

Advances in Multi-Channel Attribution Modeling for Enhancing Marketing ROI in Emerging Economies

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Abstract- Advances in multi-channel attribution (MCA) modeling have become pivotal in optimizing marketing return on investment (ROI), especially within the dynamic context of emerging economies. Traditional attribution models, such as last-click or first-touch, often fail to capture the complexity of consumer journeys that span multiple digital and offline channels. As emerging markets experience rapid digital transformation and increasing consumer access to varied media platforms, the need for robust, data-driven attribution frameworks becomes more pronounced. Recent developments in data analytics, machine learning, and artificial intelligence (AI) have enabled the construction of sophisticated MCA models that offer granular insights into channel effectiveness, temporal influence, and user interactions. These models allow marketers to allocate budgets more efficiently by accurately assessing the contribution of each touchpoint toward conversion. In emerging economies, where marketing budgets are often constrained and consumer behavior exhibits significant heterogeneity, the implementation of advanced MCA techniques can be a game-changer. The integration of real-time data sources such as mobile usage, social media engagement, and e-commerce transactions enhances the precision of attribution metrics and supports agile marketing strategies. Moreover, innovations in probabilistic and algorithmic attribution models, such as Markov chains and Shapley value-based approaches, further empower marketers to understand non-linear pathways and synergistic channel effects. Despite these advancements, several challenges remain,

including data fragmentation, limited technological infrastructure, and a shortage of analytical talent. Nonetheless, the trajectory of MCA modeling in emerging economies is promising, driven by growing investment in analytics capabilities and increasing demand for accountability in marketing expenditures. This review explores these advances and evaluates their implications for enhancing marketing ROI in diverse, rapidly evolving markets. By leveraging cutting-edge attribution methodologies, businesses in emerging economies can unlock deeper customer insights, optimize cross-channel performance, and achieve more sustainable growth in competitive digital environments.

Indexed Terms- Advancement, Multi-channel, Attribution, Modeling, Enhancement, Marketing, ROI, Emerging economies

I. INTRODUCTION

Marketing return on investment (ROI) is a critical metric used to evaluate the efficiency and effectiveness of marketing expenditures. However, in emerging economies, measuring and enhancing marketing ROI presents numerous challenges due to economic volatility, infrastructural disparities, fragmented data ecosystems, and rapidly evolving consumer behaviors (Adekunle *et al.*, 2021; Chukwuma-Eke *et al.*, 2021). Companies operating in these regions often face limited access to high-quality data, constrained marketing budgets, and a lack of advanced technological infrastructure. These factors collectively hinder their ability to accurately assess the

performance of marketing initiatives and allocate resources optimally (Oyedokun, 2019; Elujide *et al.*, 2021). Moreover, the digital transformation underway in many emerging markets characterized by increased smartphone penetration, social media usage, and e-commerce activity has introduced further complexity in tracking and analyzing consumer interactions across multiple channels (Elujide *et al.*, 2021; Agho *et al.*, 2021).

Understanding the customer journey in this context is more important than ever. Consumers in emerging economies frequently interact with brands through a combination of offline and online channels, including television, radio, retail stores, websites, mobile apps, and social media platforms (Kolade *et al.*, 2021; Egbuhuzor *et al.*, 2021). These multi-touchpoint journeys make it difficult to determine which channels are most influential in driving conversions. A nuanced understanding of this journey is essential for marketers seeking to tailor their strategies, engage consumers effectively, and ultimately improve ROI. Traditional attribution models, such as last-click or first-touch, oversimplify the decision-making process and often misrepresent the true contribution of each channel (Ajayi and Osunsanmi, 2018; James *et al.*, 2019).

To address these limitations, multi-channel attribution modeling (MCAM) has emerged as a transformative tool in modern marketing analytics. MCAM involves assigning credit to various marketing channels based on their relative contribution to desired outcomes, such as purchases or sign-ups (Abimbade *et al.*, 2017; Olanipekun, 2020). It provides a more holistic and accurate view of how different touchpoints work together to influence consumer decisions. By incorporating real-time data and advanced analytics, MCAM enables businesses to allocate marketing budgets more effectively and design campaigns that align with actual consumer behavior (Akinyemi and Ojetunde, 2020; Adelana and Akinyemi, 2021).

Recent advances in MCAM, particularly those driven by data science and machine learning, have opened new avenues for enhancing marketing ROI. Machine learning algorithms such as Markov models, Shapley value methods, and deep learning frameworks can process vast amounts of data to reveal complex, non-linear relationships between touchpoints (Akinyemi,

2013; Famaye *et al.*, 2020). These approaches allow for dynamic attribution, which considers the sequence, timing, and interaction effects of various channels. As such, they provide marketers with actionable insights into which strategies yield the highest returns and how to optimize future investments (Adeniran *et al.*, 2016; Akinyemi and Ebimomi, 2020).

Advances in multi-channel attribution modeling (MCAM), including data-driven and machine learning-based approaches, offer significant potential to enhance marketing ROI in emerging economies by providing deeper insights into consumer behavior across multiple touchpoints (Aremu and Laolu, 2014; Akinyemi and Ojetunde, 2019). These models not only help overcome the unique challenges posed by fragmented markets and limited resources but also enable a more strategic and informed allocation of marketing efforts. As emerging economies continue to digitize and expand their consumer bases, the adoption of sophisticated MCAM frameworks will be vital for businesses seeking to remain competitive and achieve sustainable growth (Adewoyin, 2021; Dienagha *et al.*, 2021).

II. METHODOLOGY

This study adopted the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) methodology to conduct a comprehensive and systematic review of the literature on multi-channel attribution modeling (MCAM) and its application in enhancing marketing ROI, with a specific focus on emerging economies. The review process followed the four-stage PRISMA flow: identification, screening, eligibility, and inclusion.

In the identification stage, a thorough search was conducted across major academic databases, including Scopus, Web of Science, IEEE Xplore, ScienceDirect, and Google Scholar. The search terms used included combinations of keywords such as “multi-channel attribution,” “marketing ROI,” “emerging economies,” “machine learning in marketing,” and “customer journey analytics.” Articles published between 2013 and 2024 were considered to ensure contemporary relevance, given the rapid technological developments in marketing analytics. A total of 482 records were identified after removing duplicates.

During the screening phase, titles and abstracts were reviewed to assess relevance to the research objectives. Studies were excluded if they focused solely on developed economies, were not written in English, or did not provide empirical or theoretical insights into attribution modeling or marketing ROI. This step reduced the pool to 176 potentially relevant studies.

In the eligibility stage, the full texts of the remaining articles were reviewed to determine alignment with the study's inclusion criteria. Eligible studies had to meet the following requirements: (1) relevance to MCAM, (2) focus on marketing ROI optimization, (3) context involving emerging or transitional markets, and (4) application or discussion of data-driven or machine learning approaches. Following this review, 68 articles were deemed eligible for final analysis.

The final inclusion consisted of 52 studies that provided substantial insights into MCAM approaches, their technological underpinnings, and applications in emerging markets. These included peer-reviewed journal articles, conference proceedings, and select industry reports that met the rigor and relevance criteria. The review synthesizes findings to identify key trends, methodological advancements, challenges, and opportunities related to enhancing marketing ROI through MCAM in emerging economies.

2.1 Background and Importance of Marketing ROI in Emerging Economies

Marketing return on investment (ROI) is a critical performance metric that quantifies the effectiveness and efficiency of marketing expenditures in generating revenue or achieving strategic objectives. In emerging economies, where resource constraints and rapidly evolving market conditions are common, optimizing marketing ROI is both essential and challenging (Oluokun, 2021; Ogunnowo *et al.*, 2021). Unlike developed markets, emerging economies often present a unique combination of institutional, technological, and consumer behavior complexities that complicate the accurate measurement and strategic application of marketing ROI.

