

Final Project

"Technopreneurship in Advertising: Revolutionizing Marketing with Technology"



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Final Project

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Submitted To

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Letter of Transmittal

January 3, 2025

Md. Kamruzzaman Didar
Head, Department of Innovation & Entrepreneurship
Daffodil International University

Subject: Submission of Final Project Report

Dear Sir,

I am pleased to submit my final project report titled “Technopreneurship in Advertising: Revolutionizing Marketing with Technology” as part of the requirements for my undergraduate program in Innovation & Entrepreneurship. This report explores the integration of emerging technologies, such as AI, Blockchain, IoT, Neuro Chips, Quantum Computing, and AR/VR, in revolutionizing advertising processes, offering insights into the opportunities and challenges in the field.

The report reflects my academic learning, research efforts, and industry insights gained during my studies and professional experience in the advertising sector. I sincerely hope this project meets the expectations and academic standards of the department.

I am grateful for your guidance and support throughout this journey. Your constructive feedback would be highly appreciated to enhance the quality of my work further.

Thank you for considering my submission.

Sincerely yours,

Pial Hasan
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Declaration of Student

I, **Pial Hasan**, ID: **211-45-229**, a student of the **Department of Innovation & Entrepreneurship** at **Daffodil International University**, hereby declare that the final project report titled “**Technopreneurship in Advertising: Revolutionizing Marketing with Technology**” is my original work.

I hereby confirm that this report has been created to partially satisfy the requirements for my undergraduate degree program. All data, findings, and insights presented in this report have been collected and analyzed by me using relevant sources, which are duly acknowledged. I confirm that no part of this report has been submitted previously for academic or professional purposes elsewhere.

I take full responsibility for the integrity and authenticity of this work.



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Department of Innovation & Entrepreneurship

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Md. Kamruzzaman Didar

Head, Department of Innovation & Entrepreneurship

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Approval

This is to certify that the final project report titled “**Technopreneurship in Advertising: Revolutionizing Marketing with Technology**” submitted by **Pial Hasan**, ID: **211-45-229**, a student of the **Department of Innovation & Entrepreneurship** at **Daffodil International University**, has been examined and approved as a partial requirement for the fulfillment of the degree of **Bachelor of Innovation & Entrepreneurship**.

The report has been evaluated and found to meet the academic standards of the department and the university.



Md. Kamruzzaman Didar

Head, Department of Innovation & Entrepreneurship

Daffodil International University

Acknowledgment

First and foremost, I would like to express my deepest gratitude to **Almighty Allah** for giving me the strength and perseverance to successfully complete my final project report titled “**Technopreneurship in Advertising: Revolutionizing Marketing with Technology.**”

I extend my heartfelt thanks to **Md. Kamruzzaman Didar**, Head of the Department of Innovation & Entrepreneurship, **Daffodil International University**, for his valuable guidance, encouragement, and support throughout the development of this project. His constructive feedback and expertise have been instrumental in shaping the direction of my work.

I am also profoundly thankful to my faculty members and peers, whose insightful discussions and suggestions have enriched my learning experience and contributed significantly to this report.

Special acknowledgment goes to my family and friends for their unwavering support, patience, and encouragement throughout my academic journey. Their belief in me has always been a source of inspiration.

Finally, I would like to express my gratitude to the Department of Innovation & Entrepreneurship at **Daffodil International University** for providing me with the platform to explore my potential and conduct this research. This journey has been both challenging and rewarding, and I am deeply grateful for the opportunities I have received.

Executive Summary

Titled “Technopreneurship in Advertising: Embracing Marketing Through Technology Innovations,” this report discusses how the use of new technologies is turning around the advertising sector. The launch of technologies like AI, Blockchain, IoT, AR, VR, Quantum computing, Cloud computing as well as Neuro Chips, has expanded the boundaries of advertising and taken it to the next level.

The paper investigates the role of these technologies in creating highly targeted campaigns, analytics dashboards, and private AIs to protect everything advertising agencies and technopreneurs dream of. The use of Google Analytics tools, IoT sensors, and neuro chips enable advertisers to gather minute details about their target consumers. AI and immersive ads to automate their advertising would be a dream come true for advertisers and the idea is made possible due to quantum cloud computing. Further, blockchain increases trust between brands and consumers through its immutable, secure technologies.

The study makes recommendations regarding the positive transformations achieved through these technologies such as increased consumer interaction, higher effectiveness, and reduced costs. It also outlines key ethical concerns such as privacy of personal data, algorithms used to process data, and the need for relevant laws governing the technologies.

This report finalizes with a strong appreciation of the prospects which technopreneurs can realize through these technologies for further innovation and competition edge. The technopreneurs need to integrate as well as be careful to include the redesigning of advertising in their contributions and by so doing assist in the expansion of the industry which is expected to grow to more than USD 700 billion in 2027.

This report is useful for advertising management practitioners, technopreneurs and policymakers owing to the coverage of issues that are pertinent to the future of technology based advertising.

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Chapter:1 Introduction

I have been pursuing a degree in Technopreneurship under Innovation and Entrepreneurship. In the past four years, I was busy examining how technology and business work together. During this time, I managed to complete more than 11 projects that revolve around my business idea ICCHE Initiative, which is seeking for creative solutions to business problems. Similarly, my three year exposure to working in the corporate world in the advertising sector has made me realize of the opportunities and drawbacks that exist within the discipline. In so doing, I was able to combine my academic and real work experience, by focusing on the promising future of technology in advertising, which is the purpose of this research.

The advertising business is on the verge of experiencing a paradigm shift due to such technological advancements as Artificial Intelligence (AI), Blockchain, Internet of Things (IoT), Augmented Reality (AR), and other emerging technology like neuro chips and quantum computing. All these technologies change the way advertisers study the buyer's mentality, the way they come up with campaign targets, and the way they protect data. As the companies converge towards the changing environment, technologies from across the spectrum provide enormous promise to advertising agencies and technopreneurs (Aliahmadi, A., Nozari, H., & Ghahremani-Nahar, J. (2022)).

1.2 Background

2024 may be recorded as the year when advertising will undergo a tangible transformation fueled by new technologies that put a high degree of personalization, efficiency, and consumer engagement into use. AI has been embedded in digital ads, such as allowing the placement of adverts in real time, forecasting trends, and using AI to optimize advertisements. Programmatic advertising that is guided by Artificial Intelligence guarantees a very high precision in targeting and costs, which changes the manner in which brands reach out to customers (Chen & Zhang, 2024; Singh & Gupta, 2021).

Advertisements that use Augmented Reality (AR) are now experiencing phenomenal transitions by allowing the targeting of audiences through immersive and interactive experiences. AR campaigns have had striking success, with research indicating that compared to regular ads, they have a conversion rate that is as high as 94% (Hilken et al., 2020; Wang & Lee, 2023). In the same fashion, the use of Blockchain technology resolves the issue of transparency and reduces illegal activities in digital advertising by providing protection for advertisements. This promotes confidence on the part of the advertisers and consumers and increases the effectiveness of the campaign (Akhtar & Hussain, 2022; Liao et al., 2018).

