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AI's Impact on Vehicle Growth and Ownership Patterns in the Automotive Industry

BITTO BENNY • KARTHIGAI PRAKASAM CHELLASWAMY

Abstract. The automotive industry is undergoing structural changes due to the incorporation of artificial intelligence (AI) technologies which will redefine automobile development and ownership models as well. This review explores the various ways in which AI technologies can ease the usability of vehicles while enhancing safety and efficiency and encourage new models of vehicle ownership. Interventions in AI technologies, especially the stronger emphasis on autonomous vehicle technologies, predictive maintenance, and shared mobility solutions are shaping the tastes of the modern consumer with a move away from the traditional ownership of cars on a dominant usage basis. Today, the role of Mobility as a Service, subscription, ride sharing and eventually autonomous cars, go beyond redefining the notion of transportation – they provide new business benefits and issues for participants. Besides, AI is also relevant to address other pressing environmental issues, as the incorporation of AI technologies improves the operational efficiency and sustainability of business models. This paper aims to provide an overview of the growing influence of AI on the automobile industry by integrating the literature currently available on the subject, determining what other areas need research to facilitate further comprehension of the impact of AI on one of the most important industries.

Keywords: Autonomous Vehicles, Artificial Intelligence, Consumer Behavior, Shared Mobility.

INTRODUCTION

The automobile industry is going through an epochal revolution owing to the technological innovations and the changing demands from the consumers. The spread of artificial intelligence technology (AI) clearly seems to be a game changer in this industry, as it redefines the old ways of designing, owning, and using the vehicle. AI technologies are not just adding to the processes that are in existence but are redefining the very integration of the vehicles in socio-economic practices. With the developments in autonomous driving and traffic system management, AI is pushing barriers of safety, efficiency, and experience of consumers [Ban, Del21].

Traditionally, vehicle ownership is a model where the majority if not all is based on individual vehicle ownership, as consumers would buy cars solely for their own use. But these days, there is an undeniable trend to move towards shared mobility and subscription-based ownership models. This is more pronounced with the younger people who prefer just the ability to use a vehicle, and all its associated ease as opposed to the hassles that come with actually owning one, like maintenance and parking [Qid20]. This shift is enabled partly by AI which improves the service, customizes the user experience and allows seamless interaction between the users of mobility services and the mobility platforms [Fag15].

AI related consequences are somewhat big since they include huge economic and environmental consequences too. In this context, AI systems could help in the improvement of vehicle effectiveness, cutting down on the operating cost and reducing negative impacts on the environment which are key concerns in this regard [Pew21]. While more and more people move to cities, and as cities make boundaries for vehicles in their attempt to be less polluted, AI seems to be very important in pushing and bringing about more intelligent and environmentally friendly transport.

The purpose of this review is to investigate the various ways through which AI has influenced vehicle proliferation and ownership trends in the automobile industry. The objective of this paper is to combine previously published data and find patterns in new technologies, shifting consumer

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preferences, and economy that explain the changes that are occurring in the industry. It has also been the concern of the article to highlight what other opportunities would be parallel areas of interest for future studies to understand better the effects of AI in the automotive sector and prepare the actors for the rapidly changing reality.

LITERATURE REVIEW

Technological Advancements in the Areas of AI and Autonomous Vehicles

The deepening of AI capabilities with the development of self-driving technologies has been a game changer in the automobile industry. New algorithms combined with better sensors and the ability to process an enormous amount of data in real time helped improve the safety and effectiveness of autonomous vehicle systems. The advancement of sensor fusion technology allows for greater speed and accuracy, which enhances decision-making in real-time and minimizes the chances of AV collisions by improving navigation [Suh20].

The absence of predictive maintenance powered by AI brought significant improvements for fleet operations. By analyzing the information and giving foresight of when maintenance is due, this type of system cuts down the amount of time spent on repairs while extending the life span of vehicles hence ideal fleet management and cost reduction. This technology is becoming more and more important for the fleet operators in the commercial sector to reduce the unforeseen maintenance expenses and enhance efficiency [Mil20].

The Contribution of ML in Self Driving Automobiles

The development of autonomous vehicles heavily relies on ML, which is a sub-branch of AI. With the help of ML algorithms, vehicles take in thousands of data points, and as time goes by, the performance continues to improve. They incorporate high-definition image recognition enhancement solutions such as AVs to improve their ability to observe pedestrians, traffic signs, or cars behind them [KPM20]. These advancements serve one of the major objectives of autonomous systems, which is to better ensure safety and security.

