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The Effect of Artificial Intelligence (AI) on New Product Development (NPD): A Future Scenario

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Abstract. In the future, artificial intelligence (AI) is likely to encounter users in many areas. Today, there is research on these and also products that consist of extensive interactions with the application. In the context of the concept of new product development (NPD), we focus on what kind of scenario the user expects in the future, given the current resources, applied surveys and data collection base, while addressing the impact of artificial intelligence on developing and growing products. Our survey results with Generation Z show how digital assistants created by the influence of artificial intelligence connect with the user and how these assistants will meet with the user in the future. It was concluded that the participants wanted to be friends with the product they were using in line with their answers to open-ended questions. In line with this result, we designed a product based on predictions and developed a future scenario with this product. The future scenario developed has been in the direction of supporting the survey results that we apply to the users.

1. Introduction

In the last few years there has been a growing interest in artificial intelligence. According to prediction studies, artificial intelligence will be the 4th industrial revolution. Artificial intelligence (AI), as a discipline, has grown enormously during the past decade. AI applications today span the realm of manufacturing, consumer products, finance, management and medicine [1]. Quite recently, considerable attention to AI products has been developed. Many companies like Tesla, Apple, Samsung, Microsoft, Facebook and Google have involved a new business with AI technology. Most of them is about assisting the users. Amazon had launched the smart speaker product called Echo in 2015 and it used the AI technology (which is called Alexa) to understand what human said and deliver proper actions or answer based on the knowledge database [2].

New product development (NPD) is the process by which an organization uses its resources and capabilities to create a new product or improve an existing one. Product development is seen as “among the essential processes for success, survival, and renewal of organizations, particularly for firms in either fast-paced or competitive markets” [3]. New products evolved with the development of technology and the contribution of artificial intelligence is helps humans life. By increasing the link between the product and the human, developing and proliferating products can facilitate people's daily activities in many areas. Therefore, the effect of using AI for new products is to make things easier. Does it really make it easier?



Currently, products made with the help of artificial intelligence respond to specific commands. The aim of this study is to understand the role of artificial intelligence in new product development and to create a future scenario for this role. It tries to establish a future scenario based on the results that arise by collecting data from Generation Z as a methodology of this study about the impact of the digital assistant or personal assistant, its usability, how it would be designed as a product. After the data collection and analysis, a future scenario will be developed while looking for answers to the question of what people expect in the future with evolving and changing technology with the help of artificial intelligence. The results and discussion of this study will also explain the new product development with artificial intelligence and shows guidelines to improve the strategic future scenarios.

In the next section, the literature on artificial intelligent (AI), new product development (NPD) and future scenario development is reviewed. After literature review section, the methodology of the study will be explained. The methodology section will include design of the study, participants, experimental settings, and results.

2. Literature Review

2.1. Artificial intelligence

Artificial intelligence was introduced in the 1950s. Modern artificial intelligence techniques are widespread and very diverse. Frequently, when a technique reaches mainstream use, it is no longer considered artificial intelligence and this phenomenon is described as the AI effect [4]. AI refers to programs, algorithms, system and machines that demonstrate intelligence [5]. AI as logic/rule-based, and a transition from the domain of explicit expert knowledge to domains of split-second recognition and response tasks including, for example, driving-related tasks [6].

Artificial intelligence (AI) is becoming an increasing part of our daily lives. However, there are a lot of AI skills that we don't know about. By saving time, access too many sources of communication and learning has become even easier with the help of AI-powered SummarizeBot. SummarizeBot whether it's news articles, web links, books, emails, legal documents, audio and image files, and more, automatic text summarization by artificial intelligence and machine learning reads communication and reports back the essential information. Currently, SummarizeBot can be used in Facebook Messenger or Slack and relies on natural language processing, machine learning, artificial intelligence, and blockchain technologies [7]. Artificial intelligence is capable to detect gunshots, analyse the sound, and then alert relevant agencies. One of the things an AI could do is that it hears and understands sounds with today's technology. Also, digital voice assistants can respond to your queries with the effect of artificial intelligence. For example, Alexa and Google Maps respond to your queries and give you directions, Google Now, Siri, Cortana, Amazon Echo (Alexa) uses AI to schedule appointments and complete tasks over the phone in very conversational language. It can respond mostly correctly to the responses given by the humans it's talking to as well. There are artificial intelligence researchers who are currently developing AI models that will be able to detect illnesses just by smelling a human's breath [7]. It can detect chemicals called aldehydes associated with human diseases and stress, including cancer, diabetes, brain injuries, and detect odours emitted from certain diseases. Gas leaks or other caustic chemicals can also be artificially identified by smart bots and brought under control. IBM is using AI to develop new perfumes.