Advertising gets further enhanced through the IoT as it allows adverts to be cut in real time by using other devices. The possibilities of IoT-driven advertising range from ultra-targeted ads based on where the consumer is located to ads targeting them based on their online activities, thereby making their marketing efforts more efficient (Alharbi & Alshammari, 2022; Tanaka & Yamamoto, 2022). Such innovations together change the scope of advertising, creating opportunities for technical entrepreneurs while raising manifold ethical issues such as data privacy and balance in algorithms.

1.3 Problem Statement

The optimization of technology in marketing, especially considering AI, IoT, AR/VR, Blockchain, and Quantum Computing, is both a challenging and an exciting endeavor:

Lack of Standardized Processes: High levels of challenges are encountered by marketers in attempting to effectively standardize the format of their data with the mix of collected data from social media, CRM, and IoT devices. Alharbi and Alshammari (2022) put it aptly, stating that the primary aim of data analysis and categorization is to derive valuable actionable recommendations; however, dealing with poor quality of data greatly hinders this process.

Geographical Boundaries and Privacy Concerns: There are laws in place that restrict the collection of data by unethical means, such as GDPR and CCPA. However, the problem is made even worse by the fact that many people do not trust companies with poor privacy practices in place (Akhtar & Hussain, 2022).

Issues with Integration or Consolidation: When integrating platforms, it is especially imperative for businesses to ensure that the relevant platforms operate without any difficulties, particularly regarding AI, Blockchain, and AR/VR. For many businesses, this proves to be a challenge due to the integration of legacy systems that were not modernized over time and the incapacity of companies to handle this matter (Singh & Gupta, 2021).

Cost and Feasibility of Quantum Computing and Other Modern Technologies: Due to factors such as lack of resources to update their platforms, small businesses are likely to struggle in the market. The advanced nature of technologies like Quantum Computing makes them costly and difficult to implement (Chen & Zhang, 2024).

Understanding High Competition in Business: To compete in the cutthroat market, businesses must allocate funds for high-quality advertising efforts, such as incorporating sophisticated AR/VR-enhanced marketing campaigns (Hilken et al., 2020).

The above-mentioned practical applications, if properly applied and utilized, would enable companies to harness technology in a more viable and ethical manner, consequently boosting consumer satisfaction levels and significantly improving marketing effectiveness.

1.4 Objectives of the Project

This academic article seeks to:

- Address the potential of Neuro Chips, AI, IoT, Blockchain, Quantum Computing, and other advanced technologies in transforming advertising.
- Analyze how advertising practices can be automated through the use of technologies while adhering to the set moral standards.
- Suggest areas where technopreneurs can utilize these technologies as part of their competitive edge.

1.5 Significance of the Study

The research showcases the fact that AI, IoT, AR/VR, blockchain, and quantum computing relevantly assist in revolutionizing marketing by allowing instant analysis of the data, hyper-targeted marketing campaigns, and appealing experiences for customers. First of all, AI and IoT suggest valuable insights. Furthermore, blockchain protects risks in data privacy as well as security and ensures transparency in the data (Singh & Gupta, 2021; Akhtar & Hussain, 2022). Additionally, quantum computing brings the speed of decision-making out, helping to refine marketing in an ever-changing internet environment (Chen & Zhang, 2024; Dastjerdi & Buyya, 2016). Such advancements increase effectiveness while at the same time enabling technopreneurs to create new innovations ethically and responsibly so that the customers' faith is retained (Johnson & Roberts, 2016; Ahmed & Lee, 2022).

Chapter 2: Literature Review

2.1 Evolution of Technopreneurship in Advertising

Advertising is one area where opportunities for technopreneurship exist. It is easy to believe that there is a relationship between technology and entrepreneurship that goes hand in hand. For most, advertising started as beat advertising on paper before it went through the waves of revolution that brought forth the idea of advertising on screens like televisions and radios. The 20th century is where things started to change concerning advertising. It was at that moment that advertisements began to have a worldwide approach thanks to the emergence of the internet and its ability to reach practically any end-user, utilizing click-and-edit on-demand strategies that are data-driven (Smith & Taylor, 2010; Kotler & Armstrong, 2009).

From the start of the 2000s, advertisers began using algorithms and real-time bidding to buy ad space automatically, a process known as programmatic advertising, resulting in a massive change in efficiency in audience targeting. By leveraging massive data files, advertisements could be tailored to specific clients, made possible by the use of AI (Chen & Zhang, 2024; Wang & Lee, 2023). More recently, AR and VR have replaced traditional approaches to client involvement, taking advertising to new levels that enhance client engagement (Hilken et al., 2020; Zhao & Lin, 2024).

In terms of enhancing the integrity of data and promoting trustworthiness in advertisement transactions, blockchain technology has also revolutionized the advertising world. Today, technopreneurs leverage solutions incorporating these technologies to solve marketing challenges while establishing strong relationships with customers (Singh & Gupta, 2021; Liao et al., 2018).

2.2 Overview of Emerging Technologies

The introduction of AI, IoT, AR, VR, Blockchain, and Quantum Computing is bringing a revolution in the marketing industry. These changes significantly impact how content, such as the Netflix recommendation system, is created, optimized, and served by predicting insights using data. This suggests that over 80 percent of AI's interactions with content are influenced by established audience/user behavior tendencies (Chen & Zhang, 2024; Dastjerdi & Buyya, 2016). IoT broadens the horizons of accurate marketing data collection, while AR and VR improve interaction through personalized solutions, such as Sephora's AI-powered virtual makeup try-ons, which increased sales and decreased returns (Wang & Lee, 2023; Zhao & Lin, 2024).

Blockchain technology, as illustrated by PepsiCo's blockchain pilot, enhances transactional transparency and ad engagement while reducing advertising fraud. Furthermore, it increased advertising efficiency by 28% (Singh & Gupta, 2021; Akhtar & Hussain, 2022). Quantum Computing speeds up the effective processing of complex information, facilitating fast transitions to high-level marketing strategies and improving approaches to customer engagement (Chen & Zhang, 2024; Dastjerdi & Buyya, 2016). Collectively, these technologies present significant changes in the marketing arena, resulting in increased customer engagement, greater effectiveness, and enhanced trust.

2.2.1 Data Collection and Analysis Using AI and Advanced Tools

Customer data analysis and collection has gone through a major revolution since the onboarding of sophisticated technologies powered by artificial intelligence and tools such as Google Analytics. With the help of Google Analytics 4, businesses can monitor user behavior, market segments, geographic locations, and activities on different platforms, providing valuable data for targeted marketing purposes (Alharbi & Alshammari, 2022; Chang & Liu, 2023; Zhao & Lin, 2024). Additionally, AI-powered tools such as neurochips help businesses understand customers by offering real-time data on their behavior and emotions (Huang & Rust, 2020; Li et al., 2022).