One of the most interesting cases of machine learning in self-driving cars is Waymo's project of a self-driving car which engages both types of learning, supervised as well as unsupervised, for teaching the vehicle while moving around the cities. The ML system helps the vehicle to learn how to drive by watching other drivers. Every million miles drive a car, a vehicle moves farther away from the complex decision making and closer to the easy one [Wad16].

Reinforcing Structures Using AI in Construction

Through the use of advanced driver-assistance systems (ADAS), AI significantly increases vehicle safety as they utilize data and intelligence to make real-time decisions with the primary goal of preventing accidents. Automatic emergency breaking, lane-keeping assistance and adaptive cruise control are some of the features powered through AI with the help of computer vision and data from various sensors. Studies have shown that vehicles operating with the afore mentioned technologies are involved in fewer accidents. For example, the Insurance Institute for Highway Safety (IIHS) has carried out research which revealed that vehicles equipped with automatic emergency braking are 50% less likely to be involved in rear-end collisions [Hao19].

AI capacity to improve safety is not only limited to personal vehicles. In fleets, AI systems monitor drivers and provide them with feedback and coaching on how to behave appropriately. Employees who adopt those systems experience fewer accidents and reduced costs for insurance which signifies the importance of the investment in AI enabled safety in the future [McK21].

Changes in Ownership Models and Consumer Preferences

The traditional perception of car ownership is being transformed due to the rise of AI technology and the shift in consumers' preferences. In particular, the younger consumers who have no qualms about using AI owned subscription services prefer the flexibility in ownership AI-powered subscription services provide as opposed to traditional ownership forms. AI facilitates these models

through its features like dynamic pricing, routing, and personalization, which are great alternatives to conventional ownership [Qid20].

Also, the analysis of data from ride hailing and carsharing also confirms that AI optimizations in route and service management make shared mobility accessible to thousands, being an attractive alternative to the high cost of owning a car, especially in the metropolitan area. AI improves the overall mobility experience of consumers by reducing time wasted on waiting, re-routing, and even modifying the price to meet demand. With these advances in technology, shared mobility is set to be a viable and resource-efficient option [Daz20].

Subscription Models and Their Appeal

Developments in Policy and Education. Subscription models' subscriptions are evolving as an important trend in the automotive industry as these allow the consumer to pay, use a vehicle and not have the full-term commitment of owning a vehicle. Similar platforms such as Volvo Care and BMW's Access enable their users to have multiple vehicles and to change them as per their requirements. Not only do these models fit the transforming demand of the customers but promote the sustainability agenda by supporting vehicle sharing [LeC98].

A survey by McKinsey & Company shows that subscriptions are appealing to 40% of the consumers in the world with this trend discovery presenting a huge opportunity to these models. This awakening is driven by the need for convenience whereby the consumers want to be free from all the costs of purchasing a vehicle including depreciation, insurance, and maintenance costs [LeC98].

The Influence of Today's Youth on the Changes in Trends of Ownership

Behind all this is the trend that puts pressure on car leasing and ownership, namely trends in the younger generation, especially the millennials and gen Z. According to studies, these customers are willing to use these services because they are more concerned with experience than owned things. The advancement of mobile networks and applications has made it easy for people to access transportation services, which enhances the demand for ride-hailing and car-sharing services [Ins20].

It can also be seen from these statistics that younger age groups do not own cars in large numbers, especially in urban settings where personal automobile ownership is made more difficult by increased traffic and the unavailability of parking space. According to a recent report by the American Public Transportation Association (APTA), it appears that users with a high level of mobility share are able to maximize public transport in cities with well-developed infrastructure and cannot in cities where such infrastructure is weak [Ame21].

Wider Effects on Economy and Environment

The use of Artificial intelligence in consumer services in the automobile industry is not just beneficial to the individual consumer but also to the overall economy and environment. The economic gains from fleet manager systems built around AI incorporate efficiency increases that come from lower idle times, optimized fuel use, and more efficient and effective routing hence lowering operational expenses and carbon emission [Fag15].

The use of AI has also been evaluated through the lens of its positive contribution towards durability. Significant reduction of intercity GHG emissions would also be noticed with the incorporation of AI in shared mobility which is common in some urban cities. Such AI-powered services effectively reduce vehicle miles travel, cutting congestion and emissions that help advance the cities towards achieving their sustainability goals [Wan20].

