

THE ROLE OF ARTIFICIAL INTELLIGENCE (AI) IN PREDICTING CONSUMERS' BEHAVIOR

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ABSTRACT

Understanding the factors that influence consumers when making purchasing decisions, the phases that consumers go through to make decisions, as well as how to evaluate the company after the purchase are just some of the elements that require research into consumer behavior to gain a competitive advantage in the market. Digital transformation is a process that, by implementing novel Information and Communication Technologies (ICTs), has influenced not only the formation of new business models but also consumer behavior. Novel technologies have changed the way companies communicate with consumers, whether they are final or business consumers, the way they meet their needs, and the use of certain products and services, but they have also altered how consumers' needs and requirements are researched. Technologies that support the process of digital transformation such as Artificial Intelligence (AI), Augmented Reality (AR), Internet of Things (IoT), Blockchain, Virtual Reality (VR), Robotics, and 3D printing have influenced the transformation of business models and consumer expectations, consumer experience, as well as research and prediction of consumer behavior. Taking into account the importance of predicting consumer behavior for achieving business success and gaining competitive advantages in the market, this paper will examine the role of AI in the predictive activities of companies.

Keywords: digital transformation, AI, consumer behavior.

INTRODUCTION

Artificial intelligence (AI), like many other emerging technologies, lacks a widely accepted definition. The concept behind AI is the theory and development of computer systems that can solve complicated problems in a more human-like manner (United Nations Economic Commission for Europe [UNECE], 2021). According to Precedence Research (2022), the AI market size is projected to surpass around US\$ 1,597.1 billion by 2030 and is expanding growth at a CAGR of 38.1% from 2022 to 2030. AI is becoming increasingly important in today's world because it can efficiently handle complicated problems in a variety of areas, including healthcare, transport, education, agriculture, finance, automotive, entertainment, social media, gaming, space exploration, etc. The growth of the AI market will also result in its greater use in business, as well as in marketing. In-depth knowledge of consumers' wants and preferences, as well as the capacity to act swiftly and effectively on that knowledge, are essential components of modern marketing. For marketing stakeholders, AI is now at the forefront thanks to its capacity for making timely, data-driven decisions. When selecting how to integrate AI into their campaigns and processes, marketing firms must exercise caution. AI tool development and application are still in their infancy. As a result, while using AI in marketing, there are several issues to be mindful of. Marketing teams are finding it difficult to extract insights from large amounts of heterogeneous data. Using predictive analytics, which uses a variety of machine learning algorithms, models, and datasets to forecast future behavior, AI enables marketing teams to make the most of this data. As a result, marketing teams will be better able to position their ads by knowing the kinds of things consumers will be looking for and when (Marketing Evolution, 2022).

This paper discusses the role of AI in the consumers' behavior domain. The remainder of this paper is organized as follows. The digital consumers' behavior is discussed in the second section. The third and fourth sections present the basic concepts of AI and AI tools for predicting consumers' behavior, respectively. The last section draws conclusions.

DIGITAL CONSUMERS' BEHAVIOR

The company's main objective is to guarantee consumer satisfaction while generating long-term profit. It is evident that consumers have a direct impact on a company's success. Making marketing decisions requires a thorough understanding of changing consumers' demands and preferences. To properly manage business activities, a company must ascertain why consumers choose or reject particular products, as well as what they like or dislike. Research is done on the external effects and internal (psychological) elements that affect consumers' behavior in order to gather this data. By putting the digital transformation process into practice, consumers' demands, wants, and even the way of their research, were altered.

