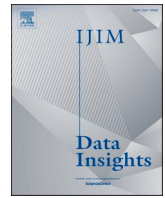


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## Developing big data enabled Marketing 4.0 framework

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### ABSTRACT

Due to the industrial revolution and, thereby with, the emergence of Industry 4.0, there has been an impact on the marketing of business firms, enabling them to digitally transform and adopt Marketing 4.0 practices supported by smart technologies. One of these is Big Data Analytics (BDA), which enables a firm to improve its marketing practices. The main objective of this study is to evaluate how integrating big data technology improves the marketing strategies of Indian FMCG companies operating in a dynamic and highly competitive market distinguished by its size and diversity, constantly changing consumer behaviour, and Marketing 4.0 trends. This study adopts a systematic approach to coding an interview with seasoned Indian FMCG professionals to explain the capabilities of Big Data in molding marketing practices. A framework is constructed based on the same. The theoretical and practical implications are discussed to visualize its applicability in business. Further, the Resource-based View (RBV) theory is discussed for describing the insights into the role and adoption of Big Data by Indian FMCG firms for enhancing performance and achieving competitiveness, along with demonstrating its benefits for decision-making, customer loyalty and internal capability assessment.

### Introduction

With technological advancements, industries now utilize innovative technologies that bolster a range of corporate activities and procedures, profoundly influencing the internal operations of these firms. (Cammarano et al., 2023, Singh et al., 2022b). The fourth industrial revolution, known as Industry 4.0, which is driving this technological change for business firms, serves as a bridge between intelligent products and adaptive processes and has a significant impact on both business models and production processes (Rosário & Dias, 2022; Salkin et al., 2018). Industry 4.0 enables the digital transformation of firms, which is further impacted by different internal and external factors related to the firm. The digital transformation is required to improve customer experiences and retain customers (Kitsios et al., 2021). Despite their implementation challenges and hazards, these advancements increase market analytics, cost, channel management, client connections, professional skills, and organizational procedures (Pascucci et al., 2023). With Industry 4.0, there is a steady trend towards understanding the consumers, which includes their needs, behaviours, storytelling, and anticipation (Lampropoulos, 2023; White & Pathak, 2023). These are the core components of marketing techniques that have evolved into marketing 4.0 (Yakut, 2022). As an outcome of the emergence of trends like Big Data (BD), social media, corporate social responsibility, and e-commerce, the shift

to Marketing 4.0 is accelerating (Güven, 2020). Marketing 4.0 is driven by the convergence of offline and online marketing strategies and incorporates technical advancements to provide better flexibility (Rathod et al., 2020; Kotler et al., 2017). The improvement of the consumer experience, the induction of repurchase intention, and brand promotion are some of the significant achievements of Marketing 4.0 (Dash et al., 2023). Consumer usage patterns of social media, online platforms, search engines, contextual interactions, and community influences are some of the areas the companies are looking into. Companies use the information mainly for promotional and consumer engagement activities. The consumers are seen to be transformed into advocates through marketing 4.0, where a sense of community building takes place, resulting in a meaningful engagement of the marketers and consumers (Gau, 2019).

In the era of Industry 4.0, the technological impact on a business's marketing has been significant, from developing strategies to engaging customers (Kaur et al., 2022). Today, BDA has revamped many methods and processes of doing business. The BDA, which complements to increase the performance of continual industry 4.0 applications, helps the firm to obtain a clear awareness of changes in online and offline marketing initiatives (Richards et al., 2019), thereby improving business operations, processes, the performance of the firm and efficiency in the decision-making process (Zhan et al., 2018; Jabbar et al., 2020; Gupta

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et al., 2021). Organizations and firms generate enormous amounts of data and information about relationships between brands and consumers across channels that influence the decision-making process. This consistent stream of information on consumers' engagement from various avenues and their inter-communication is critical for forming new marketing practices, like segmentation and targeting of consumers, use of automated technology to enable programmatic media buying, responding to consumers, enabling real-time trigger marketing (Malt-house et al., 2018). Adopting BDA varies with organization types, environment, and innovation characteristics affected by organizational factors and priorities (Sun et al., 2018). Studies reveal that firms require the development of data management and analytics, which are categories of process or capabilities, for extraction of significant insights from BDA (Day, 2011; Sanders, 2016; Sivarajah et al., 2017). The firms' content and recommendation engine optimization is carried out for advertisement towards the target group of consumers, campaigns related to marketing, capacity planning, understanding consumer behaviour, sentiments, buying practice and attitude. BDA, aggregation tools, and consumer agility add to the success of new products in an unstable marketing environment, enabling the firms to grab the opportunities in an aggressive marketing situation quickly (Hajli et al., 2020).

Marketing analytics (descriptive, predictive, and prescriptive) is a part of BDA (Morgan et al., 2009), which aids in the decision-making for firms (Wedel & Kannan, 2016; Dremel et al., 2020). Marketing analytics, using BD, can be used constructively to reveal meaningful insights and knowledge (Janssen et al., 2017). All the actions of the consumers are captured in the form of BD. The data can be extracted and used to augment the dynamic or adaptive capabilities and moderated by the human and organizational capital (V. Singh et al., 2022; Modgil et al., 2022; Erevelles et al., 2016). A firm's challenges can be mitigated with a data-driven decision-making culture, where judgments are made using data rather than intuition, which is necessary to adopt BD technologies and maximize their benefits (Waqar & Paracha, 2023).

