

Data Engineering for Data-driven Marketing

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INVESTOR IN PEOPLE

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Chapter 1

Exploring AI in Data-driven Marketing: Understanding the Intersection of Data Engineering and Marketing

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Abstract

In today's competitive era, it has become significant for companies to understand their end consumer and target customers effectively. One of the ways to accomplish this goal is data-driven marketing. The current study seeks to explore the differences between traditional marketing and digital marketing, the pros and cons of data-driven marketing and usage of artificial intelligence (AI) in data-driven marketing. The research objective was met by exploration of published papers in the past 10 years covering the evolution of data-driven marketing, functions of data engineering, application of technology like AI in data-driven marketing and opportunities and challenges. This study is significant as it provides the insight into the relationship between marketing and data engineering and thus helps marketers to frame strategies by leveraging data-driven marketing to improve consumer experience and gain a competitive edge. Moreover, this study is an interdisciplinary study including marketing, engineering and data science. This study focusses on use of innovative methods to improve profitability of business and consumer experience.

Keywords: Artificial intelligence; consumer experience; data-driven marketing; data engineering; data processing; machine learning

Data Engineering for Data-Driven Marketing, 1–16

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Introduction

Data-driven marketing is an integration of data engineering and marketing resulting into strategies for marketers to optimize their return on investment (ROI) by understanding customer needs and improving their experience (Ali, 2023). Data engineering majorly deals with collection, processing and storing large-scale data (Chiang, 2021). And marketing involves identifying target audiences, their unmet needs and offering them with a product which fulfils their need (Grandhi et al., 2021). Data-driven marketing involves using large-scale data available on various platforms to understand customer preferences, behaviour and trends (Kumar et al., 2013). Data-driven marketing helps businesses to develop marketing strategies, identify target markets and measure competitiveness and results in improved ROI.

Data-driven marketing is presently used for estimating the satisfaction level of customer conversion rates and identifying needs of customers via data analysis. Data-driven marketing has also helped marketers to track their marketing plan, distribution of marketing content over various channels, optimum use of available resources resulting in improved effectiveness and efficiency of marketing campaigns (Theodoridis & Gkikas, 2019).

This chapter explores why data-driven marketing is replacing traditional marketing methods. This chapter explores the features of data-driven marketing, benefits of its adoption, its current application and opportunities and challenges. To fulfil this objective, the current study has explored previously published papers in the given area.

The section below presents the research questions of the current study.

Research Question

The current study tries to answer the following questions:

RQ1. What is the point of difference between digital marketing and traditional marketing?

RQ2. What are the advantages and disadvantages of data-driven marketing?

RQ3. What part does AI play in making data-driven marketing initiatives more effective?

The questions are answered by secondary data analysis of already published papers in this subject area. The section below presents the scope of study.

Scope of Study

Data-driven marketing ecosystems are a strategic approach that leverages customer data to inform marketing strategies and personalize experiences (Sundsøy et al., 2014). These ecosystems involve various technologies, processes, stakeholders and metrics, aiming to optimize spending, increase customer loyalty and drive growth. Key components include customer data platforms, analytics tools,

dashboards, attribution and predictive modelling and orchestration systems. The ecosystem must also integrate marketing, sales and service to align interactions across the customer journey. Governance frameworks for data management also play a crucial role in ecosystem effectiveness (Hossain et al., 2023). The focus is on real-world performance versus theoretical potential, with a comparison of ecosystem success and ROI against traditional marketing approaches lacking personalization and analytics optimization (Abakouy et al., 2019). Analysing quantitative ROI and qualitative relevance helps evaluate real-world ecosystem performance and compare it against non-data-driven approaches.

Data-driven marketing is a growing trend that leverages customer data and analytics to inform marketing strategies and campaigns (Johnson et al., 2021). This approach enhances customer experiences, improves ROI and provides a competitive advantage. Research shows that personalized experiences based on data analysis and insights influence 72% of customers' purchase decisions and brand loyalty. Companies employing data-driven attribution models have six times higher conversion rates compared to models not using data.

Relatively relevant recommendations and offers are also more likely to be purchased when brands provide personalized recommendations and offers tailored to individual preferences and interests based on data analytics (Akter et al., 2021). Customizing experiences around individuals' unique needs and wants, as identified through data analysis, enhances how customers perceive and interact with brands (Saura et al., 2023). Leveraging data to deliver personalized, timely and relevant experiences caters to customer preferences, strengthening brand loyalty and conversions.

Personalized experiences, individual-level personalization in real time and relevant recommendations build brand affinity (Kumar et al., 2020). Data-driven attribution models enhance analysis of the end-to-end customer journey, identifying pain points and opportunities to improve. Smoothing out main points increases customer satisfaction and loyalty.