Digital consumers are those who purchase and sell products and services using technology (Reach First, 2022). While offline consumer buying behavior refers to the purchasing habits of the final consumer who prefers to use offline media, online consumer buying behavior refers to the behavior displayed by consumers when they search for, purchase, use, and evaluate products or services that they expect will satisfy their needs through web media (Arya, 2015). Recent research shows that the average Internet user currently uses the Internet on all devices for 6 hours and 58 minutes each day (Kemp, 2022). Social media is used by 58.4% of the world's population, who spend 2 hours and 27 minutes there each day on average (Chaffey, 2022). Given that more people are using the Internet to pass their time, companies have realized their opportunity in this. Every time consumers use the Internet, they leave a digital footprint (digital shadow or an electronic footprint) that companies can use to analyze their activity. A digital footprint covers the websites people visit, the emails they send, and the data they enter online. An individual's online behaviors and gadgets can be followed via their digital footprint. Internet users either purposefully or inadvertently leave a digital footprint (Kaspersky, 2022). The digital footprints of users on Facebook, Twitter, and other websites can be used by AI algorithms to personalize the ads that users view based on their personality type. Television and online advertising images have a significant impact on how viewers feel about certain items or companies. However, what one individual finds to be relevant, or appetizing may be offensive to another. The digital footprints left on Facebook, Twitter, text blogs, and other websites offer information about individuals' tendencies toward extroversion or introversion, as well as how open they are to trying new things (Economicstimes, 2019). AI not only enables companies to better comprehend the wants and demands of their consumers but also equips them with tools that allow them to forecast consumers' behavior.

BASIC CONCEPTS OF AI

AI, as a branch of computer science, involves developing a computer algorithm capable of analyzing a large amount of external data in order to identify and recognize patterns and correlations, as well as performing tasks that resemble human intelligence (UNECE, 2021).

Types of AI can be classified based on capabilities and based on functionalities (Figure 1).

Based on capabilities, there are three types of AI (Figure 2) (UNECE, 2021; Markotic, 2021):

Artificial narrow intelligence (ANI or weak AI) - typically designed to perform very narrow and specific tasks, while yet resembling human intelligence in some ways. It is the only type of AI that has been successfully implemented to date. Google's Rankbrain, Google translate, image recognition software, recommendation systems, spam filtering, manufacturing and drone robots, and speech-recognition systems such as Alexa, Siri, and Cortana (Windows) are examples of ANI.

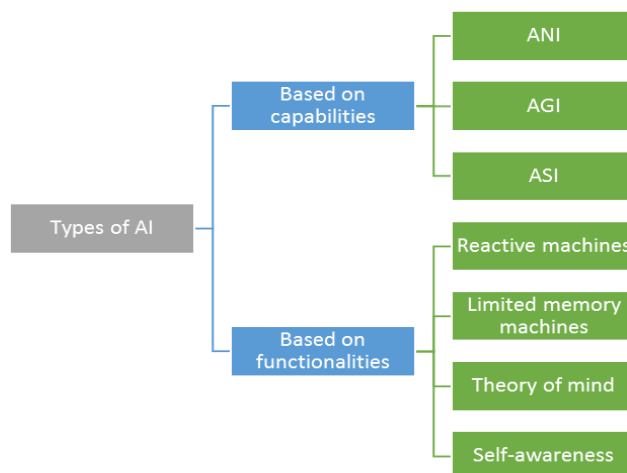


Figure 1. Types of AI.

Artificial general intelligence (AGI or strong AI) – a theoretical concept that defines that AI has a human-level cognitive function in a variety of domains such as language processing, image processing, computer functioning and reasoning, and so on. In other words, a machine can learn and understand tasks in the same way as a human can, and it is able to apply intelligence to any problem, rather than just one specific problem.

Artificial superintelligence (ASI) - one step ahead of AGI which is aimed at outperforming the human brain. Making decisions, making reasonable decisions, and even things like creating better art and building emotional relationships are all part of this.