The knowledge obtained using BDA from the large amount of data available from social media has become an integral part of prospective marketing campaign strategies. The knowledge is used for efficient decision-making for an organization, enabling the business and its processes to transform into a digital form (Ducange et al., 2018; Sestino et al., 2020). In the era of Industry 4.0, Fast-Moving Consumer Goods (FMCG) companies operate in a fast-changing and dynamic market. They must innovate continuously for competitive advantage or to maintain a competitive edge (Mariani et al., 2020). Like any other firms, FMCG firms are continuously looking for product, process and business model innovation leveraging BDA (Bresciani et al., 2021). BDA, along with innovation analytics, enables the capturing of extensive data for creating value for the consumers that can be used for first-time or repeat selling. In addition, BDA can also help firms identify opportunities for cross-selling and up-selling, thereby generating more revenue (Itani et al., 2022; Ranjan & Read, 2016; Johnson & Friend, 2015). By creating new business models, the BDA may enhance company performance by bettering consumer happiness and loyalty (Limna et al., 2021). Finding the target audience for a product and transforming them into repeat buyers has always been the primary concern for any FMCG firm's marketing team, and BDA can be of immense help (Moorthy et al., 2015).

Recent research examined how BDA impacts a firm's economic and marketability performances and increases organizational dexterity through BD-enabled strategic marketing. (Brewis et al., 2023; Hyun et al., 2023; Saeed et al., 2023). Previous studies have contributed to how BD might improve organizational performance. (Acciarini et al., 2023; Sharma et al., 2023). The increasing significance of Big Data in the FMCG industry, particularly in the Indian setting, prompted this study's development. Even though the importance of BD in business analytics and decision-making is well accepted, there is a gaping void in the literature regarding its adoption and implications, specifically within

Indian FMCG enterprises, notably in marketing. This study aims to fill this gap by investigating how Indian FMCG companies might use BD to improve their overall performance and competitive alignment. Furthermore, it is crucial to comprehend the advantages of BD adoption in this situation. Therefore, the need to shed light on the revolutionary potential of BD and its role in transforming the future for Indian FMCG companies served as the driving force behind this research.

Following are the research objectives.

1. To examine how BD deployment affects Indian FMCG companies.
2. To determine how BD will affect marketing in the Indian FMCG industry.
3. To evaluate the development of BD as a crucial tool for Indian FMCG companies.

The prevailing sections of this paper are portrayed through different sections, of which Section 2 highlights the background study on BD, digital marketing, and resource-based view, Section 3 represents the research design along with data collection, followed by Section 4 as research findings. The research propositions, framework, and implications are represented in Sections 5 and 6, respectively. The limitations and future scope of the study are discussed in Section 7, and finally, the conclusion is discussed in Section 8.

## Background study

### *BD analytics (BDA)*

The BD volume keeps extending regularly and takes the size of multiple terabytes and petabytes of data. To analyze this size of data, the business houses use state-of-the-art analytic techniques, i.e., BDA. Data analytics refers to pulling out meaningful observation and consciousness from data based on inferences and inter-relationships among the variables (Rajaraman, 2016; Sanders, 2016; Day, 2011). BDA is a data science that may boost a business house's financial and marketing performance (Qaffas et al., 2023). The applications of BDA are manifold (Kushwaha et al., 2021). BDA makes it possible to regulate system complexity, achieve system reliability, and improve system abilities, especially when adjusting to changes and uncertainties in global corporate contexts (Bi et al., 2023). BDA enables a firm to determine its threats and opportunities and measure agility (Barlette & Baillette, 2022). Fig. 1 depicts the Global BD Market Size and Revenue Forecast from 2011 to 2027. The graph depicts a significant growth in the market volume over the years.

BDA help immensely in the field of marketing, where consumers and products play a significant role in the firm's success. Marketing attribution can be achieved from BDA (Buhalis & Volchek, 2021). From spotting the consumers to visualizing their behaviour, addressing them with customized messages, retaining consumers and calculating the return on investment, BDA plays an important role (Ranjan & Foroapon, 2021). Based on the directions, visions, and actions in BDA, the business firms find opportunities, develop models and apply analytics to drive business (Verhoef et al., 2016). Organizations can benefit from BDA by building models which are an intermixing of people, technology, and management where the spotlight should be on technology, talent management, decision-making, leadership, and the firm's practice (Barton & Court, 2012; Brynjolfsson & McAfee, 2012). BD's analytics capabilities enhance company performance and culture, which develops long-term competitive advantage (Munir et al., 2023).