One of the central challenges in measuring marketing ROI in emerging economies is the lack of consistent and reliable data. Many businesses in these regions,

particularly small and medium enterprises (SMEs), operate without formal marketing analytics systems or integrated data infrastructures (OJIKA *et al.*, 2021; Oyeniyi *et al.*, 2021). As a result, they rely heavily on manual tracking or anecdotal evidence to gauge the effectiveness of campaigns. This creates a fragmented view of marketing performance, where decision-makers are unable to accurately attribute outcomes to specific marketing initiatives. Additionally, cultural diversity, language differences, and varying levels of digital literacy further complicate the process of standardizing marketing measurements across different consumer segments.

Simultaneously, the growing importance of digital marketing in emerging economies has created both opportunities and new measurement challenges. With the expansion of internet access, mobile device usage, and social media penetration, digital channels have become indispensable tools for reaching and engaging consumers (Chima *et al.*, 2021; Fredson *et al.*, 2021). Countries like India, Nigeria, Indonesia, and Brazil have seen exponential growth in online users, transforming how consumers discover, interact with, and purchase products. This digital transformation offers a wealth of behavioral data that can, in theory, be leveraged to improve marketing ROI. However, the ability to capture, integrate, and analyze this data remains inconsistent across regions due to infrastructural gaps and a shortage of skilled data professionals.

Several factors contribute to the difficulty of optimizing marketing ROI in emerging economies. One key factor is the fragmented media landscape. Unlike in more developed regions where media channels are highly consolidated and data-rich, emerging markets often rely on a combination of traditional and digital platforms, including community radio, local newspapers, outdoor advertising, mobile messaging, and regional social media platforms (Chima and Ahmadu, 2019; Okolie *et al.*, 2021). These diverse channels vary widely in their reach, engagement levels, and data transparency, making it difficult to perform unified campaign assessments.

Another major factor is the heterogeneity of consumer behavior. Emerging markets are characterized by wide socio-economic disparities, multilingual populations,

and rapidly shifting consumer preferences. These dynamics demand highly localized and adaptive marketing strategies, which in turn complicate efforts to generate consistent ROI metrics (Okolie *et al.*, 2021; Isibor *et al.*, 2021). A campaign that performs well in one urban center may fail to gain traction in a nearby rural area, despite similar investments. Therefore, understanding local consumer journeys and their interaction with multiple marketing channels is crucial for accurate ROI attribution.

Furthermore, limited data availability and quality continue to hinder effective marketing ROI analysis. Even with increased digital engagement, the absence of integrated customer databases, inconsistent data standards, and low adoption of customer relationship management (CRM) tools undermine the ability to build robust attribution models. Privacy concerns and regulatory environments may also restrict data collection and sharing, further limiting insights into campaign performance (Fredson *et al.*, 2021).

Despite these challenges, improving marketing ROI in emerging economies is of paramount importance. Given the budgetary constraints faced by many businesses and the high competition for consumer attention, ensuring that every marketing dollar is spent effectively can determine market success or failure. Moreover, better marketing ROI analysis enables more strategic decision-making, encouraging firms to invest in the most productive channels and tailor content to the most receptive audiences (Kusumawati, 2019; Jönsson and Zahn, 2018).

While marketing ROI measurement in emerging economies is fraught with structural and contextual challenges, the rise of digital marketing provides new avenues for data-driven optimization. Addressing issues such as fragmented media, consumer heterogeneity, and limited data infrastructure will be essential in unlocking the full potential of marketing investments. As these markets continue to grow and mature, the importance of developing accurate and adaptable ROI measurement frameworks will only increase (Veilleux *et al.*, 2018; Silva *et al.*, 2020).

2.2 Evolution of Multi-Channel Attribution Modeling (MCAM)

Multi-Channel Attribution Modeling (MCAM) refers to the analytical process of assigning value to each marketing channel or touchpoint that contributes to a desired consumer action, such as a purchase or lead conversion. As consumer journeys become increasingly complex and fragmented across digital and offline platforms, the ability to accurately attribute outcomes to specific marketing efforts has become crucial for businesses striving to optimize return on investment (ROI) (Reinartz *et al.*, 2019; Klein *et al.*, 2020). The evolution of MCAM reflects a significant shift from simplistic, rule-based models to more sophisticated, data-driven, and machine learning (ML) techniques designed to capture the nuances of cross-channel consumer behavior.

Initially, marketers relied on traditional attribution models such as first-touch, last-touch, and linear attribution. The first-touch model assigns full credit for the conversion to the very first interaction a customer has with a brand. Conversely, the last-touch model credits the final interaction before the conversion, regardless of prior engagements (Ren *et al.*, 2018; Yuvaraj *et al.*, 2018). These models are easy to implement and interpret, but they drastically oversimplify the customer journey by ignoring all intermediate touchpoints. The linear attribution model attempts to address this limitation by distributing equal credit across all touchpoints in a consumer's path. While this approach recognizes multi-step engagement, it still fails to account for the differential impact of specific interactions based on timing, sequence, or context.

Recognizing the limitations of rule-based models, the marketing analytics field began to shift towards more data-driven attribution models. These models use historical customer journey data to determine the actual contribution of each touchpoint. A prominent technique includes Markov chain models, which examine the probability of conversion following each interaction and assess the drop-off rate when a particular channel is removed (Hamad *et al.*, 2018; Wu *et al.*, 2019). Another sophisticated approach is the Shapley value method, derived from cooperative game theory, which distributes credit based on the marginal

contribution of each channel across all possible combinations of touchpoints. These models provide a more accurate reflection of channel performance and enable marketers to make data-backed decisions.

With the growing availability of big data and computational power, machine learning techniques have further transformed MCAM. ML algorithms, including logistic regression, decision trees, and deep learning neural networks, can capture non-linear interactions, time decay effects, and behavioral patterns across massive datasets (Hossain and Muhammad, 2018; Ngiam and Khor, 2019). These models are dynamic and adaptive, learning continuously from new data to refine attribution accuracy. Machine learning thus marks a leap forward from static rules to dynamic, predictive modeling.

The advantages of advanced attribution models are profound. They allow businesses to accurately track cross-channel consumer behavior, identifying the true impact of marketing activities on conversions. Unlike simplistic models, advanced attribution frameworks consider the *order, frequency, recency, and interaction effects* of different touchpoints. This granular view supports smarter *budget allocation*, more targeted campaign design, and the personalization of customer experiences (Anshari *et al.*, 2019; Anny, 2020).

A key advancement in MCAM is the integration of offline and online channels into unified attribution frameworks. Consumers do not operate within siloed environments; they may see a billboard, receive a promotional flyer, visit a website, and later complete a purchase in-store (Wijaya, 2020; Luck *et al.*, 2020). Traditional digital-only attribution fails to capture these offline influences, leading to incomplete or skewed analysis. Integrating data from offline sources such as point-of-sale systems, call centers, and event tracking with online interactions enables a holistic understanding of the customer journey. This omnichannel perspective is essential, especially in emerging economies where offline interactions still play a dominant role in consumer decision-making.

MCAM has evolved from rigid, rule-based approaches to sophisticated, data-intensive methodologies powered by machine learning. These advances have significantly enhanced marketers' ability to track and understand complex, multi-touchpoint consumer

behaviors. As digital and offline touchpoints continue to converge, the ability to integrate and analyze all forms of interaction will remain central to maximizing marketing ROI and driving business growth (Dahl *et al.*, 2018; Hallikainen *et al.*, 2019).

