Indonesian Journal of Electrical Engineering and Computer Science
Vol. 32, No. 1, October 2023, pp. 563~570
ISSN: 2502-4752, DOI: 10.11591/ijeecs.v32.i1.pp563-570

Efficient ad placement using data mining and optimization

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Article Info

Article history:

Received May 10, 2023
Revised Jul 7, 2023
Accepted Jul 16, 2023

Keywords:

Ad placement
Clustering
Data mining
Digital marketing
Optimization

ABSTRACT

Nowadays online or digital marketing is the key player in modern product promotion. It allows everyone to promote their own product online easily and at the lowest cost than any other way of marketing. But people face difficulties in promoting their product online. Organizations ranging from small to big often tend to waste money in online ad placement or it may be less effective to the budget they made. The proposed system can identify the right audience and platform in which to be promoted for the product that is to be promoted. This system is so precise in achieving this through data mining and data optimization. Here we use the firefly algorithm for data optimization. The system outputs the platform that can be targeted and the countries where the customers are interested in the product.

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1. INTRODUCTION

Data mining is massive platform for acquiring suitable and relevant information from numerous varieties of information storages. It is useful to explore large amount of information to discover its pattern and examine it [1], [2]. The first step of information mining is information gathering in the form of datasets from extraordinary database. This information is used to outline and fix problems. Such information is blended and accrued from numerous information assets. This information may be stored in textual content, databases or in similar form [3], [4]. The metadata is used to minimize the mistakes within the system of integration of information. In data mining the alternative trouble is of duplication of information. In such cases we can represent the information in the form of tables [5], [6]. The integration of information goals to lower repetition and maximum guarantee of not having effect on performance and dependency of information. The information is examined and observed to extract beneficial information from collected information. The information required for evaluation is mined from databases [7], [8]. The repository of facts with statistics includes variety of facts needed. The required facts are to be selected and gathered results in needed facts. The techniques to mine pattern from collected datasets using appropriate algorithms are decided to anticipate final results in all the cases [9], [10]. The mining consists of diverse work including clustering, prediction, classification, collection, evaluation etc. In the next phase the assessment of results is done in the context of enterprise goal. In this phase new necessities can get up because of invention of latest styles in the course of assessment of facts [11]–[13].

This paper is organized in four main sections. Section 1 gives introduction and literature survey. The section 2 describes the method, section 3 describes the result and discussion and sections 4 describes the conclusion of the paper.

2. METHOD

2.1. Literature review

In this section a detailed literature survey is conducted on related to digital marketing and its related parameters. The survey mainly focused on the attributes like digital marketing, media planning, integrated marketing communication, marketing innovation, communication technologies, advertising standards, brand development, dialogic communication, multimedia tools, and social networking. Use of all these attributes is examined through the literature survey. The details of the literature survey are discussed in the subsequent section.

Mokoena *et al*. [14] described that digital evolution have changed advertising pattern globally and outdated business models used by South African adverting agencies are losing their customers towards their competitors those are using digital platform. The study investigated the extent and implications of digital disruption. The authors identified six significant factors for operations in digital advertising agencies. The factors included are mainly related with characteristics, sustainability, effectiveness, skills, capabilities, structure and process. The authors developed a framework for marketing decision makers based on digitalised business environment to provide smoother transitions of advertising agencies.

Tam *et al*. [15] stated the practice of integration in media planning is explored in the form of advertising and marketing. The consideration of public relations practitioner perspective is limited. The authors conducted interview of 25 public relations practitioners in Australia. The interviews resulted in the conclusion that the public relations practitioners are influenced by stakeholders beyond consumers. The authors recognised the need for improvement based on existing model. Authors offered a study based on interdisciplinary integration and opportunities for public relations to enhance practice.