### *BDA and digital marketing*

The advent of the Internet and digital media has changed the lives of both consumers and firms, especially the way they do business (Chaffey & Ellis-Chadwick, 2019). Consumers frequently prefer to engage and invest significant amounts of time in digital environments, conducting

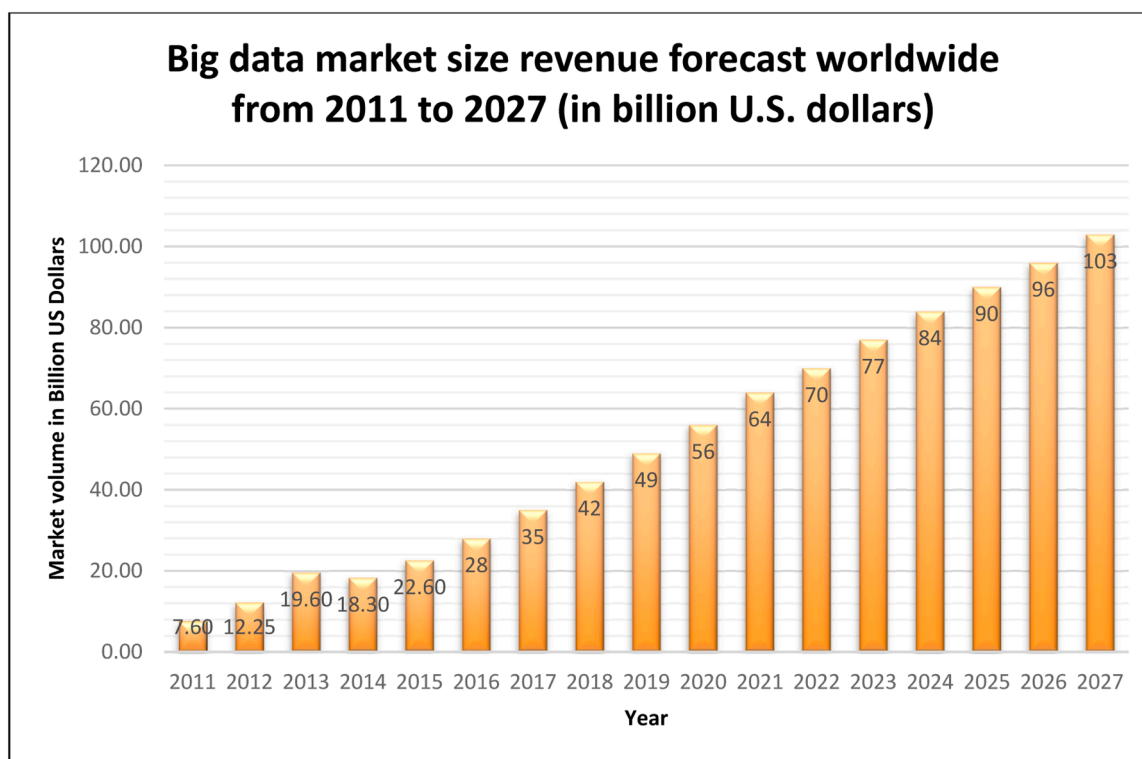


Fig. 1. Global Big Data Market Size and Revenue Forecast from the year 2011 to 2027 Source: <https://www.statista.com/statistics/254,266/global-big-data-market-forecast/>. Last accessed on September 05, 2023.

most of their activities through various digital channels. They gravitate towards the convenience, efficiency, and accessibility of the virtual realm, often opting for digital solutions to meet their needs and desires. While consumers primarily benefit from the usage of digital and social media, the same platforms also allow marketers advancement in the form of accessing, storing, and using the available excessive information about the users (Zollo et al., 2020). Digital and social media, at the discretion of both the consumers and the firm, inspire a significant change in consumer behaviour and marketing methods. The new digitalized ecosystem requires relentless alterations to adjust to the persistently changing environment of digital and social media trends (Rezaei & Valaei, 2017).

BD is one of the advancing technologies that have given an edge to the business houses for becoming a superior business player. This has a significant impact in the field of digital marketing (Verma et al., 2021). Businesses employ BD to quickly derive actionable business insights. Indian FMCG companies will be able to gain from this in several ways (Dwivedi et al., 2023). As for example, research from 2023 indicated that BDA's skills may be used to improve branding (Sakas et al., 2023). Previous studies already revealed the marketing practices are driven by data which generate ample opportunities (Rosário & Dias, 2023). While every firm had been striving hard to gain data-driven benefits, digital firms had the inbuilt advantage of capturing humongous data. BD provides digital and data-driven firms an opportunity for personalized and customized digital marketing, edging over their competitors. BD signifies enormous quantities of dynamic information generated by machines and human beings, which can be internal or external to the organization (Gupta et al., 2018). BDA plays a significant role in divulging and analyzing the patterns, trends, and associations of the data from a large data set that relates to the behaviour and interaction of humans. The digital footprints left over by consumers on different platforms are enormous. Analyzing those data enables assessing consumer behaviour and determining demand, leading to adaptable marketing strategies (Blazquez & Domenech, 2018). BDA is becoming

increasingly important as organizations seek insight into their customers and operations, resulting in knowledge generation to accomplish competitive advantage (Sumbal et al., 2017).

FMCG companies can leverage the BDA to formulate the problem, figure out a solution to the problem, and communicate with the consumer using the same digital media (Davenport & Kim, 2013). In the marketing domain, BDA helps in estimating consumer preferences, buying behaviour, relationship with the brand and advertisement target audience (Jacobs et al., 2016; Trusov et al., 2016). BDA in digital marketing of the business aids in improved information generation, decision-making, content marketing, customization, personalized product, and promotion offerings, enhancing the overall consumer experience. (Benjelloun et al., 2015; Cavlak & Cop, 2021). The BD even makes the application of Artificial Intelligence (AI) possible which is used for decision making (Duan et al., 2019). While the extant literature on the customer-firm relationship focuses on preferences and purchasing behaviour, the previous study has not addressed the role of consumers in influencing their own and broader network through digital marketing (Lemon & Verhoef, 2016). This becomes essential in the digital ecosystem, where each digital marketing activity generates a reaction from the target audience. Thus, the role of BDA in analyzing the information becomes even more significant (Salehan & Kim, 2016).