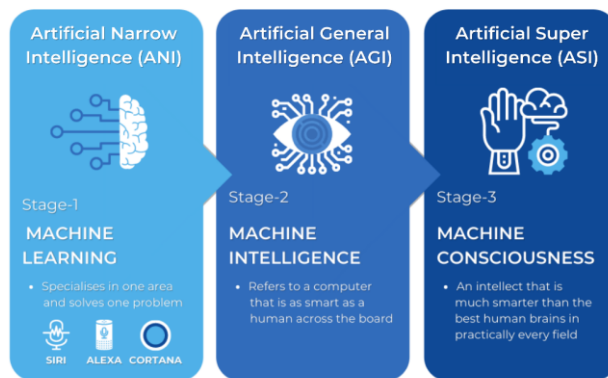


Figure 2. AI types, based on capabilities (Markotic, 2021).

Other types of AI, based on functionalities, are (Figure 3) (Joshi, 2019; Johnson, 2020):

Reactive machines - the most common and the oldest form of AI systems. These machines don't have memory or the ability to "learn" and anticipate the future; instead, they can only focus on the now, and can only respond quickly to inputs in order to deliver the greatest feasible solution at the time. Limited memory machines – one step forward than reactive machines. They can process prior memories as well as store information. However, the data in these machines can only be stored for a limited amount of time. Chatbots, virtual assistants, and even self-driving cars are examples of this AI category.

Theory of mind – the next generation of AI systems that focuses on human social values such as beliefs, likes and dislikes, and human emotions. Sophia from Hanson Robotics is an example of the theory of mind in AI.

Self-awareness - the final stage in the evolution of AI, which currently exists only in theory. This type of AI will be able to understand the emotions of those with whom it interacts, as well as have its own emotions.

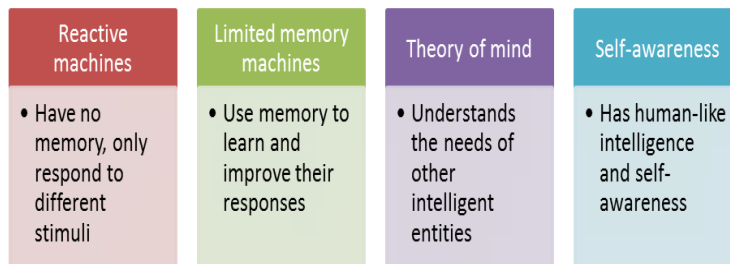


Figure 3. AI types, based on functionalities.

Various important parts of AI are shown in Figure 4. The major parts of AI include (Schatsky, Muraskin, & Gurumurthy, 2014; Campesato, 2020; UNECE, 2021):

Machine learning - an AI subdomain that tries to develop a learning algorithm that improves over time as a result of more experience. At its most basic level, machine learning is the process of automatically detecting patterns in data and making decisions with little or no human involvement. There are three types of machine learning algorithms: supervised, unsupervised, and reinforcement learning.

Natural language processing (NLP) - an AI subfield that aids computers in comprehending, interpreting, and manipulating human language. In other words, NLP allows computers to be able to work with text in the same way as people do, such as read text, interpret it, identify significant parts, create grammatically correct content, etc.

Expert systems - a machine system that stores useful human knowledge to provide intelligent advice as well as instructions and arguments in decision making. It also helps in diagnosis, explaining, interpreting input, predicting outcomes, and suggesting alternative solutions to problems. Expert systems consist of: a knowledge base – a huge database of well-defined specialist knowledge in a specific field, inference engine, and user interface.

Speech recognition - focuses on transcribing human speech automatically and accurately. Speech recognition systems employ some of the same approaches as NLP systems, as well as additional techniques such as acoustic models. Medical dictation, hands-free writing, computer voice control, and telephone consumer service are just a few of the applications.

Computer vision – a branch of AI that allows computers to see. It enables proper recognition and classification of objects using digital photos from cameras and movies, and deep-learning models, as well as the generation of an adequate response. Optical character reader, object recognition, face detection, and estimating position are tasks of computer vision.

Planning - a subfield of AI that studies how to solve planning and scheduling problems using autonomous strategies. It entails selecting a series of actions that will (most likely) gradually transform an initial starting state into the desired target state.