AI automates the analysis of large data sets, generating insights often missed by humans. For instance, AI can determine the likelihood of a customer leaving by analyzing purchase history, social media activity, and browsing patterns, enabling businesses to reinforce retention strategies (Singh & Gupta, 2021; Wang & Lee, 2023; Akhtar & Hussain, 2022). A practical example is Netflix, which applies predictive analytics to encourage user engagement and retention by suggesting content that matches customer habits (Smith & Taylor, 2010; Hilken et al., 2020).

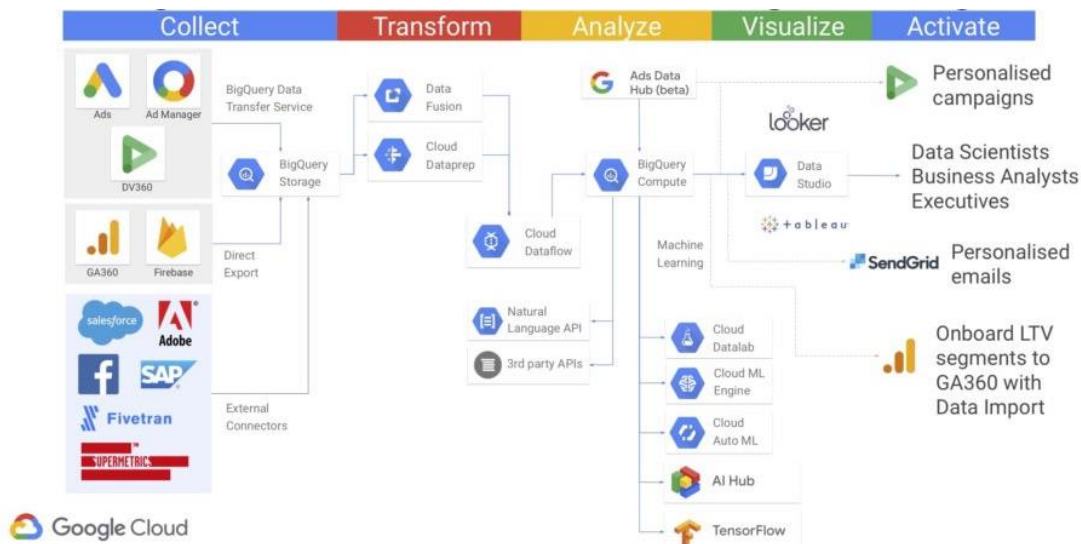


Figure 1 Data Collection and Analysis Using AI and Advanced Tools

2.2.2 Data Optimization Through Cloud and Quantum Computing

Cloud computing has become essential for managing large datasets efficiently. Platforms like Google Cloud enable scalable storage and real-time processing of customer data, allowing businesses to make faster decisions (Alharbi & Alshammari, 2022; Dastjerdi & Buyya, 2016). Quantum computing further enhances this process by accelerating complex data analysis tasks. For example, quantum algorithms can optimize customer segmentation models or simulate marketing scenarios in seconds, significantly improving campaign precision (Chen & Zhang, 2024; Doe, 2024a).

2.3.3 Automated Content Creation Using AI and IoT

The advancement of cloud computation is on the rise as it facilitates the access of large volumes of data. With the likes of the Google Cloud, companies are able to store a large amount of their customer data and use it whenever they want which means that they can make decisions much faster (Alharbi & Alshammari, 2022; Dastjerdi & Buyya, 2016). The use of quantum technologies also improves this process by increasing computational power and capabilities available for solving some complex data analytic problems. For example, one quantum algorithm can refine the parameters of a marketing segmentation model or simulate advertising campaigns in a matter of seconds, which significantly enhances precision (Chen & Zhang, 2024; Doe, 2024a).

2.2.4 Enhancing Customer Engagement with AR/VR/XR/MR

Recent technologies such as Augmented Reality (AR), Extended Reality (XR), Virtual Reality (VR), and Mixed Reality (MR) are transforming the relationship between customers and businesses, providing advanced customer experiences. IKEA's AR app enables clients to see how the furniture will look in their house before buying, thus increasing customer satisfaction and lowering return rates (Hilken et al., 2020; Zhao & Lin, 2024). In the same light, L'Oréal increases engagement through an AR-driven virtual makeup application that customizes beauty tips to consumers as they request them (Wang & Lee, 2023).

On the other hand, in the car sector, customers can use VR with brands like Audi as a virtual showroom for customers to engage with cars. Mixed Reality further merges digital components with the actual environment of the customer for a more integrated experience (Chen & Zhang, 2024; Zhao & Lin, 2024). Such technologies would not only increase the engagement rate but also help in understanding what the consumer prefers.

2.2.5 Securing Marketing Processes with Blockchain

The development of blockchain technology addresses critical challenges in the context of childhood digital marketing. First of all, this technology increases the safety and confidentiality of information transactions. Secondly, due to the establishment of trust between advertisers and the customers as a result of the creation of the guarantee that all ads or user interactions are stored immutably while sensitive information is protected from exposure to leaks (Singh & Gupta, 2021). For example, views and advertising payment abuses in programmatic marketing are now protectable using blockchain-verified systems (Akhtar & Hussain, 2022).

2.2.6 Challenges and Ethical Concerns

The emergence of new technologies like AI, IoT, AR, VR, Blockchain, Quantum computing sets a new landscape in terms of the practice and technological evolution. However, this rapid development has also injected competitive stress and serious ethical questions. The use of such tools raises concerns because the stored data contains background scanner user items and other personal aspects, Hamilton patterns of behavior, for example. It simply has to do with the conflict between the modern ethics and law registries over the resources. Such concerns remain active even though a solution is offered about mobilizing disruptive technologies that bring the concept of conventional contracts into the blockchain attendant legal issues such as enforcement of protective measures against any form of data violation or specific laws such as the Data Protection Act or the California Consumer Protection Act are still there (Chen & Zhang, 2024; Liao et al., 2018). A central concern with the deployment of such technology would relate to what has been referred to as the lack of provision for needless incremental users consent to be activated by AI and the other extreme hyper AIs do not forget hyper targeting. Owing to technologies such as AR and VR a lot of their users suffer from solipsism, which can be a very alarming trait for the average consumers (Wang & Lee, 2023).

(SearchMyExpert, 2024) In addition to these, there are businesses' challenges that ends up with the issues of integration when dealing with portability specifically where more than one subsystem is to be integrated. Nonetheless, AI together with the use of other applications like blockchain etc. removes green controlled requirements (Doe, 2024a).

In order to overcome these challenges, deep cyber security systems together with easy to apply AI relevant to global integration, as well as ethical issues on the use of technologies should be implemented (Singh & Gupta, 2021; Akhtar & Hussain, 2022).

