Algorithmic Marketing as an Effective Tool for Gaining Digital Competitive Advantage

(Outcomes of Generative AI & Large Language Models)

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Summary:
This research paper addresses a contemporary issue in digital marketing and e-commerce, one that deserves to be highlighted for its current effects and future implications. The term "algorithmic marketing" emerged following the adoption by businesses of cyber-physical systems (CPSs) and disruptive technologies, most notably artificial intelligence (AI), machine learning (ML), deep learning (DL), and big data analytics (BDAs). This comes in the context of the dynamic transition from the fourth generation of the industrial revolution (IR 4.0) to the fifth wave of the industrial revolution (IR 5.0). The study concludes that harnessing the tools of generative AI (G-AI) and large language models (LLMs) as a new era of natural language processing (NLP) enables algorithmic marketers to gain a sustainable competitive advantage (SCA) through hyper-personalization of customer experience (CX) and precise targeting of customer needs and desires.
Keywords: Algorithmic Marketing; Generative AI; Large Language Models

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I- Introduction :

Contemporary economies are experiencing tremendous scientific and computer development, and a technological transformation unprecedented in the history of human societies. This is particularly true following the birth of the fifth generation of successive industrial revolutions, which focus on humans as the guide and controller of automated machines and collaborative robot algorithms, in addition to the rise of Society 5.0, also known as the Super Smart Society. Unsurprisingly, there are future dynamics awaiting marketing management to harness whatever digital and technological innovations can be harnessed considering this rapid transition in information technology, wired and wireless communication networks, satellites, and the qualitative leap in virtual spaces and cloud systems, which leads to strong participation in promoting sustainability.

Amidst this significant cognitive development and tremendous technical progress in the fields and levels of networks and the Internet, Artificial Intelligence (AI) is a unique characteristic that marks one of the most important features of e-economy, the global Sustainable Development Goals (SDGs), and Quality of Life (QoL). It is a sign of the dramatic transition to the modern age of imagination. In this regard, it represents the cumulative assets of computer science, software, and computer hardware. This useful and beneficial technology, and valuable algorithmic tool, within the confines of these cloudy environments and virtual worlds, with its rapid and precise solutions, has sparked a tremendous revolution that is expanding exponentially in all aspects of life. Its importance lies in enabling companies, governments, and societies to perform their daily tasks more easily, more quickly, and with superior quality and precision. It is automated to minimize human effort and manual processes as much as possible, in addition to its ability to perform predictive analysis of big data.

This research aims to shed light on the phenomenon of Algorithmic Marketing—marketing supported by Generative AI applications and Large Language Models (LLMs), such as the Chinese DeepSeek and its American rival, ChatGPT. Accordingly, Algorithmic Marketing is a far-reaching alliance and long-term partnership between marketing and computer science, a phenomenon worthy of investigation and scrutiny. Academic research and field studies have begun to diagnose its nature and essence, examine, reflect, and contemplate its dimensions and perspectives, and thus anticipate its path, progress, and future scenarios, both from a theoretical and applied perspective. This is particularly true in the wake of the emergence of Super-Smart Societies as a Japanese plan, or the Fifth Industrial Revolution as a German initiative. These revolutions are reinforced by Cyber-Physical Systems (CPSs), the escalating demands for QoL, and strategic thinking to achieve SDGs within the context of Corporate Social Responsibility (CSR) and AI-based solutions.

Staying on top has become more difficult due to rapidly evolving digital technologies. The rules of competitiveness have truly changed, as we enter the second decade of the third millennium of the 21st century, where globalization and the internet are merging into a small global village. Business organizations need to possess the mechanisms and technologies that enable them to generate additional sales, grow their market share, and strengthen their profitability and investment returns. This time, however, achieving these goals and objectives depends on the effectiveness of their commercial activities and efforts in achieving rapid and effective responses to buyer expectations in general, and improving Customer Experience (CX) optimization in particular, also known as Hyper-Personalization. Therefore, the challenge facing contemporary organizations is the inevitability of adopting Algorithmic Marketing systems and methods. This comes in the context of the sweeping dominance of sustainability and AI in marketing.

The marketing mix decision has become powered by Disruptive Technologies and Digital Innovations, such as:

- Generative AI (G-AI).
- Virtual Assistants (VAs).
- Machine Learning (ML) and Deep Learning (DL).

- Artificial Neural Networks (ANNs).
- Natural Language Processing (NLP).
- Large Language Models (LLMs).
- Chatbots.
- Emotional AI and Sentiment Analysis.
- Virtual and Augmented Reality.
- Internet of Things sensors (IoT).
- Blockchain.
- Cloud Computing and Quantum Computing.
- 3D Printing or Additive Manufacturing.
- Big Data Analytics and Predictive Analytics.
- ... etc.

With the potential for future development of these feasible tools in marketing industry fields, such as Enterprise Resource Planning (ERP), Marketing Mixed (MM), Customer Relationship Management (CRM), Supply Chain Management (SCM), New Product Development (NPD), Integrated Marketing Communications (IMCs), Decision Support Systems (DSSs), Marketing Research (MR), Customer Lifetime Value (CLV), Key Performance Indicators (KPIs), Balanced Scorecard (BSC), STP Marketing, etc.

In the context of the birth of Algorithmic Marketing, the importance of Generative AI and LLMs is growing in all aspects and levels of life. This naturally impacts current and future marketing trends in a highly competitive virtual environment. After academic studies and practical experiments have proven the benefits and implications of using marketing analytics tools supported by G-AI and LLMs, the anticipated scenario in the coming timeline is the increased adoption and embrace of modern Digital Innovations in the marketing landscape. These research papers aim to shed light on the harnessing of various and diverse G-AI and LLMs software as a tributary to improving and enhancing the outputs and outcomes of the marketing sector in the context of global cyber and computer transformation.