Robotics - an AI area concerned with the creation of intelligent and efficient robots. It combines computer vision and automated planning with carefully designed hardware in order to create robots that work side by side with people and adaptively undertake different tasks in uncertain environments.

Evidently, our daily lives are becoming more comfortable and efficient as a result of AI utilization. However, AI, like any other technology, has advantages and disadvantages. Some of the main advantages of AI can be summarized into: human error reduction, zero risk, availability 24/7, digital assistants, new inventions, impartial decisions, reduced time for data-heavy tasks, etc. On the other side, the main AI disadvantages are: expensive, unemployment, deep technical expertise need, lack of emotion and creativity, lack of ability to generalize from one task to another, etc.

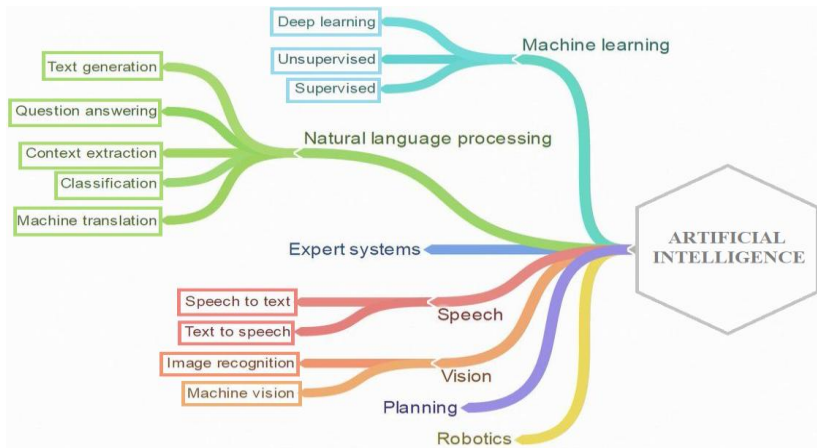


Figure 4. Fields of AI.

AI TOOLS FOR PREDICTING CONSUMERS' BEHAVIOUR

Thanks to AI, businesses may now reliably forecast consumers' behavior. To keep ahead of the competition, it is important to understand consumers' wants and expectations. In the retail sector, AI will significantly affect consumers' purchasing decisions. Companies must act on data-driven decisions immediately or risk falling behind their competitors, and marketers must realize that correctly forecasting consumers' behavior will be crucial to the success of their marketing initiatives. Deep learning, a component of AI, is already being used by many marketers to analyze patterns in data related to consumers' behavior. Deep learning uses deep neural networks to process data and outperforms people at complex problem-solving. Deep learning simulates the human brain. With the aid of AI, consumers' behavior can be predicted through (Logicai, 2020):

Predicting the trends in consumers' purchasing habits

No matter how high the quality, a product or service cannot be sold if it is not in line with the demands and preferences of the consumers. Geography, culture, religion, nationality, and environment are factors that have an impact on consumers' behavior. To determine what the consumers are expecting, AI technologies mine data from social media, news, and prior purchases as well as reviews. They can accurately forecast future supply and demand, allowing companies to provide specialized goods and services to their target markets.

Assisting in the creation of efficient marketing initiatives.

AI solutions are helpful in developing effective marketing tactics in addition to precisely forecasting consumers' behavior. Marketers can use AI to determine which type of marketing generates the most client engagement and then decide to use a particular medium in the future to increase sales.

Content Marketing

AI has completely changed content marketing by altering how material appears on search engine first pages like Google. Google is changing its approach to content ranking with AI. The best and most unique content on a given topic is automatically found by Google's machine learning algorithms, which then rank the content accordingly. The success of businesses depends critically on the production of relevant, actionable content that reaches the appropriate audience. Companies are adopting AI to generate content automatically, interact with consumers via chatbots, and make content specifically for them. Using AI tools, marketers can also learn important data about the most popular content and obtain suggestions on how to improve their current content and which distribution channel will generate more sales.

Changing the consumers' experience through improved communication.