On cost reductions, Grey's fleet management systems control businesses' expenditures by a considerable margin. Fleet operators are able to cut their maintenance expenses, optimize fuel usage, enhance routing, and so on through predictive analytics, and this significantly reduces costs. AI based routing systems designed for fleets proved to be very effective as recorded by a study published in the Journal of Transportation Research whereby fleets employing these AI algorithms

improved their rate of fuel consumption by up to 20%, thus achieving cost savings in the long run [Suh20].

Environmental Sustainability

In anticipating the role that AI technologies will play in the future, the authors see the impact on environmental sustainability by reducing energy waste. AI technologies increase the efficiency of traffic jams and their emissions, increase the rate of electrification of cars by improving intelligent charging infrastructure and battery management systems [Del21].

Considering the challenge of pollution and climate change, this transformative impact of AI technologies in cities around the world towards sustainable transportation will become vital. In the research, it has found that the development of shared mobility, which is quite possible due to AI technologies, can lower the urban carbon footprint and ATM through global agreements [Pew21].

Obstacles and Issues

The encouragement of AI technologies within the motor vehicle sector is certainly plausible, but certain challenges exist which can be overcome before enacting the full potential of AI incorporation within the industry. These problems are composed of a number of aspects, including but not limited to, technical problems, costs which will be incurred and compliance aspects.

Technical Problems

Ensuring the application of AI in the automotive industry enables technical challenges to be met which are having a sound database and also rectifying the glitches in the AI algorithms. Safety and performance are paramount, therefore ensuring the dependability and accuracy of AI systems is essential and this would require a great deal toward R&D spending.

Cost factors

The cost factors associated with the application of AI posed a threat to the automotive space specifically targeting the competition level. The majority of the concerns with this dynamic include the sustainability of smaller looking to build or startups, they could be crushed by the high level of competition. Such dynamics once again have issues of monopolization targeted at them as well as barriers to entry for the new flimsy firms to the market. In addition, there is a wide range of other concerns with ethical issues and regulatory considerations surrounding compliance with data privacy and algorithmic bias.

Ethical and Regulatory Challenges

As cars connected to the Internet collect and process data on a grand scale, ethical problems regarding the use of personal information of the clients, algorithmic bias come into view. This is especially important to tackle, especially because data misuse can become rife given the vast amount of personal data that will be collected in the automotive sector as AI usage increases. Moreover, such forms of inequitable discriminatory outcomes as algorithmic bias, inherent to any AI system, make the case for the need of ethical principles related to AI development and implementation [Wan20].

Unfortunately, the use of AI and autonomous cars does bring a new set of problems, that being insurance, liability, and safety. This leads to the creation of a hostile environment in the market, which can stem from policymakers failing to strike an acceptable balance between the need for regulations and the need for innovations. Hence, there needs to be free market industry collaboration with the regulators in coming up with sound frameworks which will ensure both clients remain safe while the progress of technology is not hindered.

RESEARCH METHODOLOGY

For AI Based Automation Ownership Models in Automobile Industry, this paper starts with an introduction and impact of AI on vehicle market growth, followed by a comprehensive review of current literature employing combing techniques. There are several components that the research

is based on, including advancements and evolution of technologies and ownership models, their economic aspects, and the policies that shall govern them.

Data Collection

The background materials for this review were obtained from academic journals, industry reports, and selected case studies published over the last ten years. The literature search employed databases such as Google Scholar, IEEE Xplore, ScienceDirect, concentrating on peer-reviewed articles and well- known industry periodicals. The search was guided by the following keywords: “artificial intelligence in automotive industry,” “autonomous vehicles,” “shared mobility,” “vehicle ownership models,” and “economic implications of AI in transportation.”

Inclusion Criteria

For the purpose of this study, the following assistance and criteria were used to select the studies which participated in this analysis:

1. *Relevance*: The paper needs to be relevant to the AI effects on the automotive industry, specifically in the context of application, consumer behavior, economics, and regulation.

2. *Recency*: A publication period of at most ten years was preferred to make sure that the findings were still relevant and up to date.

3. *Credibility*: The review was exclusively grounded in articles that underwent peer review, authoritative industry documents or reports or credible documents or sources.

Analysis Framework

The thematic analysis was used as the basis of analysis of the acquired literature. Key themes were derived from the major content and focal points of each study. This analysis incorporated qualitative findings along with quantitative data incorporating findings into appropriate sections giving the overall picture of AI in the automotive industry.