Artificial intelligence can detect the emotions we are feeling. A tool called Artificial Emotional Intelligence can create action against that emotion by obtaining data from a person's facial expressions, body language, and more and finding out what emotion is being expressed. Artificial intelligence also can make visual art, write poetry, compose music, and take photographs. People in an experiment that took place in London at the theatre in March 2019 half classical concert, half by artificial intelligence concert they listened. People's task was listen to music that had been composed partly by Bach and partly by artificial intelligence and they try to guess which parts were which. After the concert, they voted by

holding cards. We can conclude that artificial intelligence can do a lot of things that people can do. Furthermore, mind-reading aide is being developed by the help of artificial intelligence. It can interpret brain signals and then form speech in line with those signals. Some of the biggest tech giants, including Facebook and Elon Musk, are continuing to build their own projects to capitalize on AI's mind-reading potential.

2.2. New product development

Product development is a process by which an organization transforms data on market opportunities and technical possibilities into information assets for commercial production [8]. Markets are generally perceived to be demanding higher quality and higher performing products, in shorter and more predictable development cycle-times and at lower cost [9]. Companies with strong production and research and development abilities need to enter a market first in order to capitalise on their skills, whereas firms with a strong marketing orientation may feel it prudent to imitate competitors' products, relying on marketing abilities to recover lost ground with a better strategy [10]. NPD (new product development) is the process of bringing new products to market. This process is influenced by consumer profile, competition between markets or developments in technology. Product development is thus a potential source of competitive advantage for many firms [3]. Product development is also important because, probably more than acquisition and merger, it is a critical means by which members of organizations diversify, adapt, and even reinvent their firms to match evolving market and technical conditions [11].

The design of an industrial product is nowadays strictly integrated into the whole process of development and production of the item and there is no longer a sequential distinction between the different phases of concept, design and manufacture, as was common in the past [12]. The sequentially executed product development process often results in a prolonged lead-time and an elevated product cost [13]. To improve the effectiveness and efficiency of the new product development process, the sequential approach has evolved into a more integrated and simultaneous one, where the different stages are not separated and the first product concept can be modified and improved through meetings, discussions with clients and suppliers and feedbacks in every stage of the process. In consequence, companies have modified employed technology and human-resource management [12]. Researches shows that the most common way to manage the different stages and functions involved in NPD is the universal Stage-Gate methodology developed by Cooper and Kleinschmidt. Stage-Gate is a value-creating business process and risk model designed to quickly and profitably transform an organization's best new ideas into winning new products [14]. The main benefit of Stage-Gate is that it ensures that different perspectives are considered when key decisions are made, thus preventing oversights [15].

The key stages of the new industrial product development are: concept, design and production. In the fifties of the last century, during the development of mass production based on the Fordist model, these stages were considered sequential. The sequentially executed product development process often results in a prolonged lead-time and an elevated product cost [13]. According Cooper successful new product development needs a robust process, in which the responsibilities of members of the cross-functional team are clearly defined. Successful product design rests on first understanding customer needs and then developing products that meet those needs [16].

2.3. Artificial intelligence in new product development

"In recent years, it has been observed that the use of artificial intelligence in almost every sector increases the work efficiency. Those who integrate their business with artificial intelligence will be one step ahead in the future." The production sector is one of the sectors that get the most from artificial intelligence. By using artificial intelligence, production can be provided in many subjects such as assembling products, assembling and packaging. At the same time, the products produced with artificial intelligence technologies, quality control can also be applied with artificial intelligence technology. This

increases productivity and safety in production. On the other hand, by using artificial intelligence, the algorithm can do solutions, manpower is not needed. In other words, this causes employees to give energy to the design. Artificial intelligence systems are able to help managers with decision making and adopting proper strategies in any stage of new product development especially at its early stages [17].