Butkouskaya *et al*. [16] discussed that the integrated marketing communication (IMC) and dynamic capability theory are the source of competitive advantage. The strategic orientation, IMC helps to influence customers, market and financial performance. The market orientation has a direct relationship with IMC. The developed countries have relationship between technology orientation and IMC. In developed and emerging economy, the implementation of IMC gives competitive advantage over the rivals.

Purchase and Volery [17] discussed, the marketing innovation in the from of new market practices including changes in the design, promotion, distribution and pricing of a product or service. The authors described marketing innovations need to be merged with technology. The innovations in distribution channels, branding strategies, communication types, pricing mechanisms is essential. Digitization is a key for marketing innovation. The trend growing towards cocreation, service-dominant logic and user community perspectives.

Lee and Cho [18] stated, the new communication technologies have changed the way of communication and interaction with customer through digital media. The authors identified key trends as digital advertising, data-driven marketing communication, use of artificial intelligence in advertising production, big data in advertise execution. The digital advertising will be the future as per the authors perspective.

Liu *et al*. [19] stated, the advertising standardization has been moved towards mobile advertising. The marketers need to understand the importance of mobile advertising. The authors examined the impact of mobile advertising on young Australian and Chinese consumers. The authors found that, the mobile advertising have positive impact on functional value followed by credibility and interactive value.

Vollero *et al*. [20] stated, due to the digital marketing, IMC have lost customer centric focus. The traditional market created brand value replaced by buyer and seller co-created values. The new approach of marketing represents the multidimensional IMC approach. The issues about community-centric orientation, emergent strategy, hybrid communication, reciprocity-based assessment highlights global perspective of IMC.

Schultz *et al*. [21] described, the focus of media planning is on message distribution. The media planning focus is mainly on optimization models. The models based on the assumptions of purchasing journey driven by media exposures. The authors focused on consumer generated media consumption model. Authors considered the media influence on consumption model. The authors used US-based data set to demonstrate the model. The authors claimed that, the proposed approach is more superior than the traditional models.

Liljedal and Dahlén [22] investigated, how consumer react to the brand for development of new product. The main focus of the author is on consumer ideation, selection of product, marketing, consumer evaluation of product, and brand perception. The consumer participation in new product ideation impact more positively on product brand and ratings. Oliver and Fitzgerald [23] described, the social media plays important role in an organization for dialogic communication. The dialogic approach helps organizations to gain support the support of stakeholders.

Ham and Lee [24] stated five unique factors of internet media personality including intelligent, amusing, sociable, convenient and confusing. The pair of brand and internet media personality leads to advertising brands. Tafesse and Korneliussen [25] examined that whether using multimedia tools at multiple customer touchpoint leads to better marketing performance. The results show that using multimedia tools for the trade show campaign leads to better level of marketing performance. The authors used multiple regression analysis to test propositions of study.

Chin [26] explored the user motivation to use social networking on responses to social media marketing. The two type of social media marketing is discussed by the author including digital adverting and virtual brand community. The use of social networking has varying effects on social media marketing. The result shows the key implications for social media marketing use in social networking.

2.2. Summary of literature review

This section summarizes the literature survey. The parameters used for the summary are title of the paper, author, attributes described in the paper, advantages of the work, shortcomings of the work. The Table 1 gives detailed summary of the literature survey. The conclusion of the summary is given in the subsequent section.