2.3 Technological Advancements in Multi-Channel Attribution

The digital transformation sweeping across the global economy has significantly impacted marketing practices, particularly in how businesses evaluate the effectiveness of their strategies. One of the most crucial developments in this domain is the technological advancement of Multi-Channel Attribution Modeling (MCAM). Driven by innovations in machine learning (ML), artificial intelligence (AI), and big data analytics, modern MCAM systems enable marketers to assign value to various consumer touchpoints with higher precision and adaptability than ever before (Deepika, 2019; Reddy *et al.*, 2020). These technologies are especially critical in emerging economies, where rapid digitization, diverse consumer behavior, and fragmented markets demand nuanced and agile marketing approaches as shown in figure 1.

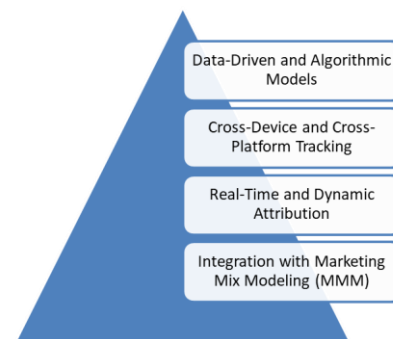


Figure 1: Recent Advances in Attribution Modeling

Machine learning and AI have revolutionized MCAM by allowing for the automated detection of patterns and relationships within vast datasets. Unlike traditional attribution models that rely on fixed rules, ML algorithms can process complex sequences of consumer interactions and dynamically assess the contribution of each channel to a final conversion. Techniques such as decision trees, support vector machines, and neural networks are used to identify the nonlinear, time-sensitive effects of marketing stimuli (Zhu *et al.*, 2018; Fong *et al.*, 2020). AI systems can

learn from historical data to improve attribution accuracy and even predict future consumer behavior based on evolving engagement trends. This adaptability is vital in emerging markets where consumer preferences and digital usage patterns shift rapidly.

One of the most transformative technological capabilities in MCAM is real-time data analysis, which allows businesses to update attribution assessments as new data is collected. Dynamic attribution models, powered by streaming analytics platforms and cloud-based infrastructures, enable the continuous monitoring of consumer interactions across various digital channels (Li *et al.*, 2018; García *et al.*, 2020). This real-time capability supports more agile decision-making, such as adjusting campaign strategies or re-allocating budgets in response to live performance metrics. For example, if a spike in social media engagement is followed by increased conversions, a real-time model can immediately signal marketers to capitalize on the momentum by intensifying related outreach efforts.

Another cornerstone of technological advancement in MCAM is the integration of consumer data from multiple touchpoints, including social media platforms, mobile applications, websites, email campaigns, and even offline interactions. The proliferation of digital engagement channels has created a wealth of consumer behavior data that can now be aggregated and analyzed using customer data platforms (CDPs), customer relationship management (CRM) systems, and data lakes (Hollebeek and Macky, 2019; Kihn and O'Hara, 2020). This integrated approach enables marketers to construct a comprehensive view of each consumer journey, linking diverse actions into a coherent narrative that informs strategic decision-making. For instance, a customer may interact with a brand via Instagram, download its mobile app, visit its e-commerce site, and eventually convert through an email offer. Only through integrated data collection and analysis can the value of each step be correctly understood and optimized.

Technological advancements in MCAM have already yielded measurable success in several emerging economies, highlighting their practical relevance and

transformative potential. In Brazil, the fintech company Nubank has effectively used advanced attribution models to track customer acquisition sources and refine digital ad spend. By combining mobile app data, website visits, and social media engagement, Nubank has increased ROI and reduced customer acquisition costs in a highly competitive market (Sirota and Fratini, 2018; Jeník *et al.*, 2020). Similarly, in India, e-commerce giants like Flipkart and Paytm employ machine learning-driven attribution systems to optimize marketing strategies across regional languages, varied customer segments, and diverse platforms, achieving improved targeting and user retention. In Nigeria, telecom companies have started integrating AI-based attribution models with mobile data analytics to understand how digital campaigns influence SIM card purchases and data plan upgrades. These insights have allowed firms to tailor promotions by region and user behavior, enhancing campaign efficiency and market penetration.

Technological advancements are reshaping the landscape of MCAM, particularly through the integration of AI, real-time analytics, and cross-channel data unification (Lim and Srai, 2018; Choi *et al.*, 2020). These innovations offer marketers in emerging economies unprecedented tools to understand and influence complex consumer journeys. As the digital ecosystem continues to expand, leveraging these technologies will be critical for organizations aiming to maximize marketing ROI and maintain competitive advantage in fast-growing markets.

2.4 Challenges of Implementing MCAM in Emerging Economies

Multi-Channel Attribution Modeling (MCAM) has emerged as a critical tool in modern marketing, offering businesses the ability to measure the effectiveness of various consumer touchpoints in the path to conversion (Gaur and Bharti, 2020; Nass *et al.*, 2020). While MCAM has demonstrated significant potential in advanced economies, its implementation in emerging economies faces a distinct set of challenges. These barriers stem from infrastructural limitations, fragmented consumer behavior, technological disparities, and the difficulty of adapting global models to local market dynamics as shown in

figure 2. Understanding these challenges is essential for contextualizing the adoption and effectiveness of MCAM in emerging regions such as Sub-Saharan Africa, South Asia, and Latin America.

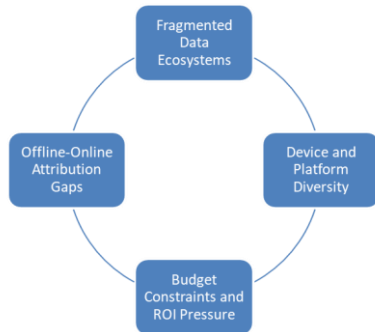


Figure 2: Specific Challenges in Emerging Economies

One of the most pressing challenges in implementing MCAM in emerging economies is limited access to quality data, often due to underdeveloped digital infrastructure. Reliable attribution modeling requires granular, consistent, and real-time data from various sources, including websites, mobile applications, social media, customer relationship management (CRM) systems, and offline transactions. However, in many developing regions, businesses still rely on outdated or manual systems for customer tracking, leading to data silos and inconsistencies. Furthermore, internet outages, limited access to cloud computing, and a lack of skilled data professionals compound the problem, resulting in poor data collection and integration (Malik and Om, 2018; Skafi *et al.*, 2020). Without comprehensive data, even the most advanced attribution models will yield flawed or incomplete insights.

Another key issue is the fragmentation of consumer behavior across digital and traditional channels. In emerging economies, the customer journey is often more erratic and non-linear than in developed markets. Consumers may receive marketing messages through television, radio, billboards, or word of mouth, while also interacting via SMS, social media, and mobile apps. Many of these channels especially offline ones are difficult to track accurately, making it challenging to capture a unified view of the customer experience. Moreover, the reliance on shared devices, multiple SIM cards, or informal purchasing mechanisms further disrupts the ability to link data to individual users,

complicating attribution accuracy (O’Dwyer, 2019; Ghosh and O’Neill, 2020).

Variability in internet penetration and technology adoption adds another layer of complexity to MCAM deployment in these regions. While urban areas in countries like India, Nigeria, or Brazil are rapidly digitizing, rural populations still experience limited internet access and inconsistent mobile connectivity. This digital divide means that consumer data is unevenly distributed, creating biases in attribution models that rely heavily on online interactions. Additionally, consumers in these markets often display different behaviors based on region, language, literacy level, and socioeconomic status, necessitating a flexible approach to modeling that many standardized MCAM tools do not currently offer (Kumar *et al.*, 2018; Sima *et al.*, 2020).