#### Resource-based view theory

The resource-based view (RVB) theory explains the collection of tangible or intangible resources that comprises financial resources, physical facilities, machinery, apparatus, human capital, intellectual property, etc., which the managers of a firm use to attain a competitive advantage and success in the long term in a market (Hunt & Morgan, 1995). The definite capability of an organization that is unique and valuable to improve performance signifies the firm's resources. The firms must interpret the connection between different available resources and their competence to attain a competitive advantage over a

prolonged period (Salam, 2021). Barney (1991) provided the essence of RBV theory and discussed the criterion that a firm’s resources must attain to get an edge in the competitive business environment. Studies reveal that the better financial performance of an organization is impacted by its competency in marketing and diversification strategy, which is further affected by the firm’s resources (Nath et al., 2010). The RBV encourages firms to build and exploit the resources specific to the firm to acquire an edge over their competitors by efficiently utilizing their skills for planning and innovation (Wamba et al., 2017). As per extant literature, the development of resources using limited resources enhances the capabilities of a firm where it can meet its desired requirements and go for a competitive advantage (Day & Wensley, 1988; Peteraf, 1993). Per previous studies, the acceptance and endorsement of digital marketing channels is heavily impacted by the physical resources defining the shopping scope (Hagen et al., 2022).

**Research design**

The research design includes the review of literature and practices related to BD, followed by conducting interviews to understand the implications and importance of BD in the marketing domain for the FMCG industry. The questionnaire was designed to understand the implications of BDA on the Indian FMCG firm. Next, the thematic codes were constructed for the derivation of themes and sub-themes and then the final propositions and research framework were linked. A systematic and structured method is adopted as represented in Fig. 2.

*Data collection*

Data collection was done by identifying and contacting 26 professionals working in the data analytics and marketing domain in Indian FMCG firms and conducting exhaustive interviews for a qualitative study. The FMCG firm was chosen based on size, as size affects the environment dynamics and the firm’s innovation abilities (Kueng et al., 2017; Younis & Sundarakani, 2020). Using personal and professional connections, the firm’s mid-level and senior-level personnel were contacted. Some were contacted through email, some through LinkedIn messages, and others through telephonic appointments. Following our preliminary discussions, we sent the company an informal discussion guide, and eventually, an interview was arranged. The interviewees were questioned about the competencies of BDA and their notable contributions for the FMCG firm towards achieving a significant accomplishment to thrive in the market. How BD benefits the firm is discussed. The questions asked of the interviewees are given in Appendix A. It was followed by applying an inductive way to determine the themes and sub-themes (Binder & Edwards, 2010; Braun & Clarke, 2006; Fereday & Muir-Cochrane, 2006). To secure the confidentiality, the details of those interviewees are not disclosed. The interviewees are numbered from IE1 to IE26, as represented in Table 1.

**Findings**

Based on the responses to the interview conducted with the experienced professionals of Indian FMCG company about leveraging BD to