It is significant for the success of any organization to understand the customers and their experience as a customer easily switches from one brand to another, from one channel to purchase to another after poor experience, sometimes without filling any bad feedback (Sundsøy et al., 2014). Thus, data-driven marketing helps marketers to understand the customer and build better customer relationships and improve customer experience resulting in improved ROI approximately 5–8 times more than what is spent on marketing campaigns.

Thus, one of the benefits of data-driven marketing is optimization of money spent on marketing campaigns. Data-driven marketing uses an attribution model such as unified marketing measurement (UMM) which evaluates the journey of the customer (Shah & Murthi, 2021). It also determines the portion of their advertisement which has maximum impact resulting into increased brand awareness and conversions. This helps marketers in optimum fund allocation and improved decision-making.

Thus, another advantage of data-driven marketing is enhanced decision-making. Furthermore, it is more significant to base the decision-making on facts rather than on gut feeling. Additionally, data-driven marketing also includes the emotional quotient of a consumer buying behaviour. Thus, it helps marketers to make decisions based on rational and emotional factors to ensure that all angles of a marketing campaign are covered.

It can be concluded that the scope of this study on data-driven marketing covers understanding the needs of modern consumers, improving customer experience, optimizing funds allocated on marketing and improving decision-making.

The next section presents the literature review of previously published papers in the field of data-driven marketing.

Literature Review

In today's competitive and contemporary economic environment, an organization can have a competitive advantage over others using data-driven marketing techniques (Alghamdi & Agag, 2024). The objective of this literature review is to explore the inter-relationship between marketing and data science. By reviewing the previously published paper, the researcher aims to identify the challenges and opportunities of adopting data-driven marketing by organizations.

Thus, this section presents the review of literature based on previously published papers related to data-driven marketing. The themes found after reviewing these papers included the evolution of data-driven marketing, function of data engineering, integration of marketing insight, data governance and compliance, real-time data processing and personalization, marketing effectiveness and attribution modelling, agile marketing and experimentation, cross-functional collaboration and skills development and opportunities and challenges.

Let's discuss each of them separately.

Data-driven Marketing Evolution

After reviewing of literature, it was found that data-driven marketing evolved after advancements in the field of data sources and digital technologies which lead to improved collection, storage and analysis of data. It gradually resulted in replacement of traditional marketing practices by data-driven marketing (Laitsos et al., 2024). It was found that data became significant in decision-making processes and strategy formulation processes.

Data Engineering Function

After reviewing literature, it was found that data engineering is vital for data-driven marketing as it eases the process of collection, processing and addressing large-scale data (Sundsoy et al., 2014). As mentioned in the above section, data-driven marketing became popular after progression in digital technology and improved access to sources of data. Thus, companies adapted data-driven marketing quickly and ensured quality of data, optimizing the operation of data and gaining worthy insights from the diverse data collected.

Integrating Marketing and Data Engineering

The literature explaining the integrating of marketing and data engineering majorly focussed on advantages of synergy of two. The use of data-driven marketing provides insights from large-scale data which can be used for

marketers for decision-making and strategy making. It helps marketers to identify market trends, improve customer experience, customize marketing campaigns and increase ROI (Timoumi et al., 2022). The techniques used in data-driven marketing are predictive modelling, segmentation and sentiment analysis.

Data Compliance and Governance

The previously published papers majorly focussed on the reason why it is important for data compliance and governance. After review, the reasons which were highlighted in these papers were to maintain integrity and security (Ashabi et al., 2020). Furthermore, the previously published papers have also discussed what is included in a data governance framework (Tokdar et al., 2022). According to them, they include the guidelines of managing usage, access and privacy of data. Also, there were papers focussing on advantages of data governance processes which included reducing the risk of moral dilemma and data breaches and resulting in transparent and reliable promotions (Trivedi & Malik, 2022).

Real-time Data Processing and Customization

The review of literature also provided the benefits of technologies which were based on real-time data processing. The study analysed that organizations are getting benefitted due to ease of gathering and examining data by quickly responding to customer data (Camilleri, 2020). The studies also analysed the benefit of real-time analytical tools such as customized suggestions, offers and experiences based on consumer behaviour, trend and preferences (Torrens & Tabakovic, 2022). It was also found useful in a dynamic business environment and was found to improve customer engagement and conversion.

Marketing Effectiveness and Attribution Modelling

The papers focussing on the benefit of using attribution modelling in marketing explained that it helped in analysing the effectiveness and ROI of marketing campaigns across varied marketing channels (Liao et al., 2024). This analysis helps companies to optimize their marketing efforts and allocation of funds for marketing. It also helps in optimizing conversion resulting into increased sales (van Leeuwen & Koole, 2022). There are advanced attribution models such as algorithm attribution and multi-touch attribution which offer insight into the impact of varied marketing efforts on conversion of customers and help in allocating resources and improved decision-making.

Agile Marketing and Experimentation

The papers focussing on experimentation and agile marketing concluded that data-driven and iterative approaches for designing and executing marketing campaigns are the objective of agile marketing. By using agile marketing concepts,

marketers can rapidly shift according to market conditions, customer needs and performance of marketing campaigns (Trivedi & Malik, 2021). The study also found that agile methods promote creativity, teamwork and flexibility in the marketing department resulting in a competitive advantage for organizations.