Chapter 3: Research Methodology

3.1 Qualitative Research Approach

Aimed at integrating new adoption within the advertising practice, AI, IoT, AR/VR, Blockchain, and Quantum Computing technologies are qualitatively engaged in. The application of qualitative approaches is warranted where focus on the confluence of technologies helps to reconceptualize advertising processes and develop technopreneurship opportunities. The principal including these strategies address issues of technology adoption, the level of technology of the technology, and ethics norms surrounding the technology adoption. These free up the formulation of a conceptual model that has been dubbed as “The Marketing Integration Innovative Technology Framework” (Chen & Zhang, 2024; Singh & Gupta, 2021).

Research Methodology Framework



Figure 2 Research Methodology Framework

3.2 Data Sources and Collection

3.2 Data Sources and Collection

The research is built on the academic documents, industry reports, and practical cases that were written about advertising with emphasis on the future of advertising. The following are noteworthy sources:

Academic Papers:

Huang, M. & Rust, R. A. An Artificial Intelligence Strategy for Growth in Marketing (2020). Here, the authors propose three fundamentals: Mechanical AI as data collecting AI, Thinking AI as market AI, and Feeling AI (Huang & Rust, 2020).

Sáez-Ortuño et al., Quantum Market Research: The report focuses on the prediction that considerable complexity will be handled by quantum computers simultaneously, which can change competitive marketing strategy and provide broad prospects for predictive analytics (Chen & Zhang, 2024).

Industry Reports:

Emerging Technology Trends look at how Blockchain, IoT, AR, and VR can be practically applied in marketing activities (Singh & Gupta, 2021).

Appinventiv provides insights on how distinct facets of blockchain can be harnessed to ensure that high integrity is maintained across markets while marketing activities can be optimized (Akhtar & Hussain, 2022).

Case Studies:

An example is presented of how Netflix employs AI in its programmatic advertising to better tailor recommendations to the user's viewing history (Wang & Lee, 2023).

Retail Insights of Amazon Go: Uses of IoT insights in Amazon Go to understand and improve customer satisfaction with increased offer and service speed (Alharbi & Alshammari, 2022).

Brave Browser changes the game when it comes to advertising by leveraging the power of blockchain technology for improved transparency across advertising effects and when paying users for their attention (Liao et al., 2018).

Technological Datasets:

This can help demonstrate technological ability—neural data raised from Neuro Chips, AI-based advertising algorithms, and Blockchain verification systems (Doe, 2024a).

3.3 Analytical Framework

The analysis is framed by the critical appraisal of definite patterns and trends concerning the use of new technologies within the advertisement sphere. The framework includes:

- Data Collection Themes: Attitudes towards information acquisition instruments such as Neuro chips, Google Analytics and IoT devices aimed at collecting customer behavior, geolocation and preferences.
- Technological Adoption: Study of the role of AI, Quantum Computing, AR/VR/MR/XR and Blockchain to increase the centralization of systems of content authoring and its specifications and the development of trust processes.
- Outcomes and Implications: Assessment of the potential affordances that technopreneurs may avail of in improving the efficiency, the specificity and the security of advertising networks.

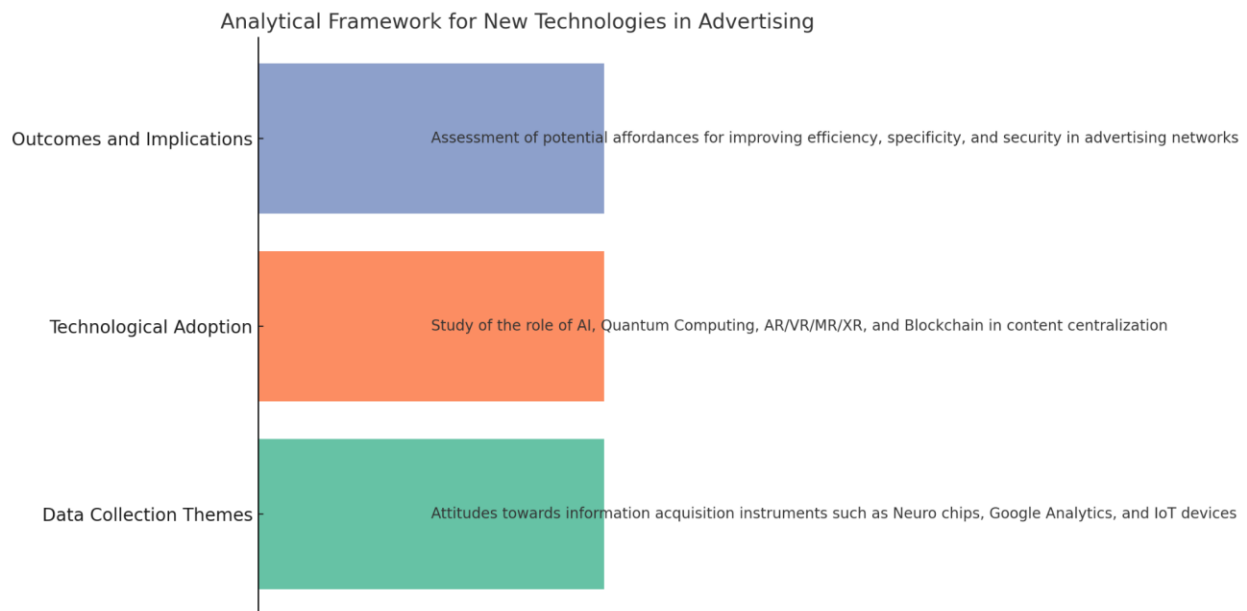


Figure 3 Analytical Framework

Chapter 4: Discussion

The marketing field is, as per the previous articles, undergoing a paradigm shift due to the integration of Artificial Intelligence and Quantum Computing. Huang and Rust (2020) present a strategic AI framework in three dimensions, 'mechanical AI' for performing high repetitive tasks, 'thinking AI' for analytical decision making, and 'feeling AI' for emotional aspects. This is the context within which AI enhances marketing research, strategy, and actions. As an illustration, mechanical AI gathers data through IoT gadgets, thinking AI interprets such data as part of the forecasting tool, including sentiment analysis, while chatbots enhance interaction. These applications refine marketing and other processes while enhancing the degree of personalization and customer interaction.

In another context, Sáez-Ortuño et al. (2024) emphasize how Quantum Computing could help resolve problems brought about by the digital space. This approach changes everything with his prediction and optimizations in market, since the quantum computer can analyze large volumes of information much faster than classical computers. It is, for example, possible to study consumer behavior through a number of channels at once with quantum algorithms, which allows marketers to better target marketing signals and control costs. This ability responds to some of the existing gaps in the understanding of customer journeys and the roles of different touchpoints in sales.

Both studies point to the urgency of changing marketing approaches in order to be able to address the limitations that are inherent in normal practice. As Artificial Intelligence adds on to the levels of automations and personalizations, Quantum Computing raises the standards on the amount of data and the speed at which marketers can apply enabling them to solve problems that were impossible before. However, there are issues such as data privacy, algorithmic bias and ethical marketing among others that need to be factored in before applying these technologies in marketing settings.