2.4. Future scenario development

The word “scenario” is derived from the Latin *scaena*, meaning scene [18]. Scenarios are a collection of stories that await us in the future or in the present. Future scenarios are the whole story that is projected as a result of analysis or research. Scenarios are the tool for helping us to take a long view in a world of great uncertainty [19]. Scenario planning is making assumptions on what the future is going to be and how your business environment will change overtime in light of that future [20]. Scenario development is a methodology for forecasting future events. It relies on analysis of the current situation, the creation of informed assumptions about the future, a comparison of their possible effects, and the likely responses of various actors. At its core, scenario development is an “if - then” statement-but one that gains rigor through analysis [21].

With the developing world, the steps taken towards the future have increased. Many of these can be called predictions. At the point where it is combined with design, various forecasting techniques have been formed to imagine the future. These include (quantitative and qualitative) trend analysis, (expert consensus [22]. Delphi studies, expert studies, simulations, time-series, causal modelling and scenario writing [23]. One of the most powerful of these techniques, fit to product design, is scenario-development [19].

The advantages of scenario development that makes it especially suitable for design are its flexibility in time dimensions, details and imagination, and the possibility to include the results from other methods. The scenarios can be written text or visualized in any way, adapted to the underlying design problem. By writing and visualising multiple scenarios, designers can also take into account the inherent uncertainty of the current developments and the accompanied ambiguity of trends. Moreover, although one might discern typical and strong patterns in product development and product use, combined with other technical and social developments, tensions may arise, with unpredictable outcomes as a result [24].

3. Methodology

In this section, to create the future scenario for new products developing with artificial intelligence, a survey is conducted. The survey is prepared for Generation Z. People born and raised in certain periods are exposed to similar events, have similar technologies, and generally live in similar conditions, so this has a big impact on their personality, behaviour and attitudes, and thus they form a separate segment according to the period in which they were born. Z Generation, “Digital children”, which is expected to be the world's largest consumer group by 2020, is growing along with different family structures and much more diverse ethnic groups [25]. That is why we choose Z generation for this survey. Digital children’s will help us to improve digital world.

To collect the required data for the scenario, first, we give information about Alexa, Siri and Google digital assistants in the survey. After that, the survey will continue with eight direct questions. The questions will ask whether people know the products and whether they are using them. If they are users, we will ask what they are using them for and if they are not users, we will ask why they are not using them. We will also ask how often they use the digital assistant. The question of how and in what ways the products would have been different for people prefer to use them will also lead the way for the idea of new product scenario development. As a result, the answers given by people will be examined and the future scenario will be created.

3.1. Data collection

In the data collection, Generation Z participants will be asked about three types of personal assistant products using AI technology. Those personal assistants called Google Assistant, Amazon Alexa and Siri have become huge in recent years (see Figure 1). They aren't just on respective smart home speakers, but you'll find them on devices like phones and tablets too - each offering their own strengths and features [26].

Alexa is a voice that you can ask questions and get answers to, such as "what is the weather today in Chicago?" Alexa has been integrated into many of Amazon's services and can be used with products such as the original Amazon Echo, Echo Dot, Echo Spot, or Amazon Fire TV [30]. It features seven smart speakers and Smart Displays powered by Amazon's AI assistant Alexa. After you mention her name, you can contact Alexa. Alexa can help with many things, such as ordering products, turning on and off the lights or adjusting the thermostat. To start a new conversation line with Alexa, you need to say the waking word (Alexa). For example, you may ask "Alexa, what is the current temperature of the corridor thermostat?". Then, you have to say "Alexa" again if you want the voice assistant to adjust its thermostat to 68 degrees.



Figure 1. Digital assistants such as Alexa and Siri can play music, podcasts, audiobooks, and the radio; answer questions; provide factual information; tell stories; and even control devices in your home [27].

Google Assistant is launched in 2016 as an extension of Google Now and it not only offers personalized information from the likes Google Calendar, Gmail and other Google services. It recognizes different voice profiles and supports features like continued conversation. Google Assistant will allow you to control compatible smart home devices, control music, access information from your calendars, act as a translator in real-time, run timers, alarms and reminders, call contacts using Duo, find information online and play content to a Chromecast device, among plenty of other things [28].

Siri is Apple's voice-controlled personal assistant. She or he designed to offer interacting with your iPhone, iPad, iPod Touch, Apple Watch, HomePod or Mac by you speaking [29].