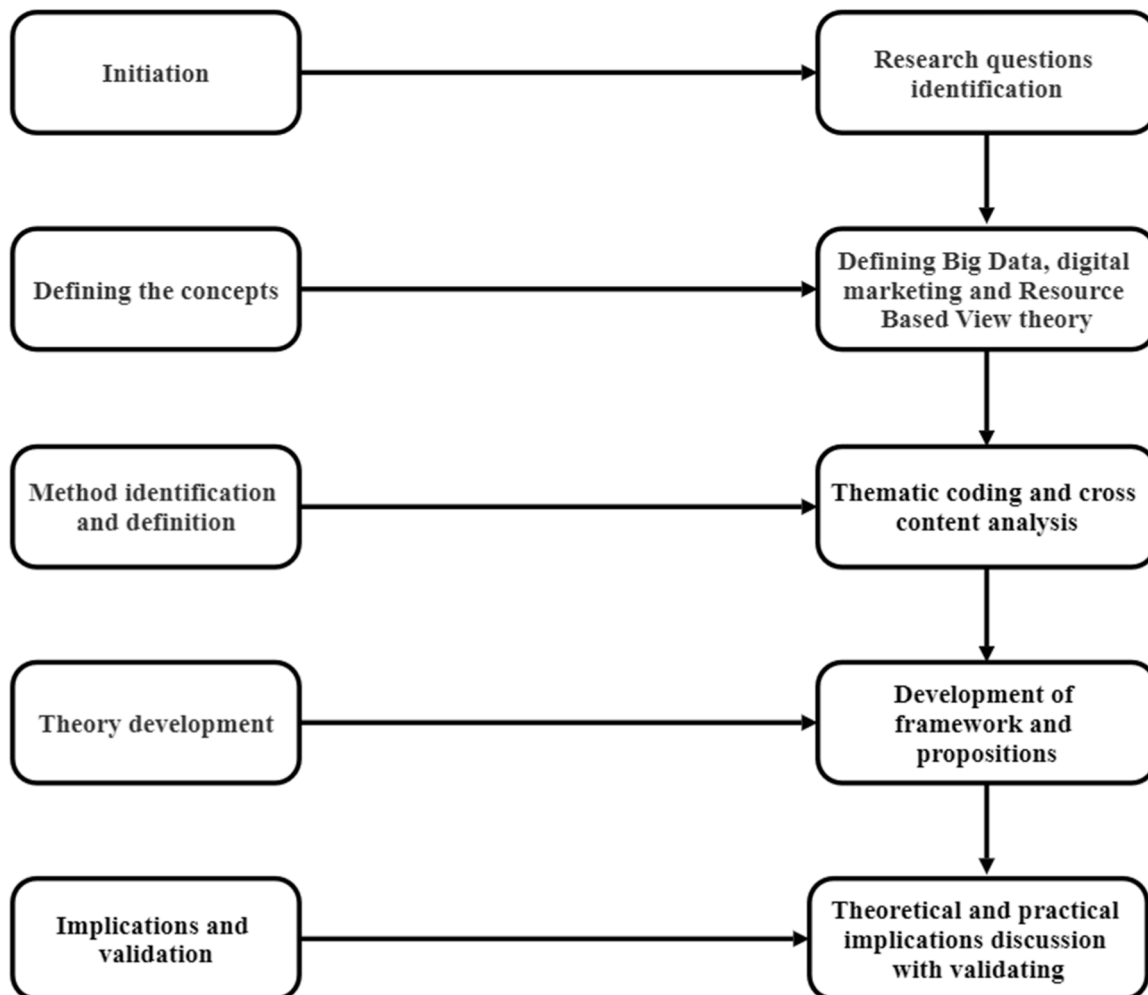


Fig. 2. Research structure adopted for this study.

**Table 1**  
Interviewee details.

Interviewee code	Job role	Nature of work	Experience in years
IE1	Senior Manager	Sales and marketing	10–15
IE2	Manager	Digital marketing and advertising	>10
IE3	Associate consultant	Sales and marketing	5–10
IE4	Market Research Director	Consumer liaison and promotional research	15
IE5	Engineer	IT services	5–10
IE6	Consultant	Operations	5–10
IE7	SEO specialist	IT and web services	>10
IE8	Business Analyst	Strategy	5–10
IE9	Manager	Seles and marketing	>10
IE10	Manager	Manufacturing	>10
IE11	General Manager	Public relations and organization marketing plan development	>10
IE12	Engineer	Manufacturing	>10
IE13	Digital Strategist	Advertising	10–15
IE14	Marketing specialist	Market research	>10
IE15	Senior Engineer	IT services	10–15
IE16	General Manager	Marketing	10–15
IE17	Content Marketer	Sales	5–10
IE18	General Manager	Sales	15
IE19	General Manager	Advertising	15
IE20	Manager	Public Relations	10–15
IE21	Assistant Manager	Operations	5–10
IE22	Area Sales Manager	Sales	10–15
IE23	Promotion Manager	Sales	10–15
IE24	VP	Sales	15
IE25	Regional Manager	Advertisement	10–15
IE26	Sales Officer	Sales	5–10

improvise digital marketing in the era of Industry 4.0, the significant findings are discussed in this section. The identified themes that came out from the empirical data are (i) Personalized targeting, (ii) Real-time customer insight, (iii) Efficient marketing campaigns and (iv) Strategic use. Results of the interview signify that BD helps the firm in various ways, right from customer focus to efficient decision-making following Marketing 4.0 and efficient resource utilization. Each of the themes is discussed in context with BD-enabled marketing.

*Personalized targeting*

Companies have long been trying to analyze consumer sentiments and mostly used collective analysis of the captured data. BDA supports marketers with one-to-one consumer analysis and information. This enables the marketers to target market individuals by creating personalized campaigns in combination with other technologies where recommendations of the products to the consumers based on their likings and usage (Sahay & Patil, 2020). The individual behavioral traits of the consumers revealed through BDA enables the organization’s personalized targeting and gain a competitive edge (Erevelles et al., 2016).

Table 2 exhibits the pertinent codes and axial codes related to the theme of Personalized Targeting.

**Table 2**  
Themes and codes established under ‘Personalized targeting’.

Interviewee code	Axial code	Supporting indicative quotations from interviews and open code
IE1	Purchase histories and physiological data	BDA gathers a huge number of consumers’ digital footprints in the online shopping market. Open code: Personalized targeting based on previous shopping history.
IE19	Customer segmentation	Identification and segmentation of consumers based on interest, behaviour and demographics through their online activity and thereby collecting data accordingly through different channels. Open code: Personalized advertisement

*Real time customer insight*

Companies have used retrospective analysis on the captured data about consumer sentiments and state of mind. This has primarily resulted in limited benefits as the analysis of the past has been different from the real-time sentiments, and consumers might not return, thus missing out the opportunity to serve the consumer (Jansen et al., 2009). This becomes very crucial for FMCG companies. BDA enables marketers with real-time customer insights, providing opportunities for real-time marketing where the data is analyzed instantly based on trending markets and helps in fast decision-making processes. (Briggs & Walker, 2016; Elia et al., 2020).