Table 1. Summary of literature review

Sr. No.	Title of the paper	Authors	Attributes described	Advantages	Shortcomings
1	A framework for the sustainability of advertising agencies in an emerging economy: the case of South Africa	Mokoena *et al.* [14]	Digital Marketing	Decision based on six parameters of digital marketing	No attributes other than digital marketing
2	Towards greater integration in media planning: Decision-making insights from public relations practitioners	Tam *et al*. [15]	Media planning	Interdisciplinary integration taken under consideration	Public relations is the main focus of the study
3	Strategic antecedents and organisational consequences of IMC in different economy types	Butkouskaya *et al.* [16]	IMC	Market orientation is considered	No other technology explored than IMC
4	Marketing innovation: a systematic review	Purchase and Volery [17]	Market Innovation	Digitalization is the key	The technology details are not explained in depth
5	Digital advertising: present and future prospects", International Journal of Advertising	Lee and Cho [18]	Communication Technology	Use of artificial intelligence	The artificial intelligence techniques are not discussed in details
6	Culture, Perceived Value, and Advertising Acceptance: A Cross-Cultural Study on Mobile Advertising	Liu *et al*. [19]	Mobile Advertising	Advertising standardization taken under consideration	The technology details are nor discussed in depth
7	IMC in digitally-empowering contexts: the emerging role of negotiated brands	Vollero *et al*. [20]	Multidimensional Integrated Marketing Communications	Hybrid communication is used to contact customers	Technology details are not clear
8	Consumer-driven media planning and buying	Schultz *et al*. [21]	Media planning	Consumer generated media consumption model is taken under consideration	Consumption model attributes are not explained
9	Consumers' response to other consumers' participation in new product development	Liljedal and Dahlén [22]	Brand development	Consumer ideation is considered for item selection	Methods of brand development are not explored
10	Industry and agency views of social media: Issues implementing dialogic communication	Oliver and Fitzgerald [23]	Social media	Dialogic approach is the focus	The technology part is not explained in details
11	Internet media personality: Scale development and advertising implications	Ham and Lee [24]	Internet media	Advertising brand is the focus	The techniques of scale development are not explained in depth
12	Examining the effect of using multiple media tools on the marketing performance of organizations in a trade campaign environment	Tafesse and Korneliussen [25]	Marketing performance	Multimedia tools are used for marketing	Multiple regression is the only tool used to measure performance
13	Interactive Digital Advertising vs. Virtual Brand Community: Exploratory Study of User Motivation and Social Media Marketing Responses in Taiwan	Chin [26]	Media marketing	Social networking is used for marketing	The social media is the only tool used for marketing

All the papers reviewed in the literature are focusing on either one of the attributes of the communication or the technology details are not explored in the proper depth. Hence the system is proposed which uses data mining and data optimization techniques. The system identifies right audience and platform for the advertise placement/promotion of product. The proposed system uses K-means algorithm for clustering of data and firefly algorithm for optimization.

The subsequent section going to describe methodology used in the proposed work. The data mining algorithms including K-means clustering and firefly are used in this paper. Data mining technique is preferable to the format where data is obtained from the user across various sources. The K-means algorithm is used for clustering of data.

2.3. K-means clustering algorithm

The benefits of using k-means algorithm is to have better performance, celerity and briefness. These set of rules relies on good deal of preliminary dots. The set of rules based on course features and do the use of gradient techniques. Preliminary cluster focal factor is not always proper, complete set of rules effortlessly sinks into nearby minimal factor. If the distance between points is smaller the similarity is more.

- K-means is a set of rules totally based on dividing the given data in the form cluster.
- The set of rules uses unsupervised approach and mainly applicable in statistics mining and sample recognition.
- Minimizing cluster overall performance index, square mistakes and mistakes are the foundations of these set of rules.
- To optimize the outcome, the set of rules attempts to discover K divisions.
- At first select few dots to symbolize preliminary the cluster focal factors. (Normally, K pattern dots are selected)
- Collect last pattern dots to their focal factors according to the criteria of minimum distance.
- Then we get a preliminary class. If the class is unreasonable, it can be altered by repetitive iterations until affordable class is obtained.

2.4. Firefly algorithm

Another algorithm used in this work is a firefly algorithm. The firefly is also set of rules primarily based on flashing styles and conduct of fireflies. Firefly algorithm makes use of 3 idealized rules.

- One firefly is interested in multiple fireflies regardless of their sex.
- Beauty is proportional to the brightness. Lower weight means distance is more.
- Brightness of firefly is decided with the help of panorama of goal function.