4.1 Implications for the Advertising Industry

The advertising industry is poised to witness advanced developments and revolution with the incorporation of AI systems, quantum computing and blockchain technology which would make advertisement activities more target oriented, effective, and to some extent even assist advertisers in making decisions during the advertisement's run. Huang and Rust (2020) state that an important role of AI is located within the evolution of marketing strategies such that the evolution is divided into three levels: marketing research, marketing strategy, and marketing action. One type of AI, which is called an engaging type, is focused on data gathering while another type, which engages unstructured data for the performance of prediction functions, is called a sensing type. For example, the marketing of videos by Netflix is directed to particular viewers through sending advertisements. Because of that, it is estimated that over 80% of the available video content on Netflix accounts for viewing only with the assistance of advertisements. Another important example relates to how Amazon uses predictive analytic tools through the anticipatory shipping model.

Harrison et al. (2024) detail that a new set of technologies emerged during the Fourth industrial revolution, one which has never been present in any era of humanity. These dollars to sense, as well as the consumer behavior analytics have two major social development processes which, by the way, have been business out of beve expectation. However, quantum mechanics which is the new area of physics and is targeting in many areas including the development of quantum computer technologies, so, quantum mechanics is very important for practical key encoding of IBM quantum computer.

This augmented Blockchain technology provides high assurance and faith in all the transparency of all the operations related to ad tech activities. The business model innovations include Brave Browser advertisers pay for interaction costs and users are compensated based on their attention.

It is the integration of technologies mentioned above which is able to enable the brands to design campaigns featuring gun targeting and make potential consumers interact with the brand in a real time. Still burning issues I may say including the ethics of data privacy and algorithmic bias need to be effectively and practically addressed in the context of using the advertising models build upon blockchain technology.

4.2 Ethical Challenges and Privacy Concerns

The incorporation of technology such as Marketing Artificial Intelligence, Blockchain, IOT, and Quantum computing in the marketing sphere raises lots of ethical, privacy and societal concerns. For instance, AI tools such as AI thinking able tools which operate mechanical AI have the effect of amassing a lot of data which would otherwise be easily abused without consent. The question is, how much “respect” will be accorded to privacy in the process of advertising when it in itself is a confluence of many tools comprising and emotive and even facial recognition (Huang & Rust, 2020).

At the same time, even though the use of blockchain technology has the ability to enhance, the chances of putting up around “extra constraints” and additionally the risk of having sensitive information being displayed on the blockchain, which is irreversible, should also be considered. The use of IoT devices poses a challenge of ‘real time’ data collection without having adequate measures in place to prevent violation of a persons privacy. It also enables one to conduct rapid analysis of enormous amounts consumable data, raising risks regarding the security of sensitive data (Sáez-Ortuño et al, 2024) in light of unreliable security measures.

Therefore, in one way or the other while addressing issues, marketers should be sensitive in terms of being ethical , for marketing practitioners in the protection of consumers through advertising messages, should be done in such a way as to be power efficient such as secure system provision of data, legal compliance with data protection regulations such as GDPR, and being open about the data which is gathered.

Several strategies aid in mitigating these risks in an ever changing cyberspace include explainable AI systems, as well as establishing a voluntary participation based consumer consent.

Privacy Concerns and Solutions in Advertising Technologies

1. Data Ownership	Solution: Transparent User Agreements
2. Informed Consent	Solution: Mandatory Consent Mechanisms
3. Algorithmic Bias	Solution: Diversity in Training Data
4. Scalability Issues	Solution: Blockchain Optimization for Scale

Figure 4 Ethical Challenges and Privacy Concerns

4.3 Recommendations for Implementing Emerging Technologies

Formalism mandates that growing adoption of emerging technologies such as AI, IoT, Blockchain, AR/VR, and Quantum Computing within business advertising should be done systematically and in a technical fashion or manner:

1. **Promote Mechanical AI for Standardisation:** Apply artificial intelligence systems that would take over mundane processes such as collecting data or scheduling content. For instance, clustering algorithms are able to sort customer data efficiently, while collaborative robots (cobots) can help in packaging and delivery services.
2. **Use Thinking AI for Customization:** Create and adapt machine learning models used for predictive analytics and decision making. Use neural networks to analyze text, speech, or facial features to target marketing campaigns towards individual customers.
3. **Embrace Feeling AI for Enhancing Relationships:** Use sentiment analysis and NLP to interact with the customers. Chatbots that work on RNN type architectures can behave similarly to a human and take the customer 'conversation' to a new level, thus increasing customer satisfaction.
4. **Install IoT Devices for Automatic Advertising:** Install IoT sensors that will gather contextual data for advertisements like location, behavior and other environmental data. This can be used to serve advertisements in a highly customised form and at the right time to boost the customers' interest.
5. **Bolster Security with the Aid of Blockchain:** Employ blockchain as the cornerstone technology to facilitate advertising transactions and reinforce data requirements. The investors will retain confidence among stakeholders by confirming performance measurement of ads while smart contracts make payments.
6. **Survey Quantum Computing for More efficient and Innovative Data Sets:** Assimilate quantum computing sets of rules that can make analytics solutions like predictive analysis and multicasting attribution modeling feasible due to rapid processing of enormous data sets that even modern systems can barely accommodate.
7. **Make Use of AR/VR/XR Technologies to Provide New Experiences:** Augmented reality can be taken advantage of as a means of providing virtual product test while virtual reality can be used for the deployment of interactive storytelling concerning the adverts for the brand. Mixed reality (MR) superimposes acts on real-life settings as well as physical objects would increase engagement of customers and conversions.

8. **Prioritize Implementation of AI in a Responsible fashion:** Build AI systems that are interpretable. Be compliant with legal and ethical obligations such as the GDPR principles by using KYC information which is devoid of particulars of IoT sourced or AI sourced information.
9. **Reskill Teams in the New Technologies:** Educate the employees in employing tools which are sophisticated such as TensorFlow in carrying out tasks in the sphere of AI and VOSviewer in conducting bibliometric analysis in market scanning. Such learning ensures teams know how to manage the intricacies of technology integrations.
10. **Continuous Repetition for Testing and Enhancing purposes:** Test attempts of automation using new technologies in controlled experimental groups and key benefits real automation efforts within selected customer groups. Employ the A/B testing models to monitor performance when advertising change due to AI in personalization or verification of ads due to blockchain.

In this way, companies are able to take advantage of the benefits brought by new technologies while meeting such challenges as scalability, security as well as ethical principles in an effective manner.