Limitations

The analysis and synthesis done in this article regarding how AI affects the growth and ownership of vehicles is however not without limitations:

Research Coverage: The research emphasis on English language publications might have left out relevant research published in other languages thus limiting the range of perspectives explored.

Global Industry’s Ever-Changing Characteristics: The fast pace of technological change in the automotive industry means that the outcomes brought forward in this review are subject to change coinciding with those changes.

DISCUSSION

The integration of AI technologies within the automotive industry presents both opportunities and challenges that shape the future landscape of vehicular growth and ownership models. This section delves into the implications of these changes, exploring how AI is redefining consumer behavior, economic structures, and regulatory frameworks.

Redefining Consumer Behavior and Preferences

AI's role in enhancing the user experience cannot be overstated. The rise of mobile applications and AI- driven platforms has fundamentally changed how consumers interact with transportation services. The convenience of ride-hailing apps and car-sharing platforms has led to a cultural shift where consumers prioritize flexibility and accessibility over traditional ownership models.

Research by the Pew Research Center indicates that younger consumers express a strong preference for shared mobility options, reflecting a broader societal trend toward experiences rather than possessions [Mil20]. The implications of this shift are profound, as traditional automotive companies must adapt their business models to meet the evolving preferences of consumers.

Economic Opportunities and Challenges

The economic landscape of the automotive industry is evolving in tandem with the rise of AI technologies. While AI presents opportunities for cost savings and operational efficiencies, it also poses challenges related to job displacement and workforce adaptation. As automation becomes more prevalent, there is a growing need for workforce retraining initiatives to prepare workers for the changing job landscape [Fag15].

Moreover, the economic benefits of AI integration extend beyond individual firms to the broader economy. The shift towards shared mobility can reduce traffic congestion and lower infrastructure costs, contributing to more sustainable urban development. Policymakers must recognize these potential benefits when crafting regulations that support innovation in the automotive sector.

Environmental Sustainability and AI's Role

AI technologies are proving instrumental in addressing environmental concerns associated with transportation. By optimizing routes and enhancing fuel efficiency, AI-driven systems contribute to reduced greenhouse gas emissions and improved air quality. The integration of electric vehicles (EVs) with AI technologies further amplifies these benefits, as intelligent traffic management systems can facilitate the efficient deployment of EVs in urban areas.

The transition to AI-enabled shared mobility services has demonstrated a tangible reduction in urban emissions, showcasing AI's potential as a tool for achieving sustainability goals. As cities grapple with the challenges of pollution and congestion, the role of AI in fostering greener transportation solutions will be increasingly vital [Pew21].

Regulatory Considerations and Ethical Implications

The rapid integration of AI in the automotive sector necessitates the development of robust regulatory frameworks to ensure public safety and ethical standards. Policymakers must navigate the complexities associated with autonomous vehicles, establishing guidelines that promote innovation while safeguarding consumer interests.

Ethical considerations surrounding data privacy and algorithmic bias must also be addressed. As AI systems become more prevalent, ensuring fairness and accountability in their deployment will be critical. Collaborative efforts among industry stakeholders, regulators, and researchers are essential to develop ethical guidelines that foster public trust in AI technologies [Wan20].

FUTURE RESEARCH DIRECTIONS

This review calls attention to the contributions of AI that remains unexplored in the context of the automotive industry. Longitudinal research on consumers as well as vehicle ownership in the context of shared mobility models moves their focus towards the drivers of sustainability within these business models. Furthermore, the intention on understanding the social aspects of eliminating vehicular ownership models with regards mobility justice, will mitigate inequalities arising from such technologies.

With the rise of concerns over data ownership, there will however be a need for specific strategies that will help ameliorate the trust of consumers into these AI driven mobility platforms. Finally, inter-disciplinary studies that include urbanists, social researchers, as well as environmental specialists can complement research in the social impacts of AI applications in the automotive vehicles industry.

CONCLUSIONS

In conclusion, the adoption of AI in the automotive industry is regarded as a turning point in the conception regarding vehicles, their use, and their integration in society. It is shown in this review that AI is enhancing greatly the trends associated with the changes in the models of growth and ownership of vehicles that have been the norms in society. The arrival of shared mobility models such as subscription and even driverless vehicles are the manifestations of the change in which

personal vehicles ownership is the less priority for the consumers as they look for easier and cheaper ways of getting around.