Before embarking on this important topic, several very precise questions arise which need research and investigation. Therefore, we try to delve deeply into this phenomenon: Why is (G-AI & LLMs) important in marketing? Why should the CMO care about (G-AI & LLMs)? What can (G-AI & LLMs) do for the marketing industry in the future? Is (G-AI & LLMs) an opportunity or a threat to the marketing mix? How advanced are marketers and what hinders them from using (G-AI & LLMs)? What are the qualifications required for a marketer to embrace the transformative power of (G-AI & LLMs) efficiently and effectively?

This paper argues and examines the rise of Generative AI in its various forms, with the most prominent of which are LLMs. More importantly, it analyses the potentially disruptive impact of this ascendant technology on marketing decisions.

II– The Rise of Generative AI and Large Language Models in the Age of Industry 5.0 and Society 5.0

1. The Emergence of the Fifth Industrial Revolution and the Super Smart Society in the shadow of The Sustainable Development Goals

The first three industrial revolutions were driven, respectively, by mechanization, electrification, and automation, which gradually transformed the agricultural economy into a manufacturing-based one. While Industry 4.0 was about connecting automation and digitization, Industry 5.0 is about the collaboration of humans and machines. The fifth wave is about connecting people and robots and making them work together. More precisely, it is about human-centeredness through the symbiosis and convergence of CPSs. Sustainable and resilient operations require the return of humans to the organizational decision-making loop. Human curiosity has helped transform science fiction into real science, a tangible physical reality, and is now part of our lives and culture.

Given the fierce criticism directed at the Fourth Industrial Revolution and its concerns about forced layoffs and ecosystem destruction, it has not considered the high cost of living and the negative consequences of robots replacing humans, which would have on social stability. Therefore, the Fifth Industrial Revolution offers a logical alternative, bridging the gap through promising collaborative technologies. Instead of competing with machines to perform complex tasks and perform routine and repetitive tasks, it offers a potential scenario of substitution where robots intertwine with the human mind and act as collaborators and partners rather than competitors. Therefore, Industry 5.0 is based on the priority of human expert creativity.

Industry 5.0 enables the establishment of a climate of solidarity and mutual support and the creation of a fertile investment environment. Its basic concept is that subordinates within the workforce must cooperate and combine their efforts closely and flexibly with innovative manufacturing technologies such as robotics, exploiting the strengths and advantages of each, and compensating for their corresponding shortcomings and weaknesses.

The fifth-generation industrial revolution (IR5) is the product and outcome of innovative updates to the generative and transformative revolutions emerging over time, in which each revolution prepares the scenario for the next revolution. IR5 differs from its predecessors in terms of deepening and expanding the participatory relationship and cooperative bond between humans and cognitively adaptive and learning computers, and strengthening the interaction, connection, and communication between humans and robotic systems in a harmonious and synergistic manner.

The integration of digital technologies and cyber systems with physical and biological factors, i.e. in cooperation with efficient, intelligent and precise machines, leads to their maximum benefit in enhancing the pace of progress in the well-being, prosperity and comfort of individuals, i.e. improving the QoL and achieving sustainability for society, in a smooth, seamless, consistent, and coherent manner.

Thus, the primary goal of merging biological and computational forces under the umbrella of revolutionary technologies and CPSs is to raise the level of social responsibility and commitment and increase attention to environmental issues in line with ethical standards and legal considerations. Meanwhile, decision-makers must proactively pursue digital transformation to achieve smart, cloud-based industries for sustainable development, centered on human power and human intellectual and cognitive skills, and capable of resiliency to achieve a world of prosperity for all.

In the same context, a new global anthropological variable has emerged, dubbed Society 5.0 by scholars. This is essentially a future, super-smart, knowledge-intensive society, interconnected and interactive with the Fourth and Fifth Industrial Revolutions. New digital technologies play a prominent role in advancing society. These are integrated technologies enhanced by AI, with humans at their core, automated machines supporting and assisting, and robots collaborating.

A careful examination of the progress made by human societies in scientifically advanced and technologically sophisticated countries, where leaders aspire to modernize society, digitize the economy, and sustain the environment, is essential. Technological modernization encompasses all sectors in all aspects of life. What makes these theses, which were once more like dreams and

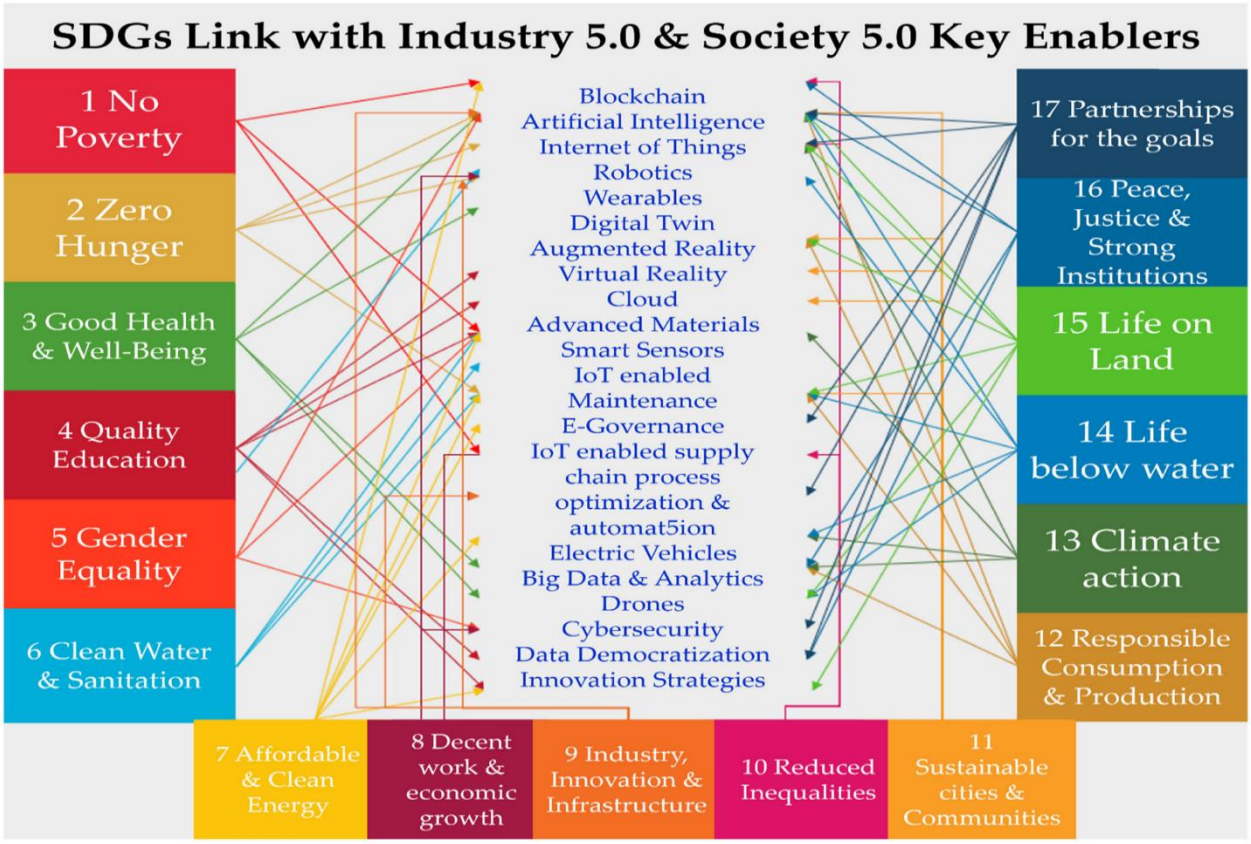
fantasies, more realistic is the rapid and successive pace of Digital Innovations and unprecedented cyber systems being offered and produced by giant technology companies.