The final challenge is the difficulty of adapting advanced attribution models to localized market conditions. Most modern attribution tools are developed in and for digitally mature economies, using assumptions and algorithms optimized for well-connected, data-rich environments. Applying these models directly to emerging economies may lead to inaccurate or misleading results due to the distinct market structures, customer behaviors, and technology ecosystems (Lehdonvirta *et al.*, 2019; Hamed and El-Deeb, 2020). Moreover, the lack of technical expertise and budget constraints often limits the customization of attribution tools, reducing their effectiveness in addressing local marketing goals.

While MCAM holds significant promise for enhancing marketing return on investment in emerging economies, its implementation is fraught with context-specific challenges. Limited infrastructure, fragmented and diverse consumer behavior, inconsistent access to digital technologies, and the lack of tailored attribution models make it difficult for marketers to fully leverage its potential (Bolton *et al.*, 2018; Dredge *et al.*, 2019). Overcoming these challenges will require investment in digital infrastructure, education and training for data professionals, and the development of flexible attribution systems that can be adapted to localized conditions. Only through such targeted interventions

can the benefits of MCAM be realized across diverse and rapidly evolving emerging markets.

2.5 Opportunities for Enhancing Marketing ROI with MCAM in Emerging Economies

Emerging economies are experiencing a transformative shift in consumer behavior driven by digital adoption, mobile connectivity, and increased access to online services. Amidst this evolution, Multi-Channel Attribution Modeling (MCAM) presents a powerful opportunity for marketers to maximize the effectiveness of their investments (Lewis, 2019; Hanna, 2019). By capturing and analyzing data across various consumer touchpoints, MCAM enables organizations to better allocate budgets, understand customer journeys, and develop more personalized and impactful marketing strategies. In emerging markets, where resources are often limited and competition is intensifying, the implementation of MCAM can significantly enhance marketing return on investment (ROI) (Mavilia and Pisani, 2020; Pham *et al.*, 2020).

One of the foremost opportunities offered by MCAM is the optimization of marketing budget allocation (Scheller, 2019; Bradley, 2019). Traditional marketing in emerging economies often relies on guesswork or simplistic metrics to distribute spending across channels. MCAM, however, uses data-driven insights to identify which channels whether social media, mobile apps, SMS, email, or television are most effective at influencing conversions. This granular visibility allows marketers to reallocate budgets toward high-performing touchpoints while minimizing spend on underperforming ones (Burroughs and Berger, 2018; Dietz *et al.*, 2018).

A second key benefit is the ability to gain a more accurate understanding of customer behavior, which is especially crucial in markets characterized by diverse demographics and consumption patterns. Emerging economies often feature significant variations in language, culture, purchasing power, and technology use. MCAM captures detailed information across touchpoints, revealing patterns such as preferred devices, peak engagement times, and popular content formats (Shi *et al.*, 2018; Fernández, 2020). These insights help marketers tailor strategies to specific audience segments. By aligning strategies with real

behavioral data, companies can increase marketing effectiveness and customer satisfaction (Ilmudeen *et al.*, 2019; Kuokkanen and Sun, 2020).

MCAM also facilitates improved personalization and customer experience, which are critical drivers of brand loyalty in competitive markets. Attribution insights reveal not only what channels customers use but also how and when they use them (Nisar and Yeung, 2018; Haggag *et al.*, 2019). This allows for the creation of individualized customer journeys, where messages are timed and tailored to specific preferences. A brand in Brazil, for instance, could use MCAM to identify that a user typically engages via Instagram Stories in the evening and prefers discounts on weekend purchases. With this information, the brand can deliver highly relevant content at the right moment, enhancing the consumer experience and increasing the likelihood of conversion. As emerging market consumers become more digitally savvy, the demand for personalized and seamless experiences will grow, making MCAM a crucial enabler of competitive advantage (Shukla and Nigam, 2018; Nam and Kannan, 2020).

Furthermore, MCAM supports the development of integrated, cross-channel marketing campaigns that improve customer engagement (Leinonen, 2018; Mainardes *et al.*, 2020). Unlike siloed marketing approaches that treat each channel independently, MCAM encourages a holistic view of the consumer journey. Marketers can design campaigns that flow seamlessly from one platform to another such as a YouTube ad leading to a landing page, followed by a follow-up email or app notification ensuring consistent messaging and greater impact. In markets like Nigeria or Indonesia, where consumers often switch between multiple platforms throughout the day, the ability to maintain cohesive engagement is especially valuable. Effective cross-channel orchestration not only enhances campaign performance but also reinforces brand recognition and trust (Höcker *et al.*, 2018; Prosper, 2020).

Multi-Channel Attribution Modeling holds immense promise for enhancing marketing ROI in emerging economies (Cui *et al.*, 2019; Ailawadi and Farris, 2020). By enabling precise budget allocation, revealing deeper insights into consumer behavior,

facilitating personalized experiences, and supporting coordinated multi-platform campaigns, MCAM equips businesses to navigate the complexities of fast-evolving markets (Navarro, 2018; Haga *et al.*, 2019). As digital infrastructure continues to improve and data becomes more accessible, the strategic application of MCAM will be instrumental in unlocking new growth opportunities and building lasting customer relationships in these dynamic environments.

2.6 Marketers in Emerging Economies

As marketing ecosystems in emerging economies become increasingly complex and digitalized, the role of Multi-Channel Attribution Modeling (MCAM) in optimizing marketing strategies has grown in significance (Kähönen, 2020; Zhe *et al.*, 2020). However, fully leveraging MCAM requires more than access to software or basic data; it demands a strategic commitment to building infrastructure, human capital, and localized solutions as shown in figure 3. To ensure that businesses in emerging markets can effectively implement and benefit from MCAM, several critical recommendations should be considered. These include investments in data infrastructure, the adoption of hybrid attribution models, collaboration with local technology firms, and the development of analytical capabilities within marketing teams (Ali *et al.*, 2018; Wong *et al.*, 2020).

A foundational step for marketers in emerging economies is investing in robust data infrastructure and analytics capabilities. Effective MCAM depends on the collection, integration, and analysis of data from a wide variety of consumer touchpoints, including mobile apps, websites, social media platforms, SMS, and even offline channels like in-store interactions or call centers (Kaila, 2020; Camilleri, 2020). Unfortunately, many businesses in developing regions face infrastructure challenges such as fragmented data systems, unreliable internet connectivity, or limited access to cloud-based technologies. By prioritizing investment in customer data platforms (CDPs), customer relationship management (CRM) systems, and scalable analytics tools, companies can begin to build the necessary ecosystem for MCAM (Castrounis, 2019; Hansen *et al.*, 2020). In addition, ensuring secure data storage and compliance with local data privacy regulations is

essential to maintaining consumer trust and operational sustainability.

Secondly, businesses should consider adopting hybrid attribution models that combine traditional and advanced techniques. In many emerging markets, consumer behavior still spans both digital and traditional channels, making it impractical to rely solely on modern, machine learning-based attribution methods (Syam and Sharma, 2018; Berggren *et al.*, 2020). A hybrid approach incorporating rule-based models such as first-touch or last-touch alongside algorithmic or data-driven models can offer a more balanced view. This allows marketers to understand broad campaign effects while gradually transitioning toward more sophisticated models as data quality improves.