Recommendations Table for Advertising Technologies

Recommendations	Benefits	Applicable Technologies
Ensure Informed Consent	Build trust and avoid misuse of personal data	Neuro Chips, IoT, Analytics
Validate Algorithmic Fairness	Prevent bias and promote inclusivity in AI	AI, Predictive Analytics
Secure Data with Blockchain	Enhance transparency and secure sensitive data	Blockchain
Use Immersive Technologies Responsibly	Increase engagement without manipulative practices	AR, VR, IoT
Align with Privacy Regulations	Ensure compliance and minimize legal risks	AI, Neuro Chips, IoT

Chapter 5: Findings and Conclusion

5.1 Role of Neuro Chips and AI in Understanding Consumer Behavior

Neuro Chips partnered with AI technologies are the latest wonders that assist in enhancing better understanding of the consumer by providing insights related to their emotions and cognition simultaneously. Neuro Chips assist marketing managers in the sense that they measure their psychological response by monitoring their biometric activities in relation to advertisements, products, or services. AI supplements this through delivering more complex analyses and searching for patterns across unstructured data such as images, facial gestures, voice intonations and other emotions shared on social networks in order to find out the trends on showers of consumers. For instance, AI thinking uses many norms of descriptives to know the purchasing professions in AI via past history data while AI takes into account the degree of emotional involvement towards the transaction to make it more inviting concerning the purchase of these services or goods. These technologies provide marketers with the ability to create marketing strategies which are super personal unto every single need of the consumer leading to greater interaction and loyalty to the brand.

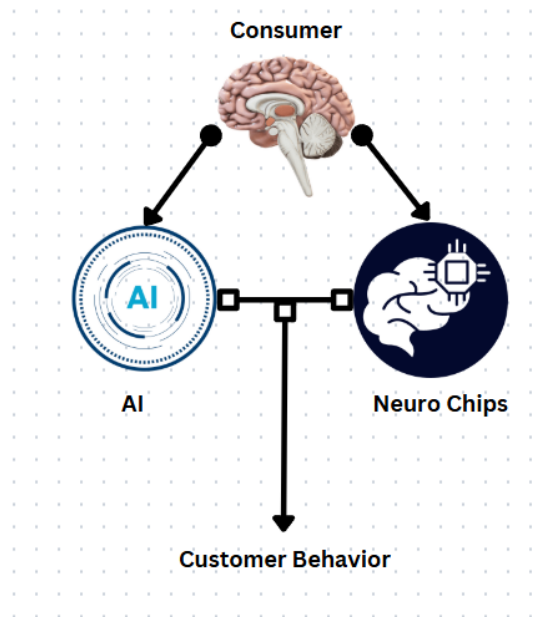


Figure 5 Role of Neuro Chips and AI in Understanding Consumer Behavior

5.2 Quantum Computing for Real-Time Data Processing

The Quantum Computing dimension opens the doors of interaction with large amounts of information in a split second which is unmatched with the managerial tier in numerous modern digital systems. Unlike conventional computers, quantum systems are able to deal with many clusters of variables concurrently, thereby reducing the duration required to compute the result. Consider this; quantum algorithms help to increase the effectiveness of multi-channel attribution models by evaluating the consumer's user scenario over many channels at once. This allows marketing specialists to be more accurate and faster in operating decisions, therefore enabling them to improve campaign implementation and resource allocation.

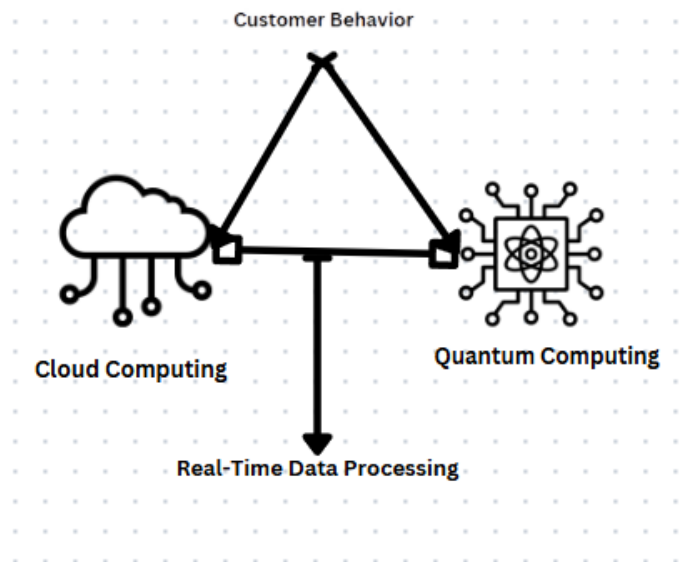


Figure 6 Quantum Computing for Real-Time Data Processing

5.3 Blockchain for Data Security and Transparency

The technology of blockchain has enabled advertising not just to secure data, but also to ensure integrity by creating immutable records of transactions. This, in turn, helps minimize programmatic advertising fraud and establishes a bond of trust between the consumers and advertisers. For instance, payments for ads placed through automated systems, using AdSmart contracts, are made only after an impression is confirmed, thereby ensuring payments for the service are by supervision. Besides, the distributed framework of blockchain technology prevents sensitive consumer data from being misused which addresses the growing concern for privacy. The existence of blockchain technology guarantees transparency and security, therefore enhancing the credibility of digital advertising system.

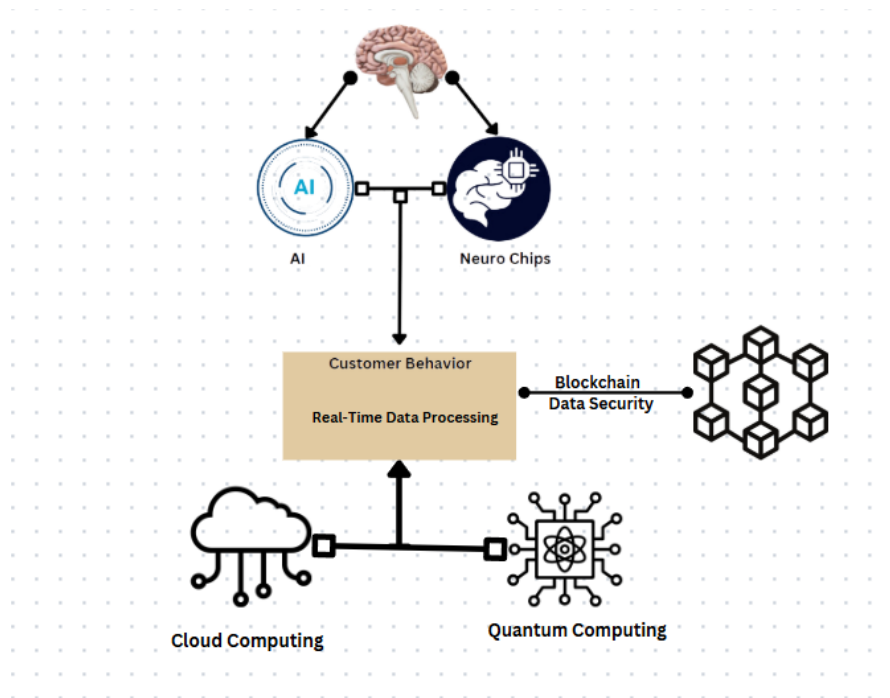


Figure 7 Blockchain for Data Security and Transparency

5.4 IoT and AR/VR in Enhancing Consumer Engagement

The consumer behavior pattern is being radically disrupted by the AR and VR as well as the IoT. The IoT marketing device helps in creating an appropriate strategy and marketing plan on the basis of information on the time zone or location of the user. The measurement tools make it easier to place an order as, for example, apps where you can “try on” makeup or virtually place furniture around you. Potential consumers get to be transformed to a desire-inducing environment where they get a firsthand experience of the product such as a mock up of the product or showroom for display. In addition to customer experience that wow’s them, these technologies help understand consumer preferences which brings about the improvement in sales