The survey reached 101 people. Some of the survey participants were contacted via telephone and others face-to-face in school classrooms. Participants are from Generation Z and their birth years are between 2009 and 2000. There are 58 women and 43 men in total. Two participants, one girl and one boy, were not included in the tables because they did not have information about digital assistants. We ranked the participants according to their gender, date of birth and, most importantly, Google, Siri and Alexa digital assistants they knew.

3.2. Survey results

As a result, we ranked the participants according to their gender, date of birth and, most importantly, Google, Siri and Alexa digital assistants they knew. The question we asked in the survey, "How would you like digital assistants to be in the future?", guided us to create a future scenario. The answers to the

question differed for each person. Most people wanted it to turn those products into a physical assistant. They wanted a product that could be interacted as a physical robot or as a hologram. They also wanted the digital assistants help them with physical activities (e.g. guiding to choose clothes, cleaning the house).

In the first chart given below, it is shown which assistants the participants know regardless of gender and age (see Figure 2). According to the responses, nine people know only Siri, four people know only Google Assistant, 49 people know Google and Siri, two people know Siri and Alexa digital assistants, and 35 people know all of the assistants.

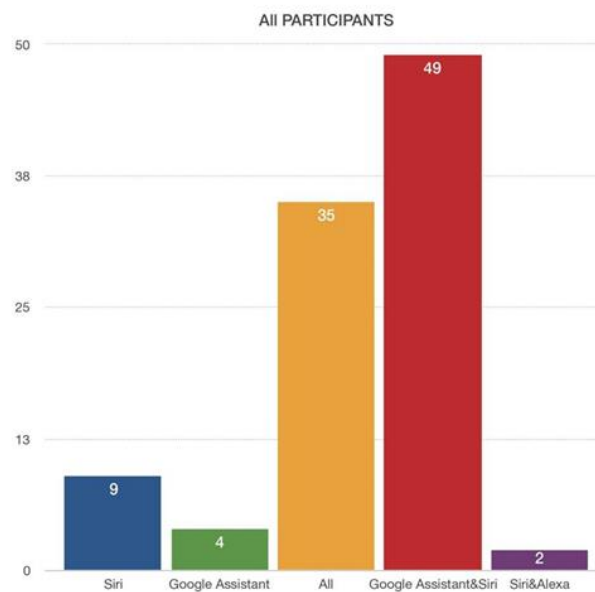


Figure 2. The chart showing the number of respondents who know digital assistants.

In the second chart below, the number and percentages of the participants according to the year they were born are indicated (see Figure 3). The survey was conducted on people born between 2000 and 2009. The majority of the survey includes those born in 2007.

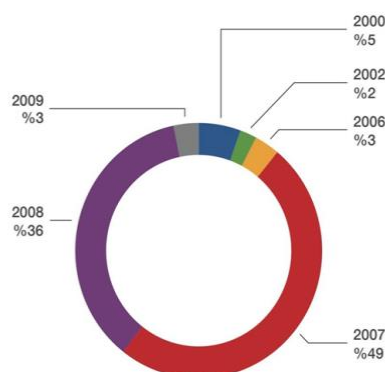


Figure 3. The chart showing the number and percentages of participants according to their birth year.

The graph below shows which assistant participants use by age (see Figure 4). Survey results show that people born in 2007 know more about Siri and Google Assistants. Alexa has been the least known digital assistant by many attendees.

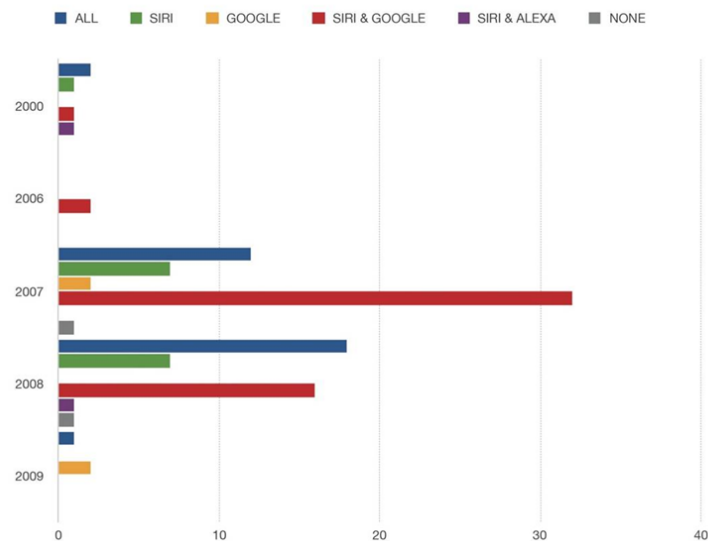


Figure 4. The chart showing the number of participants use digital assistant according to their birth year.