Cross-functional Collaboration and Skills Development

The literature review also suggested that for successful integration of marketing and data engineering, it is significant to work across boundaries of organization, collaborating with different functions and developing skills. Marketing, data engineering, information technology (IT) team and analytics can work in collaboration to bring data-driven answers, align with goals and share knowledge (Liu et al., 2020). A culture of continuous learning, creativity and data literacy can be developed by promoting training and development programmes. People across organization will be able to bring data-driven insights if they are well versed with data handling.

Opportunities and Challenges

The literature review also pointed out the opportunities and challenges of using data-driven marketing. The biggest challenges identified in literature review were privacy concerns, data silos and regulatory compliance (Venkateswaran et al., 2024). Additionally, there is a large and diverse amount of data available which further increases the complexity of the data ecosystem.

The opportunities identified in literature review were chances of invention and innovation among these challenges. Additionally, the application of AI, machine learning (ML) and Big Data analytics in data-driven marketing can be explored (Dominic et al., 2024). The application of these technologies may further improve the decision-making process, open up avenues for revenues and improve individual experience of varied and large customer bases.

In conclusion, literature review provided the insight that for leveraging data-driven marketing techniques, it is significant to understand the synergy between marketing and data engineering. This synergy is beneficial for organizations in terms of improved consumer engagement, insights which are actionable and sustainable growth of the firm (Vijesh Joe et al., 2021). Also, a company which is looking forward to leverage data-driven marketing has to invest in technology, people and strategic alliance.

The segment beneath presents the critical evaluation of the literature reviews.

Critical Analysis of Literature Review

This section (Table 1.1) presents the themes identified in the literature review, their explanation and their impact on the business.

The section below presents the research method used to carry the current study.

Table 1.1. Themes Identified in Literature Review.

Theme	Explanation	Impact
Data-driven personalization's effectiveness	<p>In accordance with the assessment, organizations that utilize advanced data engineering methods to accomplish personalization – like instantaneous data processing and ML algorithms – see enhancements in customer contentment and retention. Enhanced efficiency in conversion and continued engagement with clients are the outcomes of customized marketing strategies that focus on the preferences and patterns of specific consumers</p>	<p>A retail business deploys ML algorithms to power an algorithm for recommendations that analyses consumer browsing trends, purchasing tendencies and information regarding demographics. Customers get individualized product recommendations in accordance with their personal preferences, resulting in a substantial increase in conversion rates for the business (Lytras et al., 2020).</p>
Data governance's impacts on marketing performance	<p>An evaluation of data governance measures in marketing departments indicates that enterprises with robust information administration frameworks – which include confidentiality compliance measures and data quality management – perform more effectively in marketing compared to other firms.</p> <p>Implementing compliance with laws like the California consumer privacy act (CCPA) and general data protection regulation (GDPR) mitigates legal risks while additionally strengthening consumer confidence and brand reputation, which optimizes the effectiveness of marketing (Micheaux & Bosio, 2019)</p>	<p>An international corporation establishes into operation an extensive framework for data governance to ensure adherence to confidentiality regulations and preserve data quality norms across its advertising operations (Tomar & Grover, 2024). In addition to this, the organization not only prevents costly legal expenses but also acquires the trust of its consumers, thereby strengthening brand loyalty and enhancing involvement rates.</p>

(Continued)

Table 1.1. (Continued)

Theme	Explanation	Impact
Marketing technology	<p>The assessment of industry data highlights recent advances in the utilization of marketing technology, especially a move towards services delivered via the cloud, analytics platforms influenced by AI and integrated marketing administration structures (vom Scheidt & Staudt, 2024).</p> <p>Organizations that employ innovative marketing technologies obtain a competitive edge via modified scalability, rapid time to market, and increased flexibility in responding to fluctuating marketplace dynamics</p>	<p>An AI-powered analytics-enabled cloud-based marketing automation infrastructure has been established by a marketing agency. In the end, this helps the agency to propel greater profit on investment for consumers by optimizing campaign management operations, optimizing targeting for advertisements based on immediate data and furnishing specific materials at magnitude (Elias, 2022).</p>
Data visualization	<p>Analysing data visualization methods demonstrates how important they are for turning complicated marketing data into insights that can be put into practice.</p> <p>Engaging dashboards and visual analytics tools enable entrepreneurs to find patterns, discern trends and effectively convey insights, promoting well-informed decision-making throughout the organization</p>	<p>An interactive dashboard that shows client interaction numbers from several marketing channels (such as email, social media and websites) is created by a software company (Gabelaia, 2022). The dashboard is used by marketing managers to spot patterns, monitor the effectiveness of campaigns and make data-driven choices on the most effective utilization of their assets and approaches.</p>