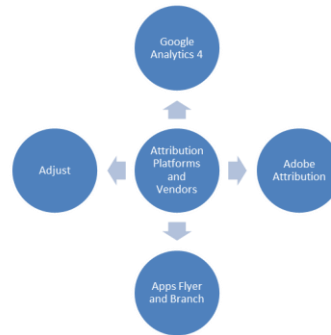


Figure 3: Attribution Platforms and Vendors

Another key recommendation is for marketers to collaborate with local technology firms and data scientists to develop region-specific attribution models. Off-the-shelf attribution solutions are often developed in Western contexts and may not account for the socio-economic, technological, and cultural nuances of emerging economies. Local tech partners can offer insights into regional media consumption patterns, mobile payment systems, and language preferences, making the attribution models more accurate and relevant (Dwyer *et al.*, 2018; Smith, 2019). In markets like India or Nigeria, where informal economies and vernacular content dominate, localized modeling is critical for meaningful ROI assessments. Moreover, such collaborations can stimulate innovation and capacity-building within local tech ecosystems.

Lastly, to maximize the value of MCAM, it is vital to train marketing teams to interpret and act upon

attribution insights. Attribution models can produce complex datasets and visualizations that require a nuanced understanding of analytics, consumer psychology, and media planning (Alhadad, 2018; Berger *et al.*, 2020). Without adequate training, teams may misinterpret the data, leading to ineffective strategy shifts or misallocation of resources. Regular workshops, certifications, and hands-on analytics sessions should be embedded into organizational learning programs. Additionally, fostering cross-functional collaboration between data scientists, marketers, and decision-makers ensures that insights from MCAM translate into actionable strategies. Empowering marketers with the skills to understand both the technical and strategic implications of attribution data will lead to more agile, evidence-based decision-making (Alter, 2019; Cichosz *et al.*, 2020).

The adoption of MCAM in emerging economies presents a strategic opportunity to enhance marketing efficiency and customer engagement (Rudnick and Velasquez, 2018; Zaki, 2019). However, to fully realize its benefits, marketers must take deliberate steps to strengthen data infrastructure, embrace adaptable modeling approaches, collaborate with local innovators, and build internal expertise (Grover *et al.*, 2018; Wright *et al.*, 2019). These recommendations not only support the successful implementation of MCAM but also contribute to the broader digital transformation of marketing in emerging markets, positioning businesses for sustainable growth in increasingly competitive environments.

CONCLUSION

Multi-Channel Attribution Modeling (MCAM) has emerged as a transformative tool for enhancing marketing Return on Investment (ROI), particularly within the dynamic and resource-constrained environments of emerging economies. By accurately tracking and evaluating the effectiveness of multiple marketing touchpoints, MCAM enables marketers to gain a comprehensive understanding of the customer journey, allocate budgets more efficiently, and tailor campaigns for greater impact. As marketing landscapes in developing regions grow increasingly complex due to digitalization and diverse consumer behaviors, the ability to attribute value accurately

across channels becomes crucial for maximizing outcomes and minimizing waste.

Technological advancements such as machine learning, artificial intelligence, and real-time analytics have significantly improved the precision and flexibility of MCAM. These innovations allow businesses to process vast amounts of data from various platforms ranging from mobile apps to social media and generate actionable insights. However, implementing MCAM in emerging economies presents unique challenges, including limited data infrastructure, fragmented consumer behavior, and disparities in internet access and digital literacy. Despite these obstacles, the opportunities are substantial. MCAM empowers firms to improve customer engagement, personalize experiences, and optimize marketing investments, thereby gaining a competitive edge in increasingly saturated markets.

Looking forward, the future of MCAM in emerging economies is promising. As access to digital tools expands and data ecosystems mature, the potential for innovation and local adaptation will grow. Businesses must act now by adopting advanced attribution models and investing in robust analytics capabilities. Such investments will not only enhance marketing ROI but also foster long-term growth through data-driven decision-making. Ultimately, organizations that embrace the strategic value of MCAM will be better positioned to navigate the evolving consumer landscape and achieve sustainable success in their respective markets.

REFERENCES

- [1] Abimbade, O., Akinyemi, A., Bello, L. and Mohammed, H., 2017. Comparative Effects of an Individualized Computer-Based Instruction and a Modified Conventional Strategy on Students' Academic Achievement in Organic Chemistry. *Journal of Positive Psychology and Counseling*, 1(2), pp.1-19.
- [2] Adedoja, G., Abimbade, O., Akinyemi, A. and Bello, L., 2017. Discovering the power of mentoring using online collaborative technologies. *Advancing education through technology*, pp.261-281.

- [3] Adekunle, B. I., Chukwuma-Eke, E. C., Balogun, E. D., & Ogunsola, K. O. (2021). A predictive modeling approach to optimizing business operations: A case study on reducing operational inefficiencies through machine learning. *International Journal of Multidisciplinary Research and Growth Evaluation*, 2(1), 791–799. <https://doi.org/10.54660/IJMRGE.2021.2.1.791-799>
- [4] Adelana, O.P. and Akinyemi, A.L., 2021. ARTIFICIAL INTELLIGENCE-BASED TUTORING SYSTEMS UTILIZATION FOR LEARNING: A SURVEY OF SENIOR SECONDARY STUDENTS' AWARENESS AND READINESS IN IJEBU-ODE, OGUN STATE. *UNIZIK Journal of Educational Research and Policy Studies*, 9, pp.16-28.
- [5] Adeniran, B.I., Akinyemi, A.L. and Aremu, A., 2016. The effect of Webquest on civic education of junior secondary school students in Nigeria. In *Proceedings of INCEDI 2016 Conference 29th-31st August* (pp. 109-120).
- [6] Adewoyin, M.A., 2021. Developing frameworks for managing low-carbon energy transitions: overcoming barriers to implementation in the oil and gas industry.
- [7] Agho, G., Ezeh, M.O., Isong, M., Iwe, D. and Oluseyi, K.A., 2021. Sustainable pore pressure prediction and its impact on geo-mechanical modelling for enhanced drilling operations. *World Journal of Advanced Research and Reviews*, 12(1), pp.540-557.
- [8] Ailawadi, K.L. and Farris, P.W., 2020. *Getting multi-channel distribution right*. John Wiley & Sons.
- [9] Ajayi, O. and Osunsanmi, T., 2018. Constraints and challenges in the implementation of total quality management (TQM) in contracting organisation. *Journal of Construction Project Management and Innovation*, 8(1), pp.1753-1766.
- [10] Akinyemi, A. and Ojetunde, S.M., 2019. Comparative analysis of networking and e-readiness of some African and developed countries. *Journal of Emerging Trends in Educational Research and Policy Studies*, 10(2), pp.82-90.
- [11] Akinyemi, A.L. and Ebimomi, O.E., 2020. Influence of Gender on Students' Learning Outcomes in Computer Studies. *Education technology*.
- [12] Akinyemi, A.L. and Ojetunde, S.M., 2020. Techno-pedagogical models and influence of adoption of remote learning platforms on classical variables of education inequality during COVID-19 Pandemic in Africa. *Journal of Positive Psychology and Counselling*, 7(1), pp.12-27.
- [13] Akinyemi, A.L., 2013. *Development and Utilisation of an Instructional Programme for Impacting Competence in Language of Graphics Orientation (LOGO) at Primary School Level in Ibadan, Nigeria* (Doctoral dissertation).
- [14] Alhadad, S.S., 2018. Visualizing data to support judgement, inference, and decision making in learning analytics: Insights from cognitive psychology and visualization science. *Journal of Learning Analytics*, 5(2), pp.60-85.
- [15] Ali, K.E., Mazen, S.A. and Hassanein, E.E., 2018. A proposed hybrid model for adopting cloud computing in e-government. *Future Computing and Informatics Journal*, 3(2), pp.286-295.
- [16] Alter, S., 2019. Applying Socio-technical thinking in the competitive, agile, lean, data-driven world of knowledge work and smart, service-oriented, customer-centric value creation ecosystems. *Complex Systems Informatics and Modeling Quarterly*, (18), pp.1-22.
- [17] Anny, D., 2020. Predictive Analytics and AI for Enhanced Customer Targeting.
- [18] Anshari, M., Almunawar, M.N., Lim, S.A. and Al-Mudimigh, A., 2019. Customer relationship management and big data enabled: Personalization & customization of services. *Applied computing and informatics*, 15(2), pp.94-101.
- [19] Aremu, A. and Laolu, A.A., 2014. Language of graphics orientation (LOGO) competencies of