Table 3 exhibits the pertinent codes and axial codes related to the theme of Real time customer insight.

*Efficient marketing campaign*

The efficiency of any marketing campaign, be it the timing or the content, has long been debated (Reutterer, 2006). Real-time data analysis using BDA supported by predictive analytics and data visualisation can solve the problem. Based on historical facts and current data, predictive analytics can be used to forecast the future market trends for FMCG products. This adaptive capability is harvested using BDA (Erevelles et al., 2016).

Table 4 exhibits the pertinent codes and axial codes related to the theme of Real time customer insight.

*Strategic use*

Every firm is constantly looking for value creation, which is of prominent importance in FMCG. Constant value creation is possible through research, especially from the consumer side (Grover, 2018). By implementing BDA, firms have a constant source of newer consumer insights which can be used for value creation using their capabilities

**Table 3**  
Themes and codes established under ‘Real time customer insight’.

Interviewee code	Axial code	Supporting indicative quotations from interviews and open code
IE4	Sentiment analysis	BD enables the monitoring of social media in real-time by FMCG companies to assess consumer feedback in real-time and understand consumer sentiments about their products. Tracking social media for analysing unstructured consumer feedback, feeling, opinions, reviews, etc. Open code: Social media listening
IE20	Consumer preference and behaviour	The consumer needs based on their timely behaviour and preferences are traced through mobile apps and FMCG firms use them for promotions and future campaigns. Open code: mobile apps



**Table 4**  
Themes and codes established under 'Efficient market campaign'.

Interviewee code	Axial code	Supporting indicative quotations from interviews and open code
IE14	Data preparation and analysis	To achieve efficiency in the marketing campaign, BD provides tools for cleaning, integrating, and provide feature engineering for analysis. Open code: efficiency in marketing campaign is achieved through data analytics.
IE25	Real time predictions	Real time data analysis is possible by platforms supported by BD where predictive models can be applied to new data to generate decisions for improving efficiency in marketing campaigns. Open code: marketing campaign efficiency is achieved through real time analysis.

(Erevelles et al., 2016; Tellis et al., 2009). The value creation done through the implementation and use of BD results in the generation of automated algorithms for decision-making, and the innovation of new business models which are used for improved strategic marketing purposes (Fast et al., 2023).

Table 5 exhibits the pertinent codes and axial codes related to the theme of strategic use.

**Proposition development**

The study is backed by semi-structured interviews conducted with personnel working in different positions of FMCG and associate organizations. The significance of the resource-based view theory, which empowers an organization to attain a competitive edge, is perceived to develop propositions that also contribute to the future scope of research.

In digital marketing, the challenge is to identify and gather data from different available sources and extract meaningful information. BD helps marketers gain an in-depth understanding and improve decision-making processes. Also, the ways to identify and influence prospective consumers are suggested by BD (Farooqi et al., 2021). According to IE1, "The geospatial data is used by our firm to understand our consumers better based on different segments and accordingly offer personalized solutions to them". The RBV theory enables a firm to attain a competitive gain by creating ample strategic resources from the capabilities where the tangible resources and the managerial and technical skills drive the capabilities of BD analytics (Gunasekaran et al., 2017; Gupta &

**Table 5**  
Themes and codes established under 'Strategic use'.

Interviewee code	Axial code	Supporting indicative quotations from interviews and open code
IE12	Automation and innovation of business models	BD enables FMCG firms in achieving exceptional capabilities and thereby achieve competitive advantage through the mechanization of business models. Open code: Use of technology for improved strategic use.
IE15	Decision science	The non-transactional data which involves review and idea generation for products from the consumers are analysed by the FMCG firms for the strategic decision-making process. Open code: categorization and interpretation of data for multidimensional analysis through BD analytics.
IE24	Risk management	BD analytics identify the potential risk associated and thereby help the firm in improved strategy making by taking proactive steps in mitigating the risk. Open code: mitigating risk with an alternative strategy.

George, 2016). According to IE4, "The BD tools help in capturing of real-time data and emotions of the consumers thereby enabling in detecting the sentiments and emotions of the consumers". The acumen takes to the following proposition.

**P1.**BD enable an FMCG firm to monitor their reactions in real-time, and marketers can go for personalized targeting.

BD enables the assessment of the consumers' sentiments, where the firms can get significant commercial insight to drive their business (Hajiali, 2020). Activities related to marketing get an edge over the other areas in opinion mining and sentiment analysis (Shayaa et al., 2018). The real-time capturing of data and data analysis helps bring out consumer details and increase the firm's adaptive capability (Erevelles et al., 2016). According to IE4, "The application of BD in our industry is used for mining the opinions and sentiments of the consumers through different posts and reviews they put forward in social media, and this helps in detecting the overall sentiments and behaviour of the consumers in real-time reflecting their notion about our products." The acumen takes to the following proposition.

**P2.** The BD finds its application in monitoring and tracking customer sentiment and behaviour in real-time, thereby getting perception about a product from the consumer's point of view.