The Figure 1 shows a block diagram of how the firefly algorithm is applied on the dataset for optimization of data. Initially data is collected from user, the formatting of collected data is performed using data mining. The firefly algorithm is used for optimization of formatted data. The variable input value is used for data optimization and further data optimization is performed. The finally optimized data is used for solution across the country/platform for the certain product(s).

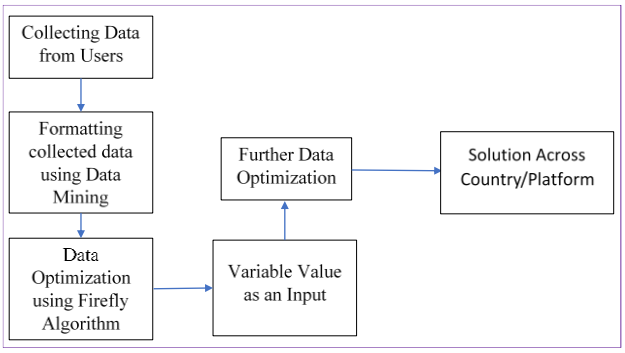

Figure 1. Block diagram of data optimization using firefly algorithm

3. RESULTS AND DISCUSSION

This work does data optimization of countries and advertising platforms with the help of real marketing dataset. The data set is used from the open source data repository named Kaggle. The bar graph

given in Figure 2 shows relation between the people of different countries and their interest in number of products. To form the number of clusters Elbow approach has been used. Elbow approach is one of the most famous approaches to discover most desirable variety of clusters. The approach uses an idea of within cluster sum of squares (WCSS), which defines overall versions inside a cluster. The model is trained using number of clusters obtained from WCSS.

The Figure 3 shows the visualization of five different clusters differentiated by colours. The clusters are shaped among the parameters of the dataset spending score and previous purchases. The image depicts the different types of customers or audiences who have different ways of spending and purchase limits. The data that is obtained from clustering is further used for data optimization to get the final optimal data for the product promotion in each country and ad platform. The firefly algorithm is used in this work to optimize the data.

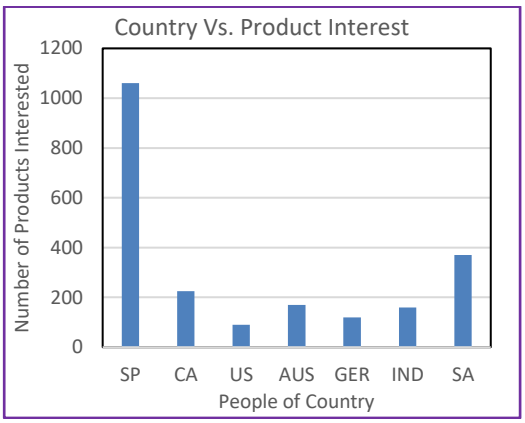

Figure 2. Number of product vs people interested

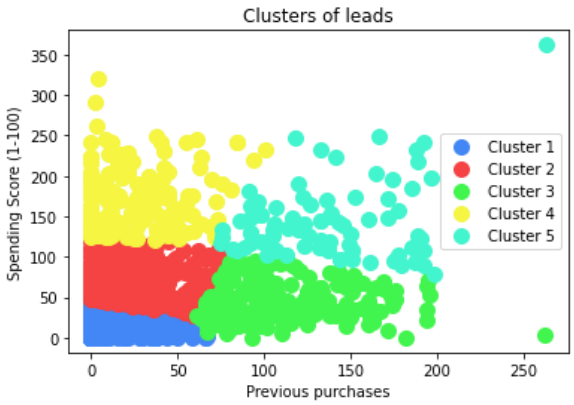

Figure 3. Clusters of spending score vs previous purchase

The Figure 4 shows the data of each country that is optimized using Firefly algorithm with the base of 10k, which is assumed to be the overall target. The data is optimized in the way to scale the promotion of the product to the given extent. Each country is scaled based on the user behavior which is observed during the trial period of the ad placement, which is published prior to the final ad placement.