The balanced integration and exchange of data between the cyber space and physical space, in addition to the activation of AI alongside Internet of Things, Blockchain, Cloud Platforms, Quantum Computing, and others as enabling tools, leads to achieving sustainable balance and achieving the three-dimensional sustainable development (SDGs), from economic growth (profit), social development (community prosperity), and solutions to environmental problems and climate challenges (the planet).

Undoubtedly, these smart, automated approaches, enhanced by computer applications, hardware, and databases, are contributing effectively and efficiently to addressing the intractable problems of the global economy and climate change. They have significant implications for the public good, business ethics, corporate citizenship, governance, the circular carbon economy, overcoming crises and dilemmas related to ozone depletion, global warming, and acid rain, protecting the environment and ecosystems from pollution and degradation, managing waste and recycling, and reducing emissions and greenhouse gases.

See: Kasinathan, P., et al. 2022; Ziatdinov, R., et al. 2024; Kim, R. Y. 2024; Ghobakhloo, M., et al. 2022; De Giovanni, P. 2023; Narkhede, G. B., et al. 2025; Dhayal, K. S., & Giri, A. K. 2025; Dhayal, K. S., & Giri, A. K. 2025; Choudhry, M. D., et al. 2024; Mouazen, A. M., et al. 2025

Figure (1): Industry 5.0 & Society 5.0 for Sustainable Development Goals



The source: **Mourtzis, D., et al. 2022**

2. Shedding light on Transformative Potential of Generative AI and Large Language Models as Disruptive Technologies and Applications

Artificial Intelligence is a term derived from computer science and a broad branch of information & communication technologies. It encompasses an integrated and coordinated electronic system of various digital technologies in a computing environment, which works in harmony to enable computers, automated machines, and robots to sense, think, understand, act, and learn at the level of human intelligence. It is a model that simulates and imitates the workings of the brain and the capabilities of the human mind, in its ability to: perceive, comprehend, interpret, adapt, self-correct, predict the future, make decisions, etc. Therefore, the successful application of AI requires mastery of a set of knowledge and expertise, and control of multidisciplinary sciences and fields, such as mathematics, linear algebra and integration, probability theory, artificial neural networks, psychology, linguistics, logic and philosophy, etc.