- Nigerian primary school children: Experiences from the field. *Journal of Educational Research and Reviews*, 2(4), pp.53-60.
- [20] Berger, J., Humphreys, A., Ludwig, S., Moe, W.W., Netzer, O. and Schweidel, D.A., 2020. Uniting the tribes: Using text for marketing insight. *Journal of marketing*, 84(1), pp.1-25.
- [21] Berggren, K., Xia, Q., Likharev, K.K., Strukov, D.B., Jiang, H., Mikolajick, T., Querlioz, D., Salinga, M., Erickson, J.R., Pi, S. and Xiong, F., 2020. Roadmap on emerging hardware and technology for machine learning. *Nanotechnology*, 32(1), p.012002.
- [22] Bolton, R.N., McColl-Kennedy, J.R., Cheung, L., Gallan, A., Orsingher, C., Witell, L. and Zaki, M., 2018. Customer experience challenges: bringing together digital, physical and social realms. *Journal of service management*, 29(5), pp.776-808.
- [23] Bradley, L., 2019. Charging infrastructure strategies: Maximizing the deployment of electric drayage trucks in Southern California.
- [24] Burroughs, J. and Berger, S., 2018. Best-Practice, Evidence-Based Management That Minimizes Costs and Optimizes Outcomes. *Essential Operational Components for High-Performing Healthcare Enterprises*, p.299.
- [25] Camilleri, M., 2020. Higher education marketing communications in the digital era. In *Strategic marketing of Higher education in Africa* (pp. 77-95). Routledge.
- [26] Castrounis, A., 2019. *AI for people and business: A framework for better human experiences and business success*. O'Reilly Media.
- [27] Chima, P. and Ahmadu, J., 2019. Implementation of resettlement policy strategies and community members' felt-need in the federal capital territory, Abuja, Nigeria. *Academic journal of economic studies*, 5(1), pp.63-73.
- [28] Chima, P., Ahmadu, J. and Folorunsho, O.G., 2021. Implementation of digital integrated personnel and payroll information system: Lesson from Kenya, Ghana and Nigeria. *Governance and Management Review*, 4(2).
- [29] Choi, H., Mela, C.F., Balseiro, S.R. and Leary, A., 2020. Online display advertising markets: A literature review and future directions. *Information Systems Research*, 31(2), pp.556-575.
- [30] Chukwuma-Eke, E. C., Ogunsola, O. Y., & Isibor, N. J. (2021). Designing a robust cost allocation framework for energy corporations using SAP for improved financial performance. *International Journal of Multidisciplinary Research and Growth Evaluation*, 2(1), 809–822. <https://doi.org/10.54660/IJMRGE.2021.2.1.809-822>
- [31] Cichosz, M., Wallenburg, C.M. and Knemeyer, A.M., 2020. Digital transformation at logistics service providers: barriers, success factors and leading practices. *The International Journal of Logistics Management*, 31(2), pp.209-238.
- [32] Cui, H.T., Ghose, A., Halaburda, H., Iyengar, R., Pauwels, K., Sriram, S., Tucker, C.E. and Venkataraman, S., 2019. Omnichannel marketing: The challenge of data-integrity. *Northeastern U. D'Amore-McKim School of Business Research Paper*, (3460580).
- [33] Höcker, F., Sturén, C.O. and Troedsson, J., 2018. Cross-Channel Integration Towards Omnichannel Retailing: A Dynamic Capabilities Approach: A case study on IKEA. Dahl, A.J., D'Alessandro, A.M., Peltier, J.W. and Swan, E.L., 2018. Differential effects of omni-channel touchpoints and digital behaviors on digital natives' social cause engagement. *Journal of Research in Interactive Marketing*, 12(3), pp.258-273.
- [34] Deepika, M., 2019. *AI & ML-Powering the Agents of Automation*. BPB Publications.
- [35] Dienagha, I.N., Onyeye, F.O., Digitemie, W.N. and Adekunle, M., 2021. Strategic reviews of greenfield gas projects in Africa: Lessons learned for expanding regional energy infrastructure and security.
- [36] Dietz, M., Jenkins, P., Kapashi, R., Lemerle, M., Mehta, A. and Quetti, L., 2018. New rules

- for an old game: Banks in the changing world of financial intermediation. *McKinsey Global Banking Annual Review*.
- [37] Dredge, D., Phi, G.T.L., Mahadevan, R., Meehan, E. and Popescu, E., 2019. Digitalisation in Tourism: In-depth analysis of challenges and opportunities.
- [38] Dwyer, T., Shim, Y., Lee, H. and Hutchinson, J., 2018. Comparing digital media industries in South Korea and Australia: The case of Netflix take-up. *International Journal of Communication*, 12, p.20.
- [39] Egbuhuzor, N.S., Ajayi, A.J., Akhigbe, E.E., Agbede, O.O., Ewim, C.P.M. and Ajiga, D.I., 2021. Cloud-based CRM systems: Revolutionizing customer engagement in the financial sector with artificial intelligence. *International Journal of Science and Research Archive*, 3(1), pp.215-234.
- [40] Elujide, I., Fashoto, S.G., Fashoto, B., Mbunge, E., Folorunso, S.O. and Olamijuwon, J.O., 2021. Application of deep and machine learning techniques for multi-label classification performance on psychotic disorder diseases. *Informatics in Medicine Unlocked*, 23, p.100545.
- [41] Elujide, I., Fashoto, S.G., Fashoto, B., Mbunge, E., Folorunso, S.O. and Olamijuwon, J.O., 2021. Informatics in Medicine Unlocked.
- [42] Famaye, T., Akinyemi, A.I. and Aremu, A., 2020. Effects of Computer Animation on Students' Learning Outcomes in Four Core Subjects in Basic Education in Abuja, Nigeria. *African Journal of Educational Research*, 22(1), pp.70-84.
- [43] Fernández, L., 2020. Applications of Multi-Touch Attribution Modelling.
- [44] Yuvaraj, C.B., Chandavarkar, B.R., Kumar, V.S. and Sandeep, B.S., 2018, August. Enhanced last-touch interaction attribution model in online advertising. In *2018 IEEE Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER)* (pp. 110-114). IEEE.
- [45] Fong, J., Ocampo, R., Gross, D.P. and Tavakoli, M., 2020. Intelligent robotics incorporating machine learning algorithms for improving functional capacity evaluation and occupational rehabilitation. *Journal of occupational rehabilitation*, 30(3), pp.362-370.
- [46] Fredson, G., Adebisi, B., Ayorinde, O.B., Onukwulu, E.C., Adediwin, O. and Ihechere, A.O., 2021. Revolutionizing procurement management in the oil and gas industry: Innovative strategies and insights from high-value projects. *Int J Multidiscip Res Growth Eval [Internet]*.
- [47] Fredson, G., Adebisi, B., Ayorinde, O.B., Onukwulu, E.C., Adediwin, O. and Ihechere, A.O., 2021. Driving organizational transformation: Leadership in ERP implementation and lessons from the oil and gas sector. *Int J Multidiscip Res Growth Eval [Internet]*.
- [48] García, Á.L., De Lucas, J.M., Antonacci, M., Zu Castell, W., David, M., Hardt, M., Iglesias, L.L., Moltó, G., Plociennik, M., Tran, V. and Alic, A.S., 2020. A cloud-based framework for machine learning workloads and applications. *IEEE access*, 8, pp.18681-18692.
- [49] Gaur, J. and Bharti, K., 2020. Attribution modelling in marketing: Literature review and research agenda. *Academy of Marketing Studies Journal*, 24(4), pp.1-21.
- [50] Ghosh, I. and O'Neill, J., 2020. The unbearable modernity of mobile money. *Computer Supported Cooperative Work (CSCW)*, 29(3), pp.227-261.
- [51] Grover, V., Chiang, R.H., Liang, T.P. and Zhang, D., 2018. Creating strategic business value from big data analytics: A research framework. *Journal of management information systems*, 35(2), pp.388-423.
- [52] Silva, S.C., Duarte, P.A.O. and Almeida, S.R., 2020. How companies evaluate the ROI of social media marketing programmes: insights from B2B and B2C. *Journal of Business & Industrial Marketing*, 35(12), pp.2097-2110.
- [53] Haga, P., Johnsen, J.E. and Wold, M.W., 2019. *Facilitation of Network Effects in Early-Stage Multi-Sided Platforms: A Multi-Case Study* (Bachelor's thesis, NTNU).