3.3. Future Scenario

As we look further into the future, our imagination is guided by common tropes and narratives that predate the AI revolution [30]. On the utopian end, super-intelligent thinking machines that have our interests as their guide, or with which we merge, could solve problems that have previously proven too hard to us mere humans, from challenges of environmental management and sustainability, to advanced energy sources and manufacturing techniques, to new forms of nonviolent communication and new worlds of entertainment, to medical and biological advances that will make diseases a thing of the past, including the most terrifying disease of all – ageing and death [31]. On the dystopian end, robotic armies, efficient and entirely lacking in compassion, coupled with the ability to tailor propaganda to every individual in every context on a massive scale, suggest a future captured by the power-hungry, ruthless few, with no hope of freedom or revolution [16].

The future version of digital assistants will be virtual assistant robots. Virtual assistant robots are designed to have a greater impact on our daily lives and help us perform manual tasks. It can also satisfy the user visually. Unlike today's voice commands, it will also understand the physical commands and guide the user. For now, the vast majority of consumers use other smart devices in the home to shop, search for locations, or search over the web. On the other hand, amazon's digital assistant, Alexa, introduced a humanoid robot to the market in 2017. The lynx, which is a first, stands out for its cute appearance. Included in the humanoid robot class, Lynx is not an adult human-sized. The Lynx is almost 50 cm long. The robot, which can do everything Amazon Alexa can, also has some different features. “Surveillance Mode” is the beginning of these. With cameras and microphones in the head area, the product can shoot 30-second videos and send them to the owner when he hears any sound or movement in the environment. It is controlled via the smartphone app, featuring fun features such as dancing or singing, the product can be controlled remotely with Avatar Mode. When this mode is activated, people can see around the robot's camera and talk through the microphone.

In addition to these features in the future, digital assistant will be able to wake you up by determining your sleep and waking hours to move your sleep cycles and patterns to the ideal spot, to coordinate your schedules, activities and meetings during the day. It will be able to recommend clothes based on the weather. It may even be a stylist belonging to the users. It will also check the traffic density and tell you when you need to leave the house in the morning. In fact, by arranging your breakfast according to your

food balance, it will be able to provide a healthier meal by choosing the products you need to consume and perhaps by preparing them, to order automatically for birthdays or important occasions, to prepare minutes of meetings you attend, and to develop a to-do list based on planned goals. In addition to these, it can be responsible for the security of the home. It will be able to implement many security processes such as lock and unlock. It will be able to create not only security but also the cleaning of the house, the materials that need to be taken into the house, the grocery shopping. It will be able to provide these purchases online on a regular basis. Moreover, it will also provide supporting information based on the work project you are working on and give useful examples to the user. As an example, it can provide additional information by conducting research on the topics the user is researching.

In future, people's assistant or secretary will be transformed into a product developed with artificial intelligence-based technology and it will be ready to develop itself at any moment. The future digital assistant who started being with us from the moment we woke up and continued the tasks until they put us to bed could actually be more than an assistant. It will have the potential to be our own personal psychologist, our stylist, our designer. Just by clinging to a product, we can keep our lives going and make it easier.

We will feel the effects of artificial intelligence in many areas in the future. In the future scenario that we have created, we first put forward a digital assistant, which has an image that is different from what we have today. With this image, it has gone from being a voice assistant to an assistant that we can use physically. Based on the result of our surveys, digital assistant users indicated that they would like to reach their assistants in the future not only with voice but also visually. For our future scenario, we designed a robotic digital assistant to achieve this (see Figure 5).



Figure 5. The visualization of our robotic digital assistant (Source: Authors' own image).

It is designed to facilitate the user's almost basic tasks such as home, office, work, food, traffic, clothing, etc., except to respond to specific commands (see Figure 6 and 7).