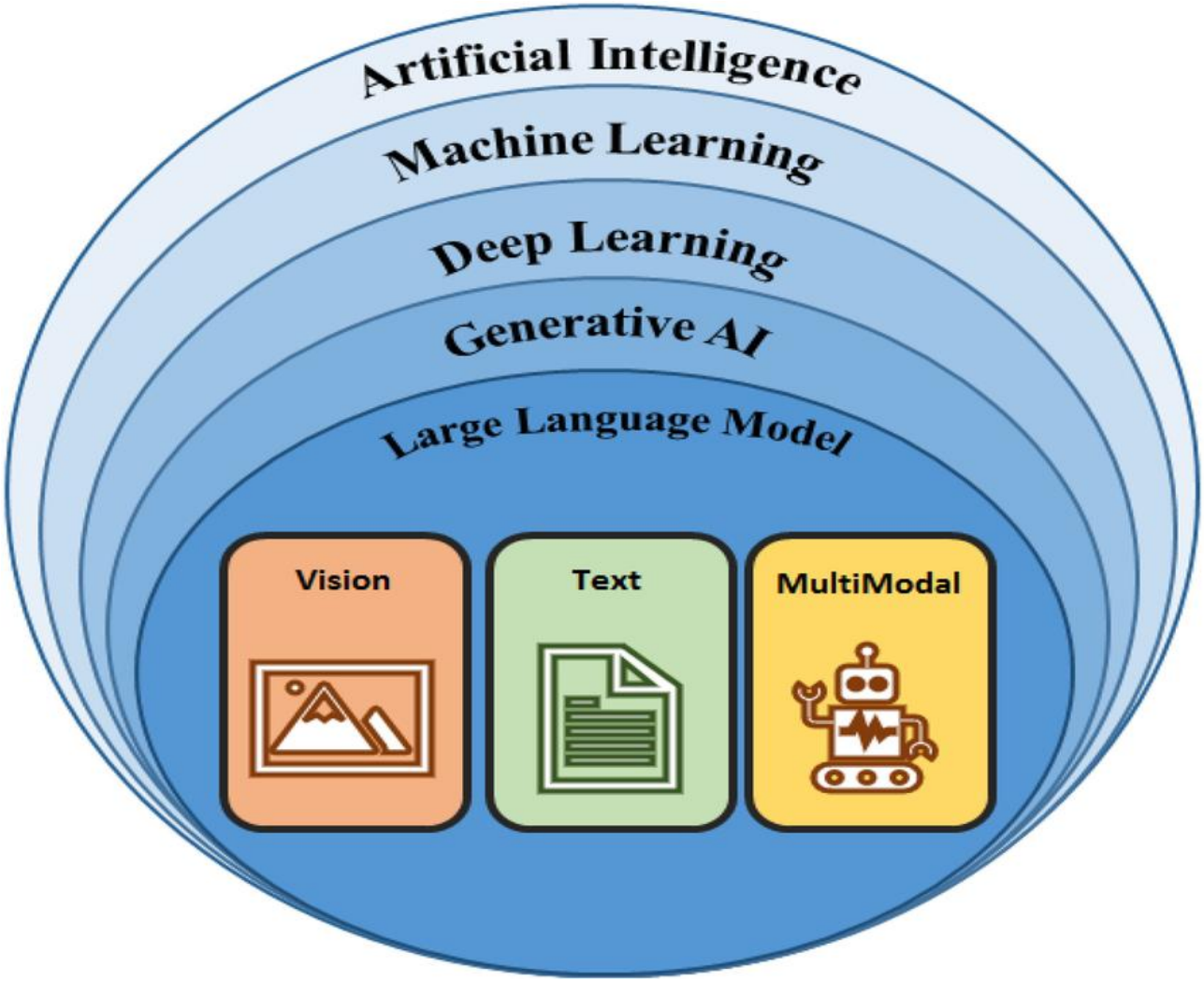
In a related context, the importance of AI is growing as it advances, particularly in detail-oriented jobs. It also reduces the time required for data-intensive tasks, as machines are automated, programmed, and responsible for completing daily tasks and duties. It is therefore a strategic gain for improving operational efficiency and productivity, while simultaneously reducing the likelihood of human error. Despite all these advantages and benefits, there are some noted criticisms and shortcomings, such as its high cost (i.e., development costs), its requirement for in-depth technical expertise, the inability to generalize from one task to another, the potential for automated machines and robots to replace human jobs, and, most seriously, the blatant violation of privacy.

Generative AI and LLMs are subsystems emerging and derived from the science of Artificial Intelligence (AI) and Machine Learning (ML) in general and Deep Learning (DL) in particular. There is no doubt about the global buzz generated by G-AI and LLMs, given their innovative capabilities and distinctive uses. They have had a profound impact on addressing complex problems in strategic and sensitive sectors, such as manufacturing, agriculture, e-commerce, finance, infrastructure, stock markets, defense, cybersecurity, the judiciary, healthcare, education, transportation, traffic, weather, logistics, real estate, media, etc. The boom in global demand for G-AI and LLMs services has coincided with favorable conditions, such as the widespread penetration of the internet, 5G and 6G, the widespread use of laptops, tablets, smartphones, GPS systems, smart factories, smart cities, distance learning, telehealth, and facial recognition operating systems. This is in addition to the modern trend in societal behavior, the move toward self-driving cars and drones.

Therefore, the repercussions of embracing G-AI & LLMs in social, cultural, economic, academic, health, and military affairs cannot be denied. It is growing steadily and offers great opportunities and gains, while also posing threats and challenges. Therefore, it is imperative to strike a balance to maximize the gains and positives over the costs and negatives. This is to carefully and rationally deal with the complexities of this technology. This does not come from a vacuum, but rather requires well-thought-out strategic arrangements, appropriate regulations, and adherence to ethical standards.

See: Fallah Madvari, R. 2022; Mian, S. M., et al. 2024; Alwahedi, F., et al. 2024; Hagos, D. H., et al. 2024; Linkon, A. A., et al. 2024; Barreto, F., et al. 2023; Parasuraman, B. 2024; Wong, W. K. O. 2024; Salierno, G., et al. 2025; Boareto, P. A., et al. 2024; Chowdhury, M. N. U. R., et al. 2025; Baskara, F. R., et al. 2024

Figure (2): Generative AI and Large Language Models (Subsystems derived from the science of AI, ML and DL)



The source: Hadid, A., et al. 2024

III- The Birth of Algorithmic Marketing as a natural result of the Strategic Partnership between Computer Science and Marketing Theory :

1. The Efficiency and Effectiveness of Algorithmic Marketing based on Generative Artificial Intelligence and Large Language Models

The AI-powered marketing sector, or in other words, marketing solutions enabled by the dynamic power of AI, is a very important agenda. It is a critical turning point and an unprecedented turning point, but the marketing team must approach it with extreme caution and care.

In this regard, we list a set of advantages and gains of the Algorithmic Marketing mix with all its cyber components: product engineering and development, creativity and innovation management, dynamic pricing policies, integrated promotional communications and advertising campaigns, distribution channels, and supply chains. Enhanced by the digital and software tools provided by AI. G-AI & LLMs possesses superior capabilities and highly precise skills to help manage marketing and sales activities in economic institutions and production companies to achieve their quantitative goals and qualitative objectives based on the automation of work and sales and commercial efforts, and the use of chatbots, digital assistants, automated recommendation systems, and positive and negative

product reviews, without any human intervention or manual labor that takes time and drains money. This is evident in several aspects and angles, which we summarize as follows:

 Generate additional sales and revenue and increase market share compared to competitors.

 Reduce operating costs, minimize expenses, burdens, and administrative expenses.

 Save time due to the flexibility and speed of completing routine tasks and repetitive functions.