For the target consumers, messages with details in a customized form can be produced with BD, where the reaction of the consumers can be analyzed along with product benefits (Farooqi et al., 2021). The descriptive, diagnostic, predictive, and prescriptive capabilities of BD analytics enable an FMCG organization to understand the market's past, current and future trends (Paul & Rakshit, 2021) and accordingly target the consumers. Therefore, micro-marketing and micro-targeting are feasible with the help of BD technology to achieve customization on a segment basis (Lies, 2019). According to IE14, "Intelligent tools are provided by BD for cleaning, integrating the available and mined information from different sources and feature engineering is supported for analysis to achieve efficiency in marketing campaign related activities for different FMCG products." Virtual assistants and chatbots are used for interaction and promoting products, facilitating product campaigns. Marketing intelligence supported by BD enables the campaigns. The acumen takes to the following proposition.

**P3.** BD tools help develop efficient market campaigns for a newly launched FMCG product and help in promotional activities by identifying and targeting consumers.

The activities related to marketing supported by BD relate to the platform, market, entrepreneurial orientation, innovations, etc., that address the performances and customer feedback, which uses the organisations' resources to enhance the firm's performance and provide a competitive edge in the marketplace. Intelligence, response generation, and dissemination, along with an orientation toward creating a market and achieving innovations, are the key features BD provides for strategic orientation (Aker et al., 2021). The firm's capabilities should be relied upon for the strategic resources to achieve competitive advantage. According to IE12, "The differentiation strategy and the cost leadership strategy are leveraged upon by the firm's resources and supported by BD, backed by innovative business models and decision science to achieve a competitive edge." The acumen leads to the following proposition.

**P4.** The strategies of FMCG product marketing to be opted by the firms are based on the innovations of business models and the decision science being used.

Based on the four propositions constructed, a framework is developed, which is presented in Fig. 3.

**Discussion and implications**

This study discusses the implications of BD-enabled marketing practices for Indian FMCG firms where the RBV of the firm inspires different themes related to marketing for integration with the consumers. Big data can be combined with the company's current resources to adhere to the marketing 4.0 practices used by FMCG companies.



Fig. 3. BD enabled Marketing 4.0 capabilities (Author's Framework).

Studies have revealed the importance of BD in marketing, which enables the development of strategies to deal with situations that require intervention in products, services, customer communication, market scenarios, etc., facilitating digitization of business processes, business reengineering, implementation of intelligent machinery systems, improvements in data analysis (Singh et al., 2023; Dwivedi et al., 2021; Ducange et al., 2018). From planning, organizing, staffing, leading, and controlling any business process, BD proved efficient for improvement, innovations, business model development, and marketing strategies (Kumar et al., 2021; Sestino et al., 2020). Furthermore, BD will enable the assessment of the behaviour of the consumers through the development of new models. Henceforth, value creation for managers of FMCG firms can be done through BD, leading to improved performance (Kitsios et al., 2021).

#### Theoretical implications

This study highlights the positive implications of BD in marketing for the FMCG industries in India. Persons working in different positions in FMCG firms were interviewed, and the outcome of the interview reflects that BD is being used right from personalized targeting to strategy development in the firm to attain competitive advantage (Abbasi et al., 2016; Raguseo & Vitari, 2018). Before this, no study was conducted on Indian FMCG firms for developing BD-enabled marketing 4.0 practices. First, this research brings out the various dimensions related to marketing 4.0, which the FMCG firms can use to develop a new model for enhancing marketing practices. Considering the previous researches discussed in the background study section, the future studies and research in the field of marketing for Indian FMCG companies will allow researchers to evaluate BDA's potential for more business innovation leading to a competitive edge based on the themes and axial codes that

came up from this study (Yoshikuni et al., 2023). Future academics studying the FMCG sector in India can map these themes to various domains of digital marketing for marketing initiatives (Saheb et al., 2021). The framework provided by the BD to implement creative marketing strategies supported by Marketing 4.0 may help to further support this (V. Singh et al., 2022).

The relationship between BDA, marketing flexibility, and RBV theory is examined in this study of the FMCG sector. In the past, the tourism industry used BDA to address various tourism viewpoints, leading to more sustainable tourism (Agrawal et al., 2022). On a similar note, based on this study, it signifies how BDA can improve marketing adaptability, which favors business performance by enabling quick responses to market changes. The study also emphasizes how vital marketing adaptability is for Indian FMCG companies, aiding their growth. BD significantly impacts businesses by allowing them to use digital infrastructures to collect and analyze data, enabling precise scrutiny of user-profiles and related information. This data-driven approach enables businesses to identify opportunities better and react to market trends as they gather more market intelligence using innovative technology. Thus, the future researchers can make use of the theoretical concepts to build more information on digital marketing, BDA and how the Indian FMCG firms allocate their valuable resources to achieve a competitive advantage.

