. Pipeline management, product life cycle management, simulation analytics, digital twins, co-creation with suppliers and customers, open innovation, E to E integration, agile development, digitize and simultaneous process, user-centered design, governance and responsibilities, organizational structures and interfaces, resources and competencies. So, these are the product and technology portfolio. Again, we have those four, digital product development, partnerships and ecosystems, data analytics, digital tools, organizations and methods and processes. Now this leads to digital operations ecosystem, connected execution and integrated and continuous planning. And that is individualized solution offering, customer solution ecosystem, this is technology and people and culture.

So multichannel customer interaction, IT infrastructure and architecture, digital technologies, career development skills and relationship mindset. So, this is how whole of this digital product development system it comes together. How AI benefits product development? We will discuss how AI is assisting enhancing various processes in the development of a product with examples from the industry. With AI being used, it would add more value in every process and thus to the final product as well, which eventually would be reflected throughout increased customer satisfaction. So the first is eliminating the roadblocks to getting new product launched.

It starts with using AI to improve demand forecasting accuracy. Honeywell is using AI to reduce energy cost and negative price variance by tracking and analyzing price elasticity and price sensitivity as well. Honeywell is integrating AI and machine learning algorithms into procurement, strategic sourcing and cost management, getting solid returns across the new product development. The next is the 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 segments and personas. Propensity modeling is a set of approaches to building predictive models to forecast behavior of a target audience by analyzing their past behavior.

Propensity models are based on imported data built in Microsoft Excel, making their ongoing use time-consuming. AI is streamlining creation, fine-tuning and revenue contributions of upsell and cross-sell strategies while automating the entire progress. All firms of a US-based TV data company used AI and managed to optimize the spends on advertisements by predicting the conversion of new users and targeting those with a higher likelihood to subscribe on premium. The accuracy of predictions was increased from 8 to 80%. AI is enabling the next generation of frameworks that reduce time to market while improving product quality and flexibility in meeting unique customization requirements on every customer order.

AI is making it possible to synchronize better suppliers, engineering, development operations, product management, marketing, pricing, sales and service to ensure a higher probability of a new product succeeding in the market. Leaders in this area include BMC's Autonomous Digital Enterprise. This BMC's Autonomous Digital Enterprise framework shows the potential to deliver next-generation business model for growth-oriented organizations. Looking to run and reinvent their business with artificial intelligence, machine learning capabilities and deliver value with competitive differentiation enabled by agility, customer centricity and actionable insights. The third is forecasting demand for new products including the causal factors that most drives new sales in an area AI is being applied to today with strong results.

From the pragmatic approach of asking channel partners, indirect and direct sales teams how many of new product they will sell to using advanced statistical model, there is a wide variation in how companies forecast demand for a next-generation product. AI and ML are proving to be valuable to taking into account causal factors that influence demand yet had not been known of before. Denonni use machine learning to predict demand variability and planning. The new capability improved its forecasting process and lead to more efficient planning between different functions such as marketing and sales. This has led to 20% reduction in forecast error and a 30% reduction in lost sales.

The next is using AI to analyze and provide recommendations on how product usability can be improved continuously. It is common for development ops, engineering and product management to run A-B tests and multivariate tests to identify the usability features, workflows and app and service responses customers prefer. Based on personal experience, one of the most challenging aspects of new product development is designing an effective, engaging and intuitive user experience that turns usability into a strength for the product. When AI techniques are part of the core new product development cycle including usability, delivering enjoyable customer experience becomes possible instead of a new app, service or device. As a chore to use, AI can provide insight to make the experience intuitive and even fun.

Using generative design algorithms that rely on machine learning techniques to factor in design constraints and provide an optimized product design. In May 2018, the computer-

aided design software maker Autodesk announced the alliance with General Motors to explore the use of generative design and additive manufacturing. In developing future vehicles. Dubbed Project Dreamcatcher Autodesk's generative design algorithm utilizes machine learning techniques to generate thousands of design options based on the designer's input such as functional requirement, material, manufacturing methods and other constraints. The outcomes can be optimized for weight or other performance criteria which often results in complex geometry suitable to be manufactured using AM techniques.

General Motors Dreamcatcher system used machine learning to transform prototypes. The solution was recently tested with the prototyping of a seat-welt bracket part which resulted in a single piece design that is 40% lighter and 20% stronger than the original 8 component design. So this is a 3D printed seat bracket which is 40% lighter and 20% stronger. So earlier we had this 8 part now it is and this is a generative design 150 plus design 1 part consolidating 8 component into 1.

So these 8 components are now converted into 1 component. So to conclude in this module we briefly discussed about how AI is being adopted by the industry for product development. Then we have discussed a case study of how Electrolux is using the digital twin technology. Then we have understood the process of de-utilizing product development and finally we have discussed how AI is helping the product development process to provide more value. And these are the 7 sources from which material for this module was taken. Thank you.