The consequences of these transitions are fundamental since they touch on not only the buying habits of customers but go further into social, economic, and sustainable development of the institutions. AI technologies help to improve operational effectiveness and cut costs and increase profitability as well as enable us to achieve lower emissions, thus addressing global sustainability targets. On the other hand, the fast pace with which these technologies are maturing creates its own challenges, for example, legal and regulatory issues, ethical dilemmas and responsibilities, and employing significant amounts of people that drove vehicles in the traditional way. There is a greater need to develop a framework to deal with such issues and that would involve all the parties in the game including the public to seek measures to ensure equality in movement.

The automobile sector is one of the sectors which is being affected by the evolution of artificial intelligence. However, it can conclusively be said that research will help comprehend the consequences of these changes on the global marketplace in the long term. Mobility as a Service or mass urban transport will also have to pay attention to how these new technologies, like blockchain for securing data in mobility services, are put together. It is also important to discover the social dimension of decreased car ownership. All these aspects will allow researchers to generate useful knowledge and recommendations to strengthen the development and competitiveness of the automobile sector for the benefit of the economy and society as a whole.

About most fundamental changes, artificial intelligence has the potential to send the automotive industry into overdrive, driving the transition to a more sustainable, more efficient, and more customer- oriented future. In doing so, we need to find a way to work together to come up with creative initiatives to be able to harness the promise and potential challenges offered by this technology.

Ethical Statement: This study does not contain any studies with human or animal subjects performed by any of the authors.

Conflicts of Interest: The authors declare that they have no conflicts of interest to this work.

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МЕТАДАННЫЕ / METADATA

Название: Влияние ИИ на рост числа транспортных средств и модели владения ими в автомобильной промышленности

Аннотация: Автомобильная промышленность претерпевает структурные изменения из-за внедрения технологий искусственного интеллекта (ИИ), которые также переопределят модели разработки и владения автомобилями. В этом обзоре рассматриваются различные способы, с помощью которых технологии ИИ могут облегчить использование транспортных средств, одновременно повышая безопасность и эффективность и поощряя новые модели владения транспортными средствами. Вмешательства в технологии ИИ, особенно более сильный акцент на технологиях автономных транспортных средств, предиктивном обслуживании и решениях для совместной мобильности, формируют вкусы современного потребителя с отходом от традиционного владения автомобилями как доминирующей основы использования. Сегодня роль мобильности как услуги, подписки, совместных поездок и, в итоге, автономных автомобилей выходит за рамки переопределения понятия транспорта — они предоставляют новые бизнес-преимущества и проблемы для участников. Кроме того, ИИ также актуален для решения других насущных экологических проблем, поскольку внедрение технологий ИИ повышает операционную эффективность и устойчивость бизнес-моделей. Целью данной статьи является предоставление обзора растущего влияния ИИ на автомобильную промышленность путем интеграции имеющейся в настоящее время литературы по этой теме и определения того, какие еще области нуждаются в исследованиях для содействия дальнейшему пониманию влияния ИИ на одну из важнейших отраслей промышленности.

Ключевые слова: Автономные транспортные средства, искусственный интеллект, поведение потребителей, совместная мобильность.

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About the authors | Об авторах

Bitto Benny
CHRIST (Deemed to be University), Bengaluru, India.
Assistant Professor in the Department of Management at CHRIST College, Pune. Mr. Bitto is also a Ph.D. scholar in Commerce. His research has been published in Scopus-indexed journals, and he has presented his work at numerous international conferences and seminars.
E-mail: bittobennykply@gmail.com

Karthigai Prakasam Chellaswamy
CHRIST (Deemed to be University), Bengaluru, India.
Associate Professor in Commerce. He also serves as Associate Dean of the School of Commerce, Finance, and Accountancy. He has guided PhD students on topics like stock market volatility, financial inclusion, and cashless payment systems.
E-mail: gaganjot.e13007@cumail.in

Битто Бенни
CHRIST (считается университетом), Бангалор, Индия.
Доцент кафедры менеджмента в колледже CHRIST, Пуна, доктор наук в области коммерции в CHRIST (университете), Бангалор. Его исследования опубликованы в журналах, индексируемых Scopus, представлены на многочисленных международных конференциях и семинарах.
E-mail: bittobennykply@gmail.com

Картигай Пракасам Челласвами
CHRIST (считается университетом), Бангалор, Индия.
Доцент в обл. коммерции, замдекана Школы коммерции, финансов и бухгалтерского учета. Аспиранты – темы: волатильность фондового рынка, финансовая инклюзивность, системы безналичных платежей.
E-mail: gaganjot.e13007@cumail.in