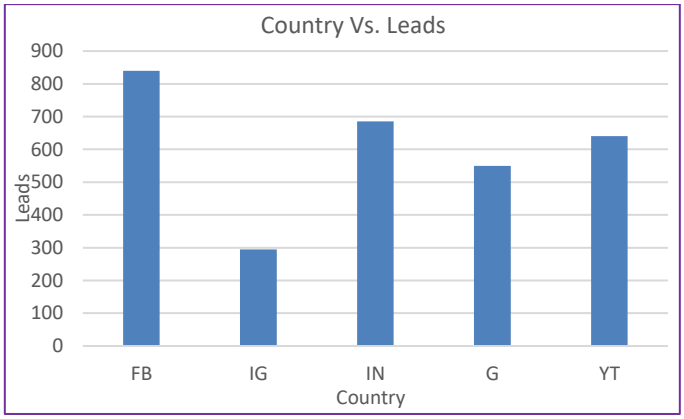

Figure 4. Optimized country data

Here Figure 5 shows the same optimization which is done to scale the product promotion to the desired level but in the means of ad placement platforms and social networks. As usual the leads that are to be generated are scaled based on the user's behavior in each platform in the trial period. This process can be done to all the parameters that are scalable and which requires huge capital.

The Figure 6 shows the data that is optimized based on the platform targeted by a single country. Here for research purposes the data is obtained from a single country. This should be done with each country to get

a precise map of the audiences who are distributed over country, platform, and other factors in which the customers are divided. The data that is optimized differs to the type of the product that is introduced. The data so far processed is applicable only for a single product and differs for other products. Thus, this whole cycle should be repeated every time a new product is introduced to the market.

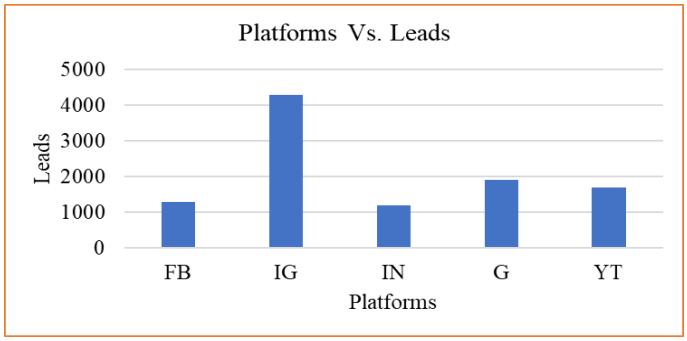

Figure 5. Optimized platform data

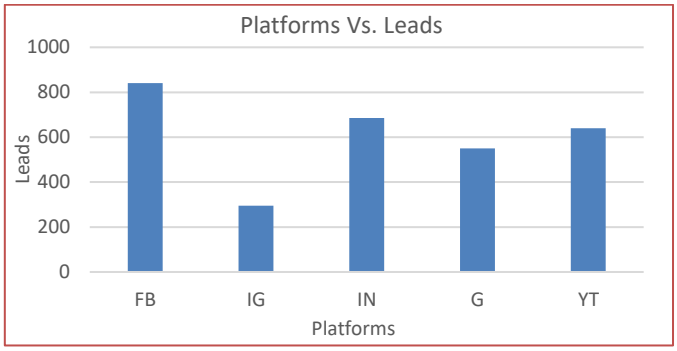

Figure 6. Data optimized based on platform in a country

4. CONCLUSION

The proposed system gives the prior information about the customers/audience for the product before going for a large-scale promotion for the product in the given market. Most of the existing techniques will provide the information about the audience and the taste of the audience with which the product is targeted. The suggested techniques act as an efficient tool to provide information about the audience or potential customers who are distributed digitally geologically and other factors which divide the people. The whole cycle of data mining and data optimization repeats for each product that is promoted. This is done to increase efficiency, since the nature and market of the product differs from product to product.

