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## ORIGINAL RESEARCH ARTICLE

# Designing an Intelligent Pattern of Digital Consumer Behavior Based on Big Data

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## ABSTRACT

This research aims to design an intelligent model of digital consumer behavior knowledge based on big data. This research was conducted using a qualitative approach. First, the qualitative method of thematic analysis was used, followed by the application of big data analysis techniques. The statistical population includes experts in the field of marketing who specialize in qualitative analysis. The sample size was determined to be 10 people using the snowball method and theoretical saturation. The data collection tool includes interviews with experts, which were analyzed using the thematic analysis technique in MAXQDA. In the following, the customer's behavioral trend has been studied based on the Big Data technique model, using the data available in the Digikala company. Coding in MATLAB is done based on specific formulas. The results showed seven components and 48 indicators that were identified and approved by experts in designing consumer behavior patterns using a digital marketing approach. These components include 1. Marketing Practices, 2- Innovation, 3- Digital marketing strategy, 4- Dynamic digital marketing, 5- Customer management, 6- Consumer cooperative behavior, and 7- Consequences of consumer response. The business management has finally decided to expand the intelligent system for consumer behavior. The main evaluation index is relatively unique and cannot effectively stimulate the acquisition of new customers. The only evaluation comes from consumers who have a recorded history of financial behavior on the digital platform. The value network model relies on digital technology because it facilitates interaction between end consumers as a relational medium. ©authors

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## Introduction

Recently, big data and data analysis have garnered significant attention in various fields, including behavioral science, finance and economics, and business (Ridzuan and Zainon, 2022). The benefits of big data analysis are not limited to a specific industry, as this analysis is considered crucial for organizations to outperform their competitors (Bozorgi & Farinoosh, 2019). The increasing interest in data-driven decision-making highlights the significance of precise and reliable forecasting (Ren, 2022).

The use of big data analysis has the ability to help organizations realize opportunities in support of sustainable development goals. It considers growth goals through a range of benefits in various business activities, including e-commerce (De Pelsmacker, Van Tilburg, and Holthof, 2018) and identifying consumer behavior (Walsh et al., 2020). The global COVID-19 pandemic has rapidly transformed e-commerce. Nowadays, the e-commerce platform has entered a rapid development stage. With the gradual expansion of the Internet market, more merchants are choosing to develop their market on online e-commerce platforms. They are willing to focus on online sales as the primary channel for product sales (Daroch, Nagraath & Gupta, 2021). Today, advanced technologies provide an opportunity for people to constantly and easily interact with others, thereby enhancing their social desirability. Consumer behavior in digital commerce refers to a range of social actions and reactions related to consumption, encompassing both economic benefits and social interaction (Krestyanpol, 2023). The literature shows that the perceived value in digital marketing is the main factor that motivates consumer behavior and influences consumers' decision to remain loyal (Poushneh & Vasquez-Parraga, 2019). The e-commerce platform itself needs to rely on consumers' purchasing habits to facilitate product delivery. E-commerce platform marketing encompasses various aspects in this field (Ramachandran & Basariya, 2020). Since it is not a face-to-face sale, the e-commerce platform should pay more