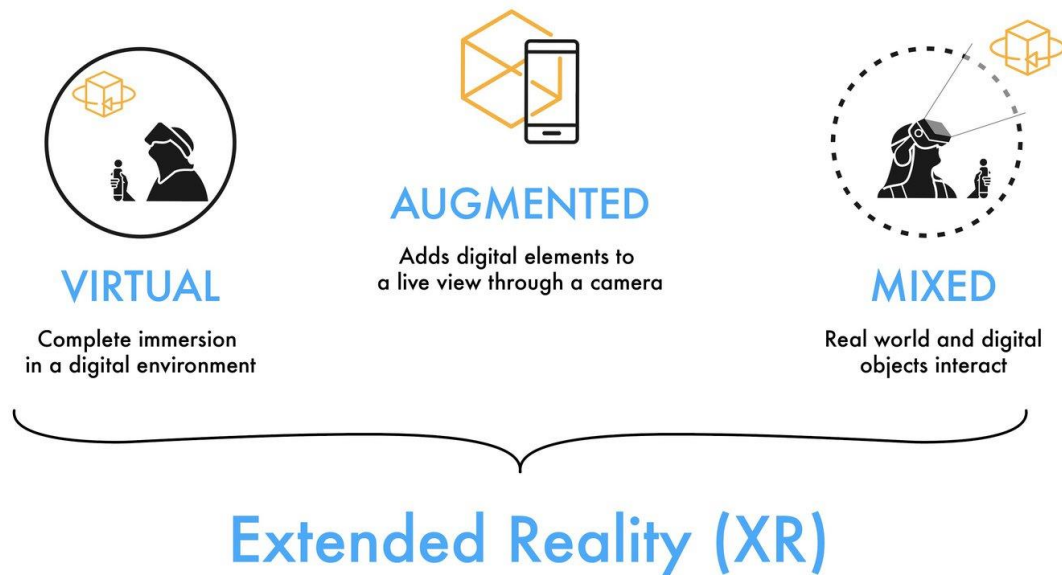


Figure 8 IoT and AR/VR in Enhancing Consumer Engagement

5.5 Integration of Emerging Technologies in Advertising

The advertising industry has been influenced a lot with the emergence of new technologies like Artificial Intelligence, Blockchain, Internet of things, Augmented Reality, Virtual Reality, and Quantum Computing as it facilitated the automation of processes, personalization, and enhancement of decision making processes. AIs use of mechanical, thinking and feeling intelligences enables the streamlining of such processes as data collection, predicting analytics and even the engagement of an emotional customer. Blockchain makes virtually all advertising transactions secure and almost impossible to change by recording them on a decentralized ledger while IoT controls and records the interaction related to the purchases. At the same time, AR and VR increase the interaction of the users by providing various virtual product fitting and various (but related to the product) story telling with the help of augmentation. Apart from that, quantum computing solves tough problems within seconds, this increases the rate at which marketers conduct operation such as launching multi measured campaigns. Their purpose is to work together and build the integrated ecosystem wherein as the advertising processes are transformed into fully automated advertising workflows the trust and the engagement of the consumers are increased concurrently.

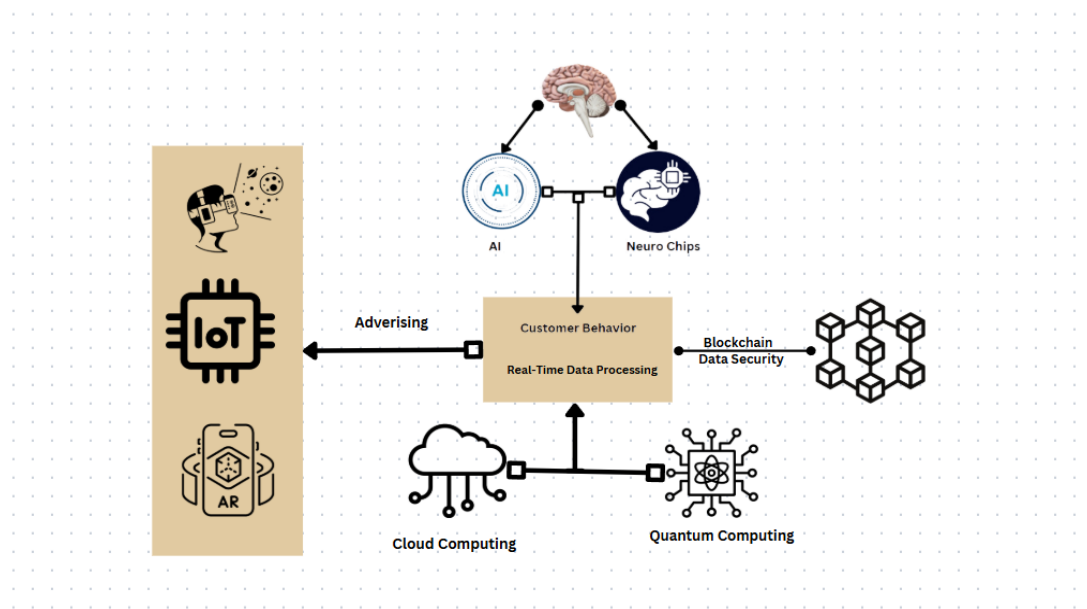


Figure 9 Integration of Emerging Technologies in Advertising

5.6 Tech Market Growth in Advertising (2024-2032)

Around the world, a drastic change is occurring in all advertising markets, as it is projected that the figures will grow from a staggering USD 800 billion to almost 980 billion dollars by the year 2024 and by the year 2025 it will reach a whopping trillion dollars, the main contributor in this surge in technology as AI, IoT, AR, VR and Quantum Computing are perceived to transform future advertising techniques (GroupM, 2024). For example the augmented Reality is set on a rapid growth of roughly 37.9 per cent on an annual basis and is expected to cross the mark of 88.4 billion dollars by the year 2030 (MarketsandMarkets, 2024). Plus the global engagement in AdTech combining AI with solutions including data targeting driven advertising techniques, it is said by a recent forecast that target over one trillion dollar AdTech marketing in 2024 will grow exponentially reaching a figure above over 2.5 trillion dollar by 2032, obtaining an annual growth of around 14.3 % (Global Business Insights, 2024). Overall, based off the growth statistics and trends involving different technologies, experts foresee that advertising will grow alongside technology and evolve in new mediums while also becoming more mature throughout the next couple of years.