ACKNOWLEDGEMENTS

We acknowledge all the people who directly or indirectly guided us in the development of this work. All the authors contributed in the development of the work. We are grateful to family members, friends and colleagues who helped and guided us directly and indirectly for the development of this system, and preparation of this paper. Our special thanks to our employers for their support from the very beginning, that has come a long way, for the publication of this paper.

REFERENCES

[1] S. Castro, J. P. Lacap, T. M. Garbosa, E. Jimenez, and S. F. Mallari, "Philippine television network companies' corporate social responsibility engagements and electronic word-of-mouth: The intervening role of consumer-company identification," *Journal of Asia-Pacific Business*, vol. 23, no. 1, pp. 24–45, Jan. 2022, doi: 10.1080/10599231.2022.2025643.

[2] M. Dixit, "Current media practices with regard to reality shows: a critical reflection on Indian market," *Quarterly Review of Film and Video*, vol. 39, no. 1, pp. 170–189, Jan. 2022, doi: 10.1080/10509208.2020.1823185.

[3] N. Antoniades, "Political competitive advantage in the usa: an rbv approach," *Journal of Marketing Communications*, vol. 28, no. 8, pp. 889–920, Nov. 2022, doi: 10.1080/13527266.2021.1981978.
[4] V. Butkouskaya, J. Llonch-Andreu, and M. del C. Alarcón-del-Amo, "Inter-country customer-perspective analysis of strategic antecedents and consequences for post-purchase behaviour in integrated marketing communications (IMC)," *Journal of International Consumer Marketing*, vol. 33, no. 1, pp. 68–83, Jan. 2021, doi: 10.1080/08961530.2020.1731901.
[5] M. E. Hoque, N. M. H. N. Hashim, and M. A. Razzaque, "Effects of communication and financial concerns on banking attitude-behaviour relations," *Service Industries Journal*, vol. 38, no. 13–14, pp. 1017–1042, Oct. 2018, doi: 10.1080/02642069.2018.1428954.
[6] A. O'Connor and M. Shumate, "A multidimensional network approach to strategic communication," *International Journal of Strategic Communication*, vol. 12, no. 4, pp. 399–416, Aug. 2018, doi: 10.1080/1553118X.2018.1452242.
[7] W. Tafesse and P. J. Kitchen, "IMC - an integrative review," *International Journal of Advertising*, vol. 36, no. 2, pp. 210–226, Mar. 2017, doi: 10.1080/02650487.2015.1114168.
[8] S. E. Andersen and T. S. Johansen, "Cause-related marketing 2.0: connection, collaboration and commitment," *Journal of Marketing Communications*, vol. 22, no. 5, pp. 524–543, Sep. 2016, doi: 10.1080/13527266.2014.938684.
[9] B. G. Smith, "Situated ideals in strategic social media: Applying grounded practical theory in a case of successful social media management," *International Journal of Strategic Communication*, vol. 9, no. 4, pp. 272–292, Oct. 2015, doi: 10.1080/1553118X.2015.1021958.
[10] E. Uzunoğlu and B. Öksüz, "New opportunities in social media for ad-restricted alcohol products: The case of 'Yeni Raki{dotless},'" *Journal of Marketing Communications*, vol. 20, no. 4, pp. 270–290, Jul. 2014, doi: 10.1080/13527266.2012.684067.
[11] B. G. Smith and K. R. Place, "Integrating power? evaluating public relations influence in an integrated communication structure," *Journal of Public Relations Research*, vol. 25, no. 2, pp. 168–187, Apr. 2013, doi: 10.1080/1062726X.2013.758585.
[12] S. McDonald, C. J. Oates, P. J. Alevizou, C. W. Young, and K. Hwang, "Individual strategies for sustainable consumption," *Journal of Marketing Management*, vol. 28, no. 3–4, pp. 445–468, Mar. 2012, doi: 10.1080/0267257X.2012.658839.