The communication hurdles between consumers and companies have been eliminated by email, Facebook Messenger, and WhatsApp. Consumers get in touch with companies right away to register their complaints or to express their satisfaction with the products and services offered. Considering that there could be thousands of messages, responding to each one would be impossible. By texting clients in human language, an AI-powered chatbot spares companies from this inconvenience. Additionally, it responds to their frequent inquiries, hence enhancing consumers' satisfaction.

Helping with the analysis of consumers' sentiment

The best instrument for examining consumers' attitudes toward products and services is social media. Sentiment analysis makes use of text-analysis methods to analyze consumers' feelings (both positive and negative as well as neutral) about particular products and services. Understanding people's emotions is crucial for commercial success. Consumers use social media to discuss all facets of goods and services, including quality, price, and consumer service, in addition to posting reviews. Social media posts can be analyzed by AI techniques to provide consumers' opinions of products and services as well as what they expect from the company. Companies may make crucial decisions based on these actionable insights to improve their quality, affordability, and consumer service in the future.

Forecasting consumer churn

A percentage of a company's consumers who have quit doing business with it is referred to as consumer churn, also known as consumer turnover. The companies are aware that it will be difficult to attract new consumers, therefore they are making every effort to keep their current clientele. Machine learning algorithms can be used by companies to anticipate which consumers will stop using their products as well as to identify the causes of this behavior.

Predictive analytics anticipates that the incorporation of AI into business operations will lead to a significant rise in consumer spending in the future. AI technologies help companies better serve their clients and alter the consumers' experience by identifying their demands and expectations. In other words, AI tools offer unique insights into consumer attitudes, needs, wants, and expectations, and support the creation of marketing campaigns targeted specifically at consumers, which has a significant impact on their purchasing habits. The development of predictive analytics technologies has increased their value and importance to businesses. By examining patterns and trends in historical and present data, predictive analytics aims to predict what might occur in the future. A range of analytics and AI models used for descriptive, diagnostic, predictive, and prescriptive analytics are developed using machine learning and data science tools. Top predictive analytics tools for 2022 are (Table 1) (Lawton, 2021; Wayner, 2022):

H2O Driverless AI - a platform for autonomous machine learning that uses AI. Through open-source and customized recipes, it makes AI creation and predictive analytics easier for both professionals and citizen data scientists. Due to end-to-end automation, it seeks to reach the best-predicted accuracy, equivalent to that of experienced data scientists, but in a significantly shorter amount of time. Some of the most challenging data science and machine learning activities, including feature engineering, model validation, model tuning, model selection, and model deployment, are automated by driverless AI. Additionally, autonomous AI provides machine learning interpretability and automatic visualizations.

IBM Watson Studio - the comprehensive hybrid environment that offers adaptable tools for data science that can be used to create and train AI models as well as prepare and examine data. IBM Watson Studio on IBM Cloud Pak for Data aids businesses in accelerating their AI-powered digital transformation. It enables companies to make the most of their data assets and incorporate forecasts into current applications and business processes.

Microsoft Azure Machine Learning - a set of services and tools designed to assist developers in training and deploying machine learning models. It assists them in scalability, workload distribution, and cloud deployment as well. Services and tools are offered by Microsoft via the public cloud Azure.

RapidMiner Studio - a predictive analytics visual workflow designer that makes data science and machine learning accessible to any member of the analytics team. As a robust data mining tool, it supports model deployment, model operations, and data mining.

SAP Predictive Analytics - statistical analysis and data mining solution that enables the creation of predictive models to find hidden links and insights in data and make predictions. Companies with substantial SAP deployments should consider the tool, especially if they want to develop predictive analytics for use cases including logistics, supply chains, and inventory management. SAP Predictive Analytics offers different capabilities that make data aggregation, predictive modeling, and model analysis easier across several user interfaces.