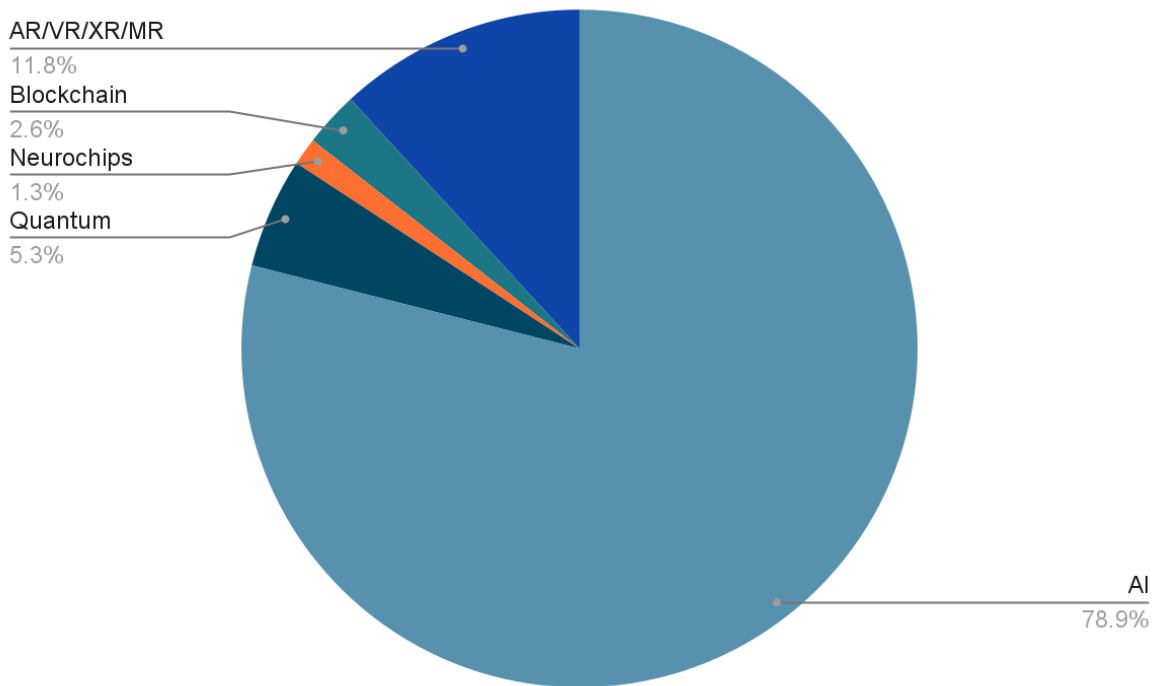


Figure 10 Tech Market Growth in Advertising (2024-2032)

5.7 Opportunities for Technopreneurs

The use of new technologies such as AI, Blockchain, Quantum Computing, Neurochips, and AR/VR/XR/MR in the advertising market provides ample opportunities for technopreneurs to transform marketing strategies and enhance customer interaction. MarketsandMarkets (2024) forecast that traditional advertising (TV channels, billboards, and more) would grow in reach by 45% purely by the integration of artificial intelligence with AR/VR technologies which are expected to grow from 40% in 2024 to 85% penetration by 2032.

Regarding BTL marketing that is related to direct mail and events, there is scope for advertising solutions via Blockchain and Neurochips that will protect the information and the penetration will rise from 35% to 80% during the same time (Fortune Business Insights, 2024). TTL marketing (advertising, campaigns and influencer marketing) possesses the maximum potential for technopreneurs because collectively AI, Blockchain and Quantum Computing boosts the entire marketing processes resulting to accurate targeting of campaigns , with an increase from 50% to upto 90% forecast through 2032 (GroupM, 2024). These trends present some opportunities for technopreneurs to develop new applications and platforms that will fill existing gaps in the market for reliable advertising platforms that are also easy to use and help deliver direct adverts as the advertising industry is projected to be over \$1 trillion in 2025 (Chen & Zhang, 2024).

Marketing

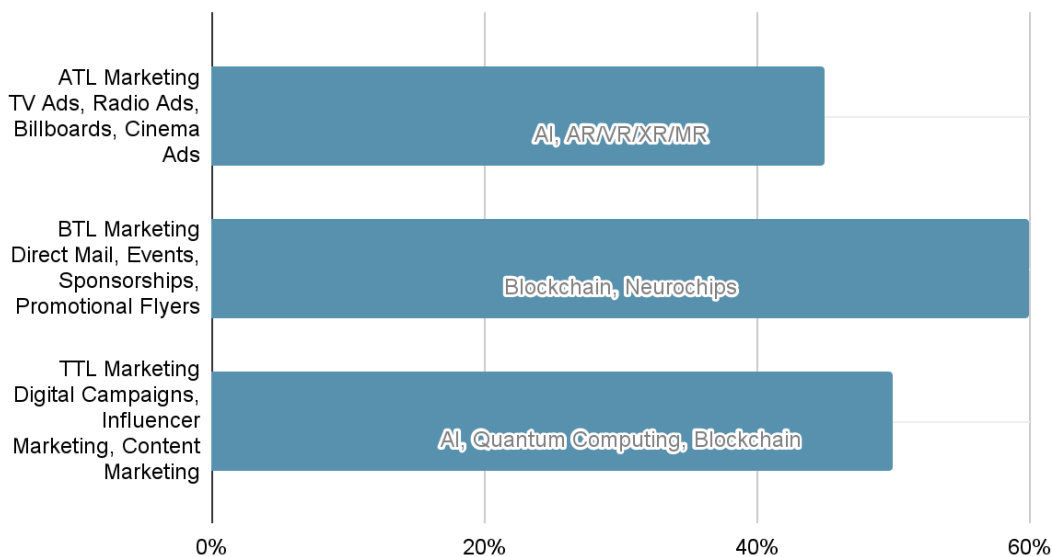


Figure 11 Opportunities for Technopreneurs

Conclusion

The advertising industry has been shaped by innovations in new technologies such as AI, Blockchain, IoTs, AR, VR, and Quantum computing. These technologies collectively allow for the automation and expansion of ad campaigns at the level of a single person, increased computation capabilities allowing to harvest more real-time information, comprehensive consumer satisfaction, and superior security of user data. In addition, as AI increases the depth of understanding of the client through predictive analytics and emotional involvement in the ad, describing the blockchain comes down to the statement “the best ever technology about digital advertising that ensures trust.” It can also be predicted that the combination of these IoT devices with AR/VR will significantly change brand-consumer relationships. Also because the switching speed of these quantum bits is much faster, it will also improve the pace of decision-making.

Considering the new technologic paradigm, advertising policies and strategies seem to offer endless opportunities for creativeness to those who are ready to innovate in the area of technology entrepreneurship. With so such tools, they can realize extendable repellents to problems like effective advertising and low-cost substitutes to hand processes. However, such technologies do carry potential moral risks - intrusions on privacy, the employment of self-serving algorithms, and disregard for external structures. If these issues are systematically addressed, firms could achieve cost effective improvements operational efficiencies and the degree of customer trust in the highly competitive online markets could also be enhanced. The purpose of the study stresses the role of advertising transformations in terms of new technologies introduction and competition in a fast changing market.

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