[13] M. Šerić and I. Gil-Saura, "ICT, IMC, and brand equity in high-quality hotels of Dalmatia: An analysis from guest perceptions," *Journal of Hospitality Marketing and Management*, vol. 21, no. 8, pp. 821–851, Nov. 2012, doi: 10.1080/19368623.2012.633211.
[14] A. Mokoena, J. J. Prinsloo, R. Gawlik, and T. Pelser, "A framework for the sustainability of advertising agencies in an emerging economy: the case of South Africa," *Journal of Marketing Communications*, vol. 29, no. 1, pp. 46–66, Jan. 2023, doi: 10.1080/13527266.2021.1989613.
[15] L. Tam, A. Mehta, and H. Goodlich, "Towards greater integration in media planning: decision-making insights from public relations practitioners," *Journal of Marketing Communications*, vol. 29, no. 1, pp. 26–45, Jan. 2023, doi: 10.1080/13527266.2021.1986740.
[16] V. Butkouskaya, J. Llonch-Andreu, and M. D. C. Alarcón-Del-Amo, "Strategic antecedents and organisational consequences of IMC in different economy types," *Journal of Marketing Communications*, vol. 27, no. 2, pp. 115–136, Feb. 2021, doi: 10.1080/13527266.2019.1633551.
[17] S. Purchase and T. Volery, "Marketing innovation: a systematic review," *Journal of Marketing Management*, vol. 36, no. 9–10, pp. 763–793, Jun. 2020, doi: 10.1080/0267257X.2020.1774631.
[18] H. Lee and C.-H. Cho, "Digital advertising: present and future prospects," *International Journal of Advertising*, vol. 39, no. 3, pp. 332–341, Apr. 2020, doi: 10.1080/02650487.2019.1642015.
[19] F. Liu, A. Kanso, Y. Zhang, and D. Olaru, "Culture, perceived value, and advertising acceptance: a cross-cultural study on mobile advertising," *Journal of Promotion Management*, vol. 25, no. 7, pp. 1028–1058, 2019, doi: 10.1080/10496491.2019.1612495.
[20] A. Vollero, D. E. Schultz, and A. Siano, "IMC in digitally-empowering contexts: the emerging role of negotiated brands," *International Journal of Advertising*, vol. 38, no. 3, pp. 428–449, Apr. 2019, doi: 10.1080/02650487.2018.1535221.
[21] D. E. Schultz, M. P. Block, and V. Viswanathan, "Consumer-driven media planning and buying," *Journal of Marketing Communications*, vol. 24, no. 8, pp. 761–778, Nov. 2018, doi: 10.1080/13527266.2016.1185833.
[22] K. T. Liljedal and M. Dahlén, "Consumers' response to other consumers' participation in new product development," *Journal of Marketing Communications*, vol. 24, no. 3, pp. 217–229, Apr. 2018, doi: 10.1080/13527266.2014.995205.
[23] M. B. Oliver and E. M. Fitzgerald, "Industry and agency views of social media: Issues implementing dialogic communication," *Journal of Marketing Communications*, vol. 22, no. 4, pp. 437–454, Jul. 2016, doi: 10.1080/13527266.2014.975829.
[24] C. D. Ham and H. S. Lee, "Internet media personality: Scale development and advertising implications," *International Journal of Advertising*, vol. 34, no. 2, pp. 327–349, Mar. 2015, doi: 10.1080/02650487.2014.996195.
[25] W. Tafesse and T. Korneliussen, "Examining the effect of using multiple media tools on the marketing performance of organizations in a trade campaign environment," *Journal of Marketing Communications*, vol. 19, no. 3, pp. 215–227, Jul. 2013, doi: 10.1080/13527266.2011.619556.
[26] H. H. Chin, "Interactive digital advertising Vs. virtual brand community: exploratory study of user motivation and social media marketing responses in Taiwan," *Journal of Interactive Advertising*, vol. 12, no. 1, pp. 44–61, 2011, doi: 10.1080/15252019.2011.10722190.

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