SAS - an integrated system of software that enables accessing data across multiple sources, performing sophisticated analyses, and delivering information across the organization. It helps to make better decisions with data by utilizing innovative analytics, AI, and data management software and services. SAS Visual Data Science, SAS Data Science Programming, SAS Visual Data Decisioning, and SAS Visual Machine Learning are among the company's primary predictive analytics capabilities. To make the creation and implementation of predictive analytics across diverse processes simpler, the company also keeps strong ties with top cloud providers and enterprise software platforms.

Table 1. Comparison of predictive AI tools (Wayner, 2022).

Tools	Highlights	Deployment	Pricing	Free option	Open-source
H2O.ai AI Cloud	Driverless AI offers an automated pipeline; AI adapts to incoming data	On-premises or in any cloud	For enterprise support, cloud options	Open-source core	Open-source core
IBM SPSS	Drag-and-drop Modeler for creating pipelines, IBM integrations	On-premises or in IBM Cloud	Per-user, per month	Free trials	N/A
Microsoft Azure Machine Learning	It makes easier to deploy predictive analytics capabilities directly into applications and business workflows	Azure cloud	Per month, per hour	Free and Standard tiers	N/A
Rapid Miner Platform	Full IDE for data scientists, automation for non-coding users, drag-and-drop designer	On-premises or in any cloud	On request	Free tier	N/A
SAP	Deep integration with SAP warehouse and SCM; low-code, no-code features	On-premises or in SAP cloud	Per-user, per month	Free tier	N/A
SAS	Composite AI mixes statistics and machine learning; industry-specific solutions	On-premises or in the cloud	On request	Free trial	N/A
Alteryx Analytics Process Automation (APA)	Visual IDE for data pipelines; RPA for rote tasks	On-premises or in Alteryx cloud	Per-user, per year on tool-by-tool basis	Free trial	Alteryx open-source options available
AWS SageMaker	Full integration with AWS, third-party marketplace, serverless options	AWS cloud	Tied to resource usage	Free tier	N/A

Alteryx Analytics Process Automation (APA) - the technology that makes it simple for anybody in the company to exchange data, automate time-consuming and difficult tasks, and convert data into results. Anyone may access predictive and prescriptive insights that lead to quick wins and rapid returns of investments with analytical process automation. By swiftly automating analytics and completing data-driven business processes that would otherwise need a variety of technologies and human handoffs, the Alteryx APA platform transforms business outcomes and workforces. One of APA's advantages is the depth of integration it has with other data sources, including geospatial databases or demographic information, to improve the quality of companies' own data sets.

AWS SageMaker - a fully managed service that spans the entire machine learning workflow, from labeling and preparing data to selecting an algorithm, training the model, tuning and optimizing it for deployment, making predictions, and acting. The models are produced more quickly, at a lesser cost, and with a lot less work.

The company can select the tool that best fits its business concept by examining the features of each one. By using the right tool, the company will be able to predict consumers' behavior and subsequently tailor its business operations to meet their wants and preferences, which ultimately aids in the achievement of business success.

CONCLUSIONS

The amount of time people spend online has considerably increased recently, especially during the COVID-19 pandemics, and there are no indicators that this tendency will change. The more time consumers spend online, the more chances there are for companies trying to connect with them. Consumers leave a digital footprint with every action they take online, and companies may use this information to learn a lot about their consumers. With the advancement of digital technology, particularly AI, companies are now better able to process data on past and present consumers' behavior and, via the use of psychological and motivational research, to forecast future consumers' behavior. Through a discussion of basic concepts of AI and AI tools that assist companies in forecasting consumers' behavior, this paper emphasized the significance of AI in predicting consumers' behavior. The performed research has confirmed that companies can precisely predict consumers' behavior with real-time data and AI. For marketing strategies to be successful, client churn must be minimized, and consumer satisfaction levels must be increased. Additionally, AI-driven systems provide insights into upcoming market trends that will change consumers' behavior. As a result, companies can proactively make knowledgeable decisions about their businesses based on these insights, which will ultimately result in achieving business success.

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