- [54] Haggag, K., Pope, D.G., Bryant-Lees, K.B. and Bos, M.W., 2019. Attribution bias in consumer choice. *The Review of Economic Studies*, 86(5), pp.2136-2183.
- [55] Hallikainen, H., Alamäki, A. and Laukkanen, T., 2019. Individual preferences of digital touchpoints: A latent class analysis. *Journal of Retailing and Consumer Services*, 50, pp.386-393.
- [56] Hamad, R., Balzter, H. and Kolo, K., 2018. Predicting land use/land cover changes using a CA-Markov model under two different scenarios. *Sustainability*, 10(10), p.3421.
- [57] Hamed, S. and El-Deeb, S., 2020. Cash on delivery as a determinant of e-commerce growth in emerging markets. *Journal of Global Marketing*, 33(4), pp.242-265.
- [58] Hanna, E., 2019. *Only at Comic-Con: Hollywood, fans, and the limits of exclusivity*. Rutgers University Press.
- [59] Hansen, I., Poulter, J., Elkin, N. and Ferguson, C., 2020. Magic Quadrant for CRM Lead Management.
- [60] Hollebeek, L.D. and Macky, K., 2019. Digital content marketing's role in fostering consumer engagement, trust, and value: Framework, fundamental propositions, and implications. *Journal of interactive marketing*, 45(1), pp.27-41.
- [61] Hossain, M.S. and Muhammad, G., 2018. Environment classification for urban big data using deep learning. *IEEE Communications Magazine*, 56(11), pp.44-50.
- [62] Ilmudeen, A., Bao, Y. and Alharbi, I.M., 2019. How does business-IT strategic alignment dimension impact on organizational performance measures: Conjecture and empirical analysis. *Journal of Enterprise Information Management*, 32(3), pp.457-476.
- [63] Isibor, N.J., Ewim, C.P.M., Ibeh, A.I., Adaga, E.M., Sam-Bulya, N.J. and Achumie, G.O., 2021. A Generalizable Social Media Utilization Framework for Entrepreneurs: Enhancing Digital Branding, Customer Engagement, and Growth. *International Journal of Multidisciplinary Research and Growth Evaluation*, 2(1), pp.751-758.
- [64] James, A.T., Phd, O.K.A., Ayobami, A.O. and Adeagbo, A., 2019. Raising employability bar and building entrepreneurial capacity in youth: a case study of national social investment programme in Nigeria. *Covenant Journal of Entrepreneurship*.
- [65] Jeník, I., Flaming, M. and Salman, A., 2020. Inclusive digital banking: Emerging markets case studies. *Consultative Group to Assist the Poor Working Paper*. Washington, DC .
- [66] Jönsson, J. and Zahn, M., 2018. Decision makers' use of Return on Marketing Investment metrics in the decision-making process.
- [67] Kähönen, S., 2020. A case study: marketing automation in digital multi-channel customer experience management.
- [68] Kaila, S., 2020. How can businesses leverage data analytics to influence consumer purchase journey at various digital touchpoints?. *Journal of Psychosocial Research*, 15(2).
- [69] Kihn, M. and O'Hara, C.B., 2020. *Customer data platforms: Use people data to transform the future of marketing engagement*. John Wiley & Sons.
- [70] Klein, J.F., Zhang, Y., Falk, T., Aspara, J. and Luo, X., 2020. Customer journey analyses in digital media: exploring the impact of cross-media exposure on customers' purchase decisions. *Journal of Service Management*, 31(3), pp.489-508.
- [71] Kolade, O., Osabuohien, E., Aremu, A., Olanipekun, K.A., Osabohien, R. and Tunji-Olayeni, P., 2021. Co-creation of entrepreneurship education: challenges and opportunities for university, industry and public sector collaboration in Nigeria. *The Palgrave Handbook of African Entrepreneurship*, pp.239-265.
- [72] Kumar, V., Leone, R.P., Aaker, D.A. and Day, G.S., 2018. *Marketing research*. New York: Wiley.
- [73] Kuokkanen, H. and Sun, W., 2020. Companies, meet ethical consumers: Strategic CSR management to impact consumer choice. *Journal of Business Ethics*, 166(2), pp.403-423.

- [74] Kusumawati, A., 2019. Impact of digital marketing on student decision-making process of higher education institution: A case of Indonesia. *Journal of e-Learning and Higher Education*, 1(1), pp.1-11.
- [75] Lehdonvirta, V., Kässi, O., Hjorth, I., Barnard, H. and Graham, M., 2019. The global platform economy: A new offshoring institution enabling emerging-economy microproviders. *Journal of management*, 45(2), pp.567-599.
- [76] Leinonen, M., 2018. Customer experience through the customer journey in a multichannel environment: case Veikkaus.
- [77] Lewis, M.A., 2019. *Operations management: A research overview*. Routledge.
- [78] Li, C.S., Darema, F. and Chang, V., 2018. Distributed behavior model orchestration in cognitive internet of things solution. *Enterprise Information Systems*, 12(4), pp.414-434.
- [79] Lim, S.F.W. and Srari, J.S., 2018. Examining the anatomy of last-mile distribution in e-commerce omnichannel retailing: A supply network configuration approach. *International Journal of Operations & Production Management*, 38(9), pp.1735-1764.
- [80] Luck, E., Barker, N., Sassenberg, A.M., Chitty, B., Shimp, T.A. and Andrews, J.C., 2020. *Integrated marketing communications*. Cengage AU.
- [81] Mainardes, E.W., Rosa, C.A.D.M. and Nossa, S.N., 2020. Omnichannel strategy and customer loyalty in banking. *International Journal of Bank Marketing*, 38(4), pp.799-822.
- [82] Malik, A. and Om, H., 2018. Cloud computing and internet of things integration: Architecture, applications, issues, and challenges. *Sustainable cloud and energy services: Principles and practice*, pp.1-24.
- [83] Mavilia, R. and Pisani, R., 2020. Blockchain and catching-up in developing countries: The case of financial inclusion in Africa. *African Journal of Science, Technology, Innovation and Development*, 12(2), pp.151-163.
- [84] Nam, H. and Kannan, P.K., 2020. Digital environment in global markets: Cross-cultural implications for evolving customer journeys. *Journal of International Marketing*, 28(1), pp.28-47.
- [85] Nass, O., Garrigós, J.A., Gómez, H.G. and Schoeneberg, K.P., 2020. Attribution modelling in an omni-channel environment—new requirements and specifications from a practical perspective. *International Journal of Electronic Marketing and Retailing*, 11(1), pp.81-111.
- [86] Navarro, L.F.M., 2018. Comparative Analysis of Content Production Models and the Balance Between Efficiency, Quality, and Brand Consistency in High-Volume Digital Campaigns. *Journal of Empirical Social Science Studies*, 2(6), pp.1-26.
- [87] Ngiam, K.Y. and Khor, W., 2019. Big data and machine learning algorithms for health-care delivery. *The Lancet Oncology*, 20(5), pp.e262-e273.
- [88] Nisar, T.M. and Yeung, M., 2018. Attribution modeling in digital advertising: An empirical investigation of the impact of digital sales channels. *Journal of Advertising Research*, 58(4), pp.399-413.
- [89] O'Dwyer, R., 2019. Cache society: transactional records, electronic money, and cultural resistance. *Journal of cultural economy*, 12(2), pp.133-153.
- [90] Ogunnowo, E., Ogu, E., Egbumokei, P., Dienagha, I. and Digitemie, W., 2021. Theoretical framework for dynamic mechanical analysis in material selection for highperformance engineering applications. *Open Access Research Journal of Multidisciplinary Studies*, 1(2), pp.117-131.
- [91] OJIKI, F.U., OWOBU, W.O., ABIEBA, O.A., ESAN, O.J., UBAMADU, B.C. and IFESINACHI, A., 2021. A Conceptual Framework for AI-Driven Digital Transformation: Leveraging NLP and Machine Learning for Enhanced Data Flow in Retail Operations.
- [92] Okolie, C.I., Hamza, O., Eweje, A., Collins, A. and Babatunde, G.O., 2021. *Leveraging Digital Transformation and Business Analysis*