Figure 6. This robotic digital assistant will help wake users up in the morning and prepare users for the day by explaining their daily schedules (Source: Authors' own image).



Figure 7. The assistant explains the daily diet program to help the user to eat healthier and prepares meals suitable for this diet (Source: Authors' own image).

It will also be able to appear as an assistant that we can access as a hologram from everywhere (e.g. while walking in the street, driving a car) (see Figure 8 and 9).



Figure 8. It can be integrated with the car in the form of a hologram, optionally for the user to be able to answer the user's questions or about traffic while the user is driving (Source: Authors' own image).



Figure 9. The Assistant can also respond to the user's questions in the form of holograms and assist in integrating with the user's clock (Source: Authors' own image)

4. Conclusions

Artificial intelligence has become the result of a technology that is evolving and renewing itself every day. Today, interest in artificial intelligence is increasing every day. What they do continues to attract people's curiosity, as it is a fragment of what they will do in the future. The growth of artificial intelligence (AI) in recent years has attracted the attention of many manufacturing sectors.

Today, AI applications reach many areas such as manufacturing, consumer products, finance, management and medicine. From these reaches, we focused on the digital assistant title. Many companies, including Amazon, Apple, Google, Microsoft, Samsung, have developed digital assistants using AI technology. Most were designed focused on helping users. The products developed in this sector are designed to assist the user by integrating with the products we use in our daily lives. So how the future of these products would be shaped? New product development (NPD) is the process by which

it uses its resources and capabilities to create a new product or develop an existing one. This process keeps the market moving and keeps the competition going. Currently, digital assistants respond to specific commands. The purpose of this study was to understand the role of artificial intelligence in new product development and to create a future scenario for this role. We created a future scenario as a result of the surveys we took and the opinions we received from 101 people from Generation Z about the availability of the digital assistant, how to design it as a product.

In developing new products, it is mentioned that the user's wishes must be considered before designing a product. Successful product design rests on first understanding customer needs and then developing products that meet those needs [16]. According to that explanation, before creating our future scenario we posed questions to Generation Z, who qualify as the people of the future. Based on the result of our surveys, we have found the answer to the question of what people expect in the future with the technology that is evolving and changing with the help of artificial intelligence. Many users stated that they wanted assistants to be friends with the user. At the same time, the importance of artificial intelligence for decision-making has become the supporting element in our study. Artificial intelligence systems can assist managers in making decisions and adopting appropriate strategies at any stage of new product development, especially in its early stages [17]. As a result of surveys and supportive research, we have created a future scenario. This scenario is based on future assumptions, needs and wishes of users. Future scenarios are the whole story that is projected as a result of analysis or research. Scenarios are the tool for helping us to take a long view in a world of great uncertainty [19]. Scenario planning is making assumptions on what the future is going to be and how your business environment will change overtime in light of that future [20]. Scenario development plays an important role in planning the future, it is one of the possibilities that can be given in terms of predicting the future and constructing on this prediction. To create our future scenario, we have achieved users' expectations for the future. In line with these expectations and demands, we decided how the scenario could be shaped. We decided to present a product for the future scenario. The robot digital assistant, the product created by the scenario of the future, is offered not only as an assistant to the user but also as a friend, confidant.

As such, it has many features: (1) This robotic digital assistant will help wake users up in the morning and prepare users for the day by explaining their daily schedules; (2) the assistant explains the daily diet program to help the user eat healthier, and prepares suitable meals for that diet and he will also be able to appear as an assistant, which we can access as a hologram from anywhere, (3) a hologram can be integrated with the car in the form of, optionally integrating with the user's clock to be able to answer the user's questions or about traffic while the user is driving and also answer the user's questions and assist in the form of holograms; (4) it can be responsible for the safety and cleanliness of the house; (5) it can also complete the House's shortcomings through online shopping by creating a weekly shopping list; and (6) it simply does not perform the tasks given. It can connect with the user and speak according to the user's emotion. For example, it can be a friend who listens to you and can find solutions to your troubles is also a duty of the robotic assistant.

As a limitation of this article, there are no doubt various possibilities and scenarios to be addressed for the future but this study only focus one possibility. Future studies may discuss more on this issue of future scenarios and how artificial intelligence will be integrated into product design.

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