#### Practical implications

This study gives an insight to the marketing professionals and managers of an Indian FMCG firm that businesses can benefit from using BD, which depends on the firm's ability to support the business process with the existing resources. The proper and timely deployment of the existing resources by the FMCG firm adds to the competitive advantage

**Table 6**  
Summary of findings.

Selective Code	Axial Code	Combined interpretation of open codes
Personalized targeting	Physiological data and purchase history identification and customer segmentation	Based on the physiological data of the consumers and their previous purchase history, personalized targeting in the form of offers, benefits, etc. is being offered to the consumers.
Real time customer insight	Sentiment analysis Consumer preference and behaviour	By analysing the unstructured data, the consumer sentiment is detected and analysed and the consumers' behaviour, preferences, and actions are tracked in real-time go get a details insight into the consumers and their choices of FMCG products based on different parameters.
Efficient marketing campaign	Data preparation and analysis Prediction in real time for effective marketing campaign	An effective marketing campaign for FMCG firms is supported by BD through integration and feature engineering along with real-time analysis for the same.
Strategic use	Use of decision science along with automation and innovation of business models for effective strategic decision-making processes, mitigation of risk	Multidimensional analysis of consumer generated data for decision making process which is automated and propose new business models

where the use of BD affects the firm's strategy affirmatively. For the FMCG industry, in the up-selling process where selling premium or luxury brands will be objective, BD can play a vital role in determining the extent of consumer engagement through social media, which is an outcome of social media marketing of premium brands (Liu et al., 2021). Informed decision-making, new policy development, enhanced problem-solving techniques, innovative and improved marketing practices, and increased cost efficiency are some managerial implications that may be visualized with the implications of BD in Indian FMCG industries.

The managers of the FMCG firm should consider the different skills associated with RBV for overcoming challenges while adopting BD. Also, real-time decision-making will be an added advantage for FMCG firm managers and consultants.

### Future scope of the study and limitations

The study considers respondents from Indian FMCG and associate firms. One future scope may be a multi-nation study, which would help further generalizations. Further, future studies may include a much larger sample size of respondents working in different positions of FMCG companies for empirical validation. Also, consumers may be interviewed to know their ease of shopping and product recommendations, and accordingly, the FMCG firms may innovate strategies. Another future scope may consider identifying and the role of mediating and moderating variables that leverage the use of BD in FMCG and thereby affect performance. By interrelating the dimensions that evolved from this research, the firms can design a new model and implement the same into practice. Also, only a qualitative approach was adopted for this study. The future scope may be a quantitative study. Other theories, like the dynamic capability view and organizational processing theory, may be considered for assessing the firm's different situations.

Limitations of this study include a restriction in getting a thorough industry overview and the limited sample size of 26 participants from one Indian FMCG company. The lack of customer viewpoints in the

study limits understanding of how BD methods interact with consumer experiences. The study also emphasizes the need to identify less-examined mediating and moderating factors associated with BD usage. Quantitative conclusions may be constrained by using only a qualitative technique, and the study's theoretical framework might benefit from including other ideas (Table 6).

### Conclusion

This study discusses and examines the role of BD and how an FMCG firm can adopt BD to improve its overall performance and attain a competitive position in the market. This research is the first of its kind to explore the implications of BD in the Indian FMCG sector. The relationship among BD, marketing practices and FMCG from an Indian perspective is a unique contribution to this paper. In addition to its usefulness, the study explores the crucial roles that automation and decision science play. This study discusses the benefits the firm achieves for accepting BD in the business. The study reveals some of how BD helps in decision-making for FMCG firms. For Indian FMCG firms, BD is crucial to value creation and achieving business operations' scalability. FMCG organizations are using BD and analytics solutions more and more since they help create value, scale corporate operations, and increase output in today's competitive market. BD makes it possible to analyze consumer preferences and behaviour at each transaction stage with a business. FMCG companies may now provide personalized experiences through targeted messaging, unique offers, and channel-specific communication optimization. BD also offers in-the-moment customer insights via sentiment, preference, and behaviour research, which aids FMCG companies in creating goods that enhance customer experiences and provide them with the necessary competitive edge.

Additionally, BD facilitates effective market campaigns through real-time predictions, data processing, and analysis. BD can also be strategically used through automation, new business model innovation, decision science, and risk management. Furthermore, customer segmentation based on BD makes marketing techniques more effective, and real-time customer insights, like sentiment analysis and tracking of consumer preferences and behavior, help organizations respond quickly to market changes.

In conclusion, the key lessons learnt from this research can be summed up in the following. BD is transforming the Indian FMCG sector by improving its capacity to comprehend, interact with, and gratify consumers. The Indian FMCG companies may respond to changing market conditions, improve operational efficiency, and maintain competitiveness through individualized targeting, real-time analytics, effective marketing campaigns, strategic utilization, automation, new business model innovation, decision science, and risk management. BD has consequently evolved into an essential tool for Indian FMCG businesses, enabling them to spur growth, raise customer satisfaction, and ultimately achieve long-term success in a cutthroat industry.

### CRedit authorship contribution statement

**Shameek Mukhopadhyay:** Conceptualization, Data curation, Formal analysis, Investigation, Writing – original draft. **Rohit Kumar Singh:** Conceptualization, Supervision, Writing – review & editing. **Tinu Jain:** Supervision, Writing – review & editing.

### Declaration of competing interest

The authors confirm that there are no conflicts of interest related to this article's content. They attest to having no connections with any organizations or entities with financial or non-financial interests in the topics or materials covered in this manuscript.



## Appendix A

Question No.	Questions for the interviewees
1.	What are the key capabilities that BDA enables your firm to achieve in its marketing efforts?
2.	How your firm achieve competitive advantage through the mechanization of business models with BDA?
3.	What role does BDA play in enabling real-time monitoring of consumer data for consumer feedback?
4.	What changes have been made to marketing practises as a result of the digital transformation brought about by BDA?

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