 Increase profit margins and cash flow and maximize benefits and returns on investment.

 Improve CX and enhance their purchasing journey through the quality of services provided.

 Analyze consumer behavior psychologically and emotionally using creative and innovative methods, and the impact this has on satisfaction.

 Reduce complaints, address objections, and automatically respond to customer inquiries.

 Provide actionable insights into buyer loyalty and how their attitudes and purchasing tendencies will change.

 Collect data in large quantities from diverse sources and filter it according to market trends.

 Evaluate customer reactions, responses, and understand their feelings through feedback.

 Enhance brand reputation and brand equity in the public's perception.

 Improving the output of information systems, marketing vigilance and surveillance, and competitive intelligence.

 Enhancing the outcomes of market surveys, opinion polls, exploration and causal research.

 Strengthening social responsibility, ethical commitment, and environmental compliance within the framework of social orientation.

 Adapting the marketing strategy according to the circumstances, facts, and events of the internal and external environment.

 Diagnosing the macro and micro marketing environment, stakeholders, and the five competitive forces.

 Segmenting market segments and targeting the most attractive and feasible segments in terms of positioning.

 Creating new markets, particularly through e-commerce, websites, and search engines.

 Monitoring social media, email, and shopper comments about the product.

 Enabling digital marketing and content marketing tools from browsers and visitor databases.

 Providing decision makers with insight, clarity, and a high ability to accurately predict the future.

 Sensing and identifying available opportunities, as well as planning for future events and overcoming obstacles.

See: Akter, S., et al. 2022; Katsov, I. 2017; Galli, F. 2022; Pellandini-Simányi, L. 2024; Degterev, A. 2019; Zhang, H. 2017; Zhao, Y., & Tsubaki, M. 2025; Dilaver, H., & Dilaver, K. F. 2024; Kshetri, N., et al. 2024; Amini, R., & Amini, A. 2024; Suneeth, S. N., et al. 2024; Arora, N., et al. 2025; Cillo, P., & Rubera, G. 2024; Aghaei, R., et al. 2025; Yaprak, B. 2024

Figure (3): Challenges and Considerations in Algorithmic Marketing



The source: **Faster Capital Team. 2025**

2. Hyper-Personalization of Customer Experiences as a Competitive Advantage: Harnessing Algorithmic Marketing Applications and Software

The birth of Algorithmic Marketing, marketing automation, and the digitization of marketing decisions represents a quantum leap in every sense of the word. It is a natural and anticipated result of the convergence of marketing fields and computer science approaches. It has emerged from the intersection of marketing programs and CPSs. There are many commonalities, most notably proactive decision-making based on databases, predictive analytics, and expert systems in complex and tense competitive environments. Where AI in general, Generative AI and LLMs are the cornerstone of managing and transforming large amounts of data into useful information at an accelerating pace, elevating it to knowledge and wisdom that plays a prominent and crucial panoramic role in the Hyper-Personalization of CXs. This leads to a rise in marketing performance standards, measures, and criteria, as well as a flourishing of financial results and accounting indicators.

In the context of Industry 5.0 and Society 5.0, G-AI & LLMs has dramatically changed the competitive game. Its benefits have become increasingly evident, ranging from automating routine tasks, controlling cost behavior, and reducing the time it takes to complete and close a wide range of complex and challenging tasks—all while operating 24/7 without interruption, resulting in continuous monitoring of demand. This is in addition to improving the ROI of marketing campaigns through better targeting, enriching and providing personalized CXs, and raising the bar and level of performance from an efficiency and effectiveness perspective. This latter is the greatest benefit of marketing technology. It allows companies to shift to Hyper-Personalization in real time. Therefore,

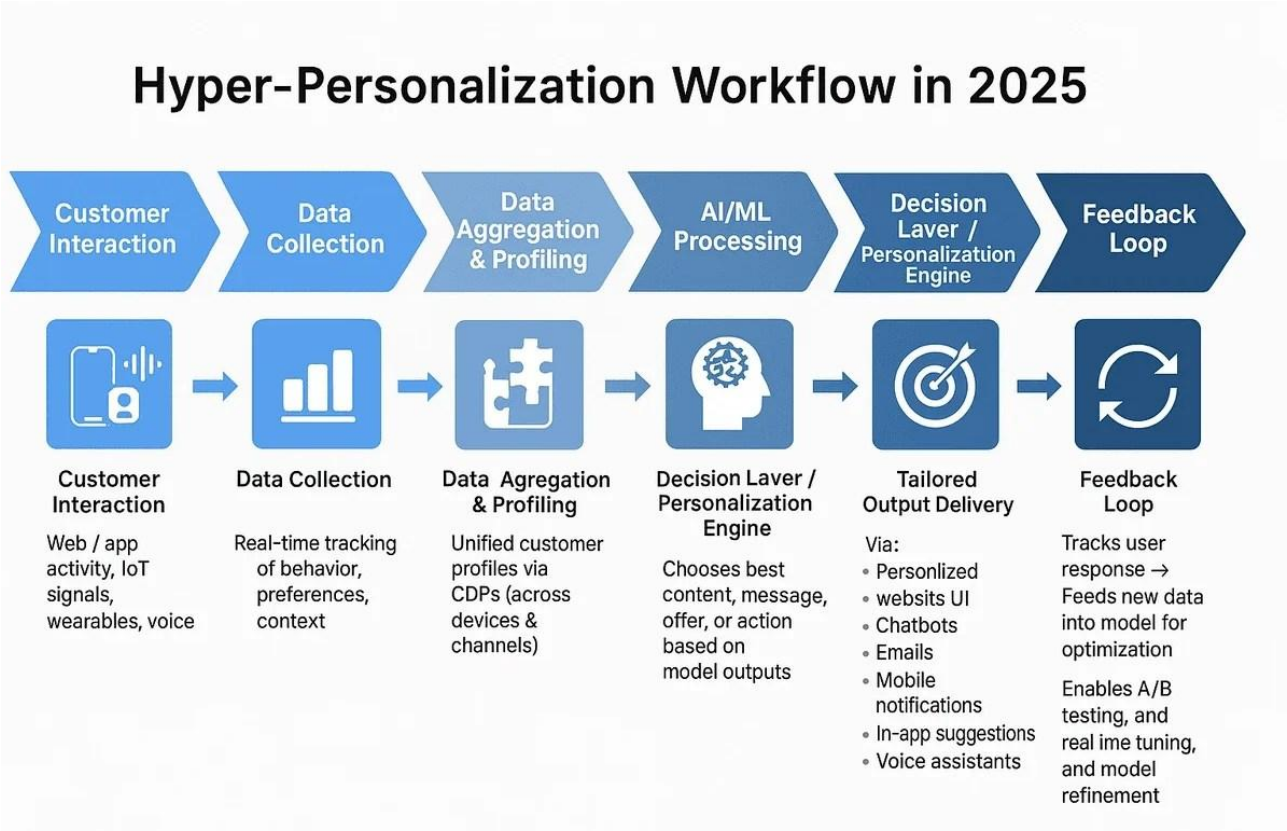
by embracing Algorithmic Marketing, marketers can cultivate lasting relationships with customers, ultimately leading to enhanced loyalty and satisfaction in today's dynamic and competitive business landscape.