- to Improve Healthcare Provider Portal. *IRE Journals*, 4 (10), 253-254 [online]
- [93] Okolie, C.I., Hamza, O., Eweje, A., Collins, A., Babatunde, G.O. and Ubamadu, B.C., 2021. Leveraging digital transformation and business analysis to improve healthcare provider portal. *Iconic Research and Engineering Journals*, 4(10), pp.253-257.
- [94] Olanipekun, K.A., 2020. Assessment of Factors Influencing the Development and Sustainability of Small Scale Foundry Enterprises in Nigeria: A Case Study of Lagos State. *Asian Journal of Social Sciences and Management Studies*, 7(4), pp.288-294.
- [95] Oluokun, O.A., 2021. *Design of a Power System with Significant Mass and Volume Reductions, Increased Efficiency, and Capability for Space Station Operations Using Optimization Approaches* (Doctoral dissertation, McNeese State University).
- [96] Oyedokun, O.O., 2019. *Green human resource management practices and its effect on the sustainable competitive edge in the Nigerian manufacturing industry (Dangote)* (Doctoral dissertation, Dublin Business School).
- [97] Oyeniyi, L.D., Igwe, A.N., Ofodile, O.C. and Paul-Mikki, C., 2021. Optimizing risk management frameworks in banking: Strategies to enhance compliance and profitability amid regulatory challenges. *Journal Name Missing*.
- [98] Pham, H., Kim, S.Y. and Luu, T.V., 2020. Managerial perceptions on barriers to sustainable construction in developing countries: Vietnam case. *Environment, Development and Sustainability*, 22, pp.2979-3003.
- [99] Prosper, J., 2020. Data Analytics and Machine Learning for Omni-Channel Optimization.
- [100] Reddy, R., Reddy, R., Bose, R. and Chopra, R., 2020. Leveraging Reinforcement Learning and Neural Collaborative Filtering for Enhanced AI-Driven Personalized Marketing Campaigns. *Journal of AI ML Research*, 9(4).
- [101] Reinartz, W., Wiegand, N. and Imschloss, M., 2019. The impact of digital transformation on the retailing value chain. *International journal of research in marketing*, 36(3), pp.350-366.
- [102] Ren, K., Fang, Y., Zhang, W., Liu, S., Li, J., Zhang, Y., Yu, Y. and Wang, J., 2018, October. Learning multi-touch conversion attribution with dual-attention mechanisms for online advertising. In *Proceedings of the 27th acm international conference on information and knowledge management* (pp. 1433-1442).
- [103] Rudnick, H. and Velasquez, C., 2018. Taking stock of wholesale power markets in developing countries: A literature review. *World Bank Policy Research Working Paper*, (8519).
- [104] Scheller, F., 2019. Modeling and optimizing of integrated multi-modal energy systems for municipal energy utilities.
- [105] Shi, S.W. and Kalyanam, K., 2018. Touchable apps: exploring the usage of touch features and their impact on engagement. *Journal of Interactive Marketing*, 44(1), pp.43-59.
- [106] Shukla, P.S. and Nigam, P.V., 2018. E-shopping using mobile apps and the emerging consumer in the digital age of retail hyper personalization: An insight. *Pacific Business Review International*, 10(10).
- [107] Sima, V., Gheorghe, I.G., Subić, J. and Nancu, D., 2020. Influences of the industry 4.0 revolution on the human capital development and consumer behavior: A systematic review. *Sustainability*, 12(10), p.4035.
- [108] Sirota, F. and Fratini, G., 2018. A case about Nubank: the story of an innovative fintech in Brazil.
- [109] Skafi, M., Yunis, M.M. and Zekri, A., 2020. Factors influencing SMEs' adoption of cloud computing services in Lebanon: An empirical analysis using TOE and contextual theory. *IEEE Access*, 8, pp.79169-79181.
- [110] Smith, H., 2019. People-based marketing and the cultural economies of attribution metrics. *Journal of Cultural Economy*, 12(3), pp.201-214.
- [111] Syam, N. and Sharma, A., 2018. Waiting for a sales renaissance in the fourth industrial revolution: Machine learning and artificial

- intelligence in sales research and practice. *Industrial marketing management*, 69, pp.135-146.
- [112] Veilleux, S., Haskell, N. and Béliveau, D., 2018. Profitable growth through international high-technology product and market development. *International Journal of Entrepreneurship and Small Business*, 35(3), pp.408-427.
- [113] Wijaya, B.S., 2020. In-store brand communication: When shelf-space and display seduce consumers. *Humanities & Social Sciences Reviews*, 8(4), pp.984-998.
- [114] Wong, T.H., Rogers, B.C. and Brown, R.R., 2020. Transforming cities through water-sensitive principles and practices. *One Earth*, 3(4), pp.436-447.
- [115] Wright, L.T., Robin, R., Stone, M. and Aravopoulou, D.E., 2019. Adoption of big data technology for innovation in B2B marketing. *Journal of Business-to-Business Marketing*, 26(3-4), pp.281-293.
- [116] Wu, H., Li, Z., Clarke, K.C., Shi, W., Fang, L., Lin, A. and Zhou, J., 2019. Examining the sensitivity of spatial scale in cellular automata Markov chain simulation of land use change. *International Journal of Geographical Information Science*, 33(5), pp.1040-1061.
- [117] Zaki, M., 2019. Digital transformation: harnessing digital technologies for the next generation of services. *Journal of Services Marketing*, 33(4), pp.429-435.
- [118] Zhe, L., Tao, D. and Huan, T., 2020. Research on garment mass customization architecture for intelligent manufacturing cloud. In *E3S Web of Conferences* (Vol. 179, p. 02125). E3S Web of Conferences.
- [119] Zhu, Z., Wang, X., Kapoor, A., Zhang, Z., Pan, T. and Yu, Z., 2018. EIS: A wearable device for epidermal American sign language recognition. *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*, 2(4), pp.1-22.