Monitoring the psychological and social factors that influence consumers behavior, and their purchasing intentions lie at the heart of the big data analytics revolution. G-AI & LLMs, represented by predictive data analytics, plays a crucial role in auditing marketing performance and reviewing marketing efficiency and effectiveness. This is achieved by automating measurements and evaluation, improving oversight and feedback on marketing activities through clear metrics and standards. G-AI & LLMs provide the CMO with detailed reports and insights into marketing efforts and campaigns. This massive emotional and behavioral data, drawn from online shopping carts, social media comments, credit card transactions, and other information sources, is a goldmine and extremely useful in supporting sound proactive marketing decisions. It is also a driver of SCA.

In the rapidly evolving business landscape of Industry 5.0 and Society 5.0, the development of Generative AI and LLMs, as branches of DL, has radically and revolutionarily changed the dynamics of today's business world. Classic SCA is now ineffective and useless; competitive strength and performance are currently based on intelligent machines, DeepSeek, ChatGPT, digital assistants' algorithms, and others. These capabilities, if properly leveraged, are key to effective marketing, saving significant amounts of money, time, and effort. This, in turn, requires managers to develop new capabilities to stay relevant in a competitive landscape based on CPSs and Digital Innovations. With the continuous advancement of technology and the competition of marketers to win customers, SCA has become Hyper-Personalization, a qualitative development that enriches customized and enhanced customer interactions and experiences. This can only be achieved through Algorithmic Marketing enhanced by AI and ML, which leads to the automation of the CX. Enhancing the customer's purchasing and consumption journey leads to a sense of psychological and emotional satisfaction, which in turn increases retention rates over the long term, which is known in marketing literature as Customer Lifetime Value (CLV).

See: Kotras, B. 2020; Thukral, V., et al. 2023; Gal, M., & Zac, A. 2024; Hermann, E., & Puntoni, S. 2024; Singh, B., & Kaunert, C. 2024; Joshi, R., et al. 2021; Florido-Benítez, L. 2024; Potla, R. T. 2024

Figure (4): Hyper-Personalization in 2025: AI-Driven Customer Experience Redefined



The source: **Poniak Times Team. 2025**

IV- Conclusion:

The gist and summary of the discussion is that these research papers yield a number of conclusions and derivations, which can be summarized as follows:

The fifth wave of the industrial revolution is a blend of humans and machines, reconciled and working side by side in the workplace. It emerged from the ashes of the third and fourth revolutions, which were both extremely impactful and harsh on humans and the environment. CPSs and their convergence with biological forces will play a vital role in various marketing areas. The super smart society initiative will have profound and far-reaching implications, particularly for CSR, SDGs, and QoL. Therefore, agile marketing, with its ability to respond interactively and adaptively, will be in line with Society 5.0, manifesting in diverse areas such as environmental issues, climate change, and, consequently, sustainability.

Generative AI and LLMs are subsystems derived from AI techniques and DL algorithms. These Digital Innovations and Disruptive Technologies are the backbone and cornerstone of electronic progress and computing development. Computers equipped with G-AI and LLMs solutions automate marketing tasks that were previously performed by humans and took time and effort, and they do so quickly and at a large scale. It is worth noting that the widespread use of advanced and sophisticated G-AI and LLMs applications and tools could have a negative impact on society, despite the global recognition of their returns and benefits. It is a phenomenon that has imposed itself and its logic and is expanding irreversibly.

Science fiction is a common denominator between G-AI and LLMs and the philosophy of marketing, both traditional and digital, and the future of their strategic alliance holds significant potential. This bond will grow and flourish more than ever. Indeed, G-AI and LLMs have penetrated

and permeated all levels of the marketing industry in a remarkable way in the past few years, and their adoption and embrace are on the rise.

Ultimately, and inspired by all the above, the effective recommendation and proposal we see is the inevitability of harnessing and adapting the intelligence shown by learning machines to simulate the natural intelligence of the human brain, as processing large amounts of data in real time and instantaneously solves marketing problems, making predictions more accurate and personalization higher quality. Therefore, many global technology companies in various industries are racing and rushing to invest huge sums of money in G-AI & LLMs applications, as the largest and most successful business organizations today employ G-AI & LLMs to improve their operations and exceptional performance and gain an advantage over their competitors.

It can be said that marketers have moved beyond the stage of considering whether G-AI and LLMs are appropriate for their business, and have moved beyond the era of weighing the pros and cons, and calibrating the advantages and disadvantages, to this moment in time, which is the conviction of the inevitability of adopting them as a fundamental factor in shaping the marketing scenario for companies, especially since the common denominator between AI_MKT is data science. Marketing is a goldmine of behavioral and emotional data, which is the vital fuel for smart decisions and profitable performance. In the same context, one of the most profound developments and radical transformations in recent years has been the emergence of appropriate G-AI and LLM systems and applications. These systems utilize the most advanced data processing tools, the power of ML, and intelligent automation to achieve impressive results on a large scale in the marketing sector. These systems make marketing work more productive, profitable, creative, and enjoyable, and make customers more likely to purchase due to Hyper-Personalization, as the largest global brands race to embrace computer and electronic technologies to gain a strategic SCA.

In conclusion, G-AI and LLMs have proven to be, and will continue to be, game-changers in both traditional and digital marketing, irrevocably. Their amazing capabilities and potential to revolutionize brand marketing methods, approaches, and techniques, whether in the tangible goods or intangible services sector, have already had a significant impact on all marketing systems. In the same vein, existing G-AI and LLMs tools still hold tremendous potential for accelerated growth and sustainable development in the marketing industry.

Referrals and references:

1. Aghaei, R., Kiaei, A. A., Boush, M., Vahidi, J., Zavvar, M., Barzegar, Z., & Rofoosheh, M. (2025). Harnessing the Potential of Large Language Models in Modern Marketing Management: Applications, Future Directions, and Strategic Recommendations. arXiv preprint arXiv:2501.10685.
2. Akter, S., Dwivedi, Y. K., Sajib, S., Biswas, K., Bandara, R. J., & Michael, K. (2022). Algorithmic bias in machine learning-based marketing models. Journal of Business Research, 144, 201-216.
3. Alwahedi, F., Aldhaheri, A., Ferrag, M. A., Battah, A., & Tihanyi, N. (2024). Machine learning techniques for IoT security: Current research and future vision with generative AI and large language models. Internet of Things and Cyber-Physical Systems, 4, 167-185.
4. Amini, R., & Amini, A. (2024). An overview of artificial intelligence and its application in marketing with focus on large language models. International Journal of Science and Research Archive, 12(2), 455-465.
5. Arora, N., Chakraborty, I., & Nishimura, Y. (2025). AI–Human Hybrids for Marketing Research: Leveraging Large Language Models (LLMs) as Collaborators. Journal of Marketing, 89(2), 43-70.
6. Barreto, F., Moharkar, L., Shirodkar, M., Sarode, V., Gonsalves, S., & Johns, A. (2023, February). Generative artificial intelligence: Opportunities and challenges of large language models. In International conference on intelligent computing and networking (pp. 545-553). Singapore: Springer Nature Singapore.
7. Baskara, F. R., Vasudevan, A., & Sain, Z. H. (2024). Redefining educational paradigms: Integrating generative AI into society 5.0 for sustainable learning outcomes. The Journal of Infrastructure, Policy and Development (Cambridge, England), 8(12).

8. Boareto, P. A., Szejka, A. L., Loures, E. F. R., Deschamps, F., & Santos, E. A. P. (2024, November). Accelerating Industry 4.0 and 5.0: The Potential of Generative Artificial Intelligence. In International Conference on Innovative Intelligent Industrial Production and Logistics (pp. 456-472). Cham: Springer Nature Switzerland.
9. Choudhry, M. D., Jeevanandham, S., Sundarrajan, M., Jothi, A., Prashanthini, K., & Saravanan, V. (2024). Future technologies for industry 5.0 and society 5.0. Automated Secure Computing for Next-Generation Systems, 403-414.
10. Chowdhury, M. N. U. R., Haque, A., & Ahmed, I. (2025). DeepSeek vs. ChatGPT: A comparative analysis of performance, efficiency, and ethical AI considerations. Authorea Preprints.
11. Cillo, P., & Rubera, G. (2024). Generative AI in innovation and marketing processes: A roadmap of research opportunities. Journal of the Academy of Marketing Science, 1-18.
12. De Giovanni, P. (2023). Sustainability of the Metaverse: A transition to Industry 5.0. Sustainability, 15(7), 6079.
13. Degterev, A. (2019). Algorithmic Marketing as a replacement for traditional Marketing Research.
14. Dhayal, K. S., & Giri, A. K. (2025). Green industries and smart societies: exploring the convergence of industry 5.0 and society 5.0. In Technological Evolution: How Innovations are Changing our Future (pp. 107-126). Cham: Springer Nature Switzerland.
15. Dilaver, H., & Dilaver, K. F. (2024). Algorithmic Marketing. International Journal of Engineering Science and Application, 8(4), 76-84.
16. Fallah Madvari, R. (2022). Artificial intelligence (AI), machine learning (ML) and deep learning (DL) on health, safety and environment (HSE). Archives of Occupational Health, 6(4), 1321-1322.
17. Faster Capital Team. (2025). Genetic Matching Algorithms: Genetic Algorithms in Marketing: Crafting the Perfect Ad Campaign. https://fastercapital.com/content/Genetic-Matching-Algorithms--Genetic-Algorithms-in-Marketing--Crafting-the-Perfect-Ad-Campaign.html
18. Florido-Benítez, L. (2024). Generative artificial intelligence: a proactive and creative tool to achieve hyper-segmentation and hyper-personalization in the tourism industry. International Journal of Tourism Cities.
19. Gal, M., & Zac, A. (2024). Is Generative Ai the Algorithmic Consumer We are Waiting for? Network Law Review (March 2024).
20. Galli, F. (2022). Algorithmic Marketing. In Algorithmic Marketing and EU Law on Unfair Commercial Practices (pp. 17-44). Cham: Springer International Publishing.
21. Ghobakhloo, M., Iranmanesh, M., Mubarak, M. F., Mubarik, M., Rejeb, A., & Nilashi, M. (2022). Identifying industry 5.0 contributions to sustainable development: A strategy roadmap for delivering sustainability values. Sustainable Production and Consumption, 33, 716-737.
22. Hadid, A., Chakraborty, T., & Busby, D. (2024). When geoscience meets generative AI and large language models: Foundations, trends, and future challenges. Expert Systems, 41(10), e13654.
23. Hagos, D. H., Battle, R., & Rawat, D. B. (2024). Recent advances in generative ai and large language models: Current status, challenges, and perspectives. IEEE Transactions on Artificial Intelligence.
24. Hermann, E., & Puntoni, S. (2024). Artificial intelligence and consumer behavior: From predictive to generative AI. Journal of Business Research, 180, 114720.
25. Joshi, R., Patel, N., Iyer, M., & Iyer, S. (2021). Leveraging Reinforcement Learning and Natural Language Processing for AI-Driven Hyper-Personalized Marketing Strategies. International Journal of AI ML Innovations, 10(1).
26. Kasinathan, P., Pugazhendhi, R., Elavarasan, R. M., Ramachandaramurthy, V. K., Ramanathan, V., Subramanian, S., ... & Alsharif, M. H. (2022). Realization of sustainable development goals with disruptive technologies by integrating industry 5.0, society 5.0, smart cities and villages. Sustainability, 14(22), 15258.
27. Katsov, I. (2017). Introduction to algorithmic marketing: Artificial intelligence for marketing operations. Ilia Katcov.
28. Kim, R. Y. (2024). The fifth wave: The sustainability age and new industrial revolution. IEEE Engineering Management Review.
29. Kotras, B. (2020). Mass personalization: Predictive marketing algorithms and the reshaping of consumer knowledge. Big data & society, 7(2), 2053951720951581.
30. Kshetri, N., Dwivedi, Y. K., Davenport, T. H., & Panteli, N. (2024). Generative artificial intelligence in marketing: Applications, opportunities, challenges, and research agenda. International Journal of Information Management, 75, 102716.

31. Linkon, A. A., Shaima, M., Sarker, M. S. U., Badruddowza, B., Nabi, N., Rana, M. N. U., ... & Chowdhury, F. R. (2024). Advancements and applications of generative artificial intelligence and large language models on business management: A comprehensive review. Journal of Computer Science and Technology Studies, 6(1), 225-232.
32. Mian, S. M., Khan, M. S., Shawez, M., & Kaur, A. (2024, July). Artificial Intelligence (AI), Machine Learning (ML) & Deep Learning (DL): A Comprehensive Overview on Techniques, Applications and Research Directions. In 2024 2nd International Conference on Sustainable Computing and Smart Systems (ICSCSS) (pp. 1404-1409). IEEE.
33. Mouazen, A. M., Hernández-Lara, A. B., Chahine, J., & Halawi, A. (2025). Triple bottom line sustainability and Innovation 5.0 management through the lens of Industry 5.0, Society 5.0 and Digitized Value Chain 5.0. European Journal of Innovation Management.
34. Mourtzis, D., Angelopoulos, J., & Panopoulos, N. (2022). A Literature Review of the Challenges and Opportunities of the Transition from Industry 4.0 to Society 5.0. Energies, 15(17), 6276.
35. Narkhede, G. B., Pasi, B. N., Rajhans, N., & Kulkarni, A. (2025). Industry 5.0 and sustainable manufacturing: a systematic literature review. Benchmarking: An International Journal, 32(2), 608-635.
36. Parasuraman, B. (2024). Introduction to Generative AI and Large Language Models (LLMs). In Mastering Spring AI: The Java Developer's Guide for Large Language Models and Generative AI (pp. 1-34). Berkeley, CA: Apress.
37. Pellandini-Simányi, L. (2024). Algorithmic classifications in credit marketing: How marketing shapes inequalities. Marketing theory, 24(2), 211-232.
38. Poniak Times Team. (2025). Hyper-Personalization in 2025: AI-Driven Customer Experience Redefined. https://www.poniaktimes.com/hyper-personalization-ai-2025/
39. Potla, R. T. (2024). Leveraging Generative AI for Enhanced Customer Relationship Management: Transforming Customer Interactions and Personalization in CRM Systems.
40. Salierno, G., Leonardi, L., & Cabri, G. (2025). Generative AI and Large Language Models in Industry 5.0: Shaping Smarter Sustainable Cities. Encyclopedia, 5(1), 30.
41. Singh, B., & Kaunert, C. (2024). Future of Digital Marketing: Hyper-Personalized Customer Dynamic Experience with AI-Based Predictive Models. In Revolutionizing the AI-Digital Landscape (pp. 189-203). Productivity Press.
42. Suneeth, S. N., Yashwant, S. N., Dharmendar, P., & Plugmann, P. (2024). Future Trends in Predictive Analytics and Generative AI for Marketing. In Predictive Analytics and Generative AI for Data-Driven Marketing Strategies (pp. 25-32). Chapman and Hall/CRC.
43. Thukral, V., Latvala, L., Swenson, M., & Horn, J. (2023). Customer journey optimisation using large language models: Best practices and pitfalls in generative AI. Applied Marketing Analytics, 9(3), 281-292.
44. Wong, W. K. O. (2024). The sudden disruptive rise of generative artificial intelligence? An evaluation of their impact on higher education and the global workplace. Journal of Open Innovation: Technology, Market, and Complexity, 10(2), 100278.
45. Yaprak, B. (2024). Generative Artificial Intelligence in Marketing: The Invisible Danger of AI Hallucinations. Ekonomi İşletme ve Yönetim Dergisi, 8(2), 133-158.
46. Zhang, H. (2017). Algorithmic Marketing with Data-Driven Simulations. Vanderbilt University.
47. Zhao, Y., & Tsubaki, M. (2025). An algorithmic marketing approach to analyzing consumer well-being: Incorporating psychological factors in customer loyalty. Journal of Retailing and Consumer Services, 84, 104238.
48. Ziatdinov, R., Atteraya, M. S., & Nabiyev, R. (2024). The fifth industrial revolution as a transformative step towards society 5.0. Societies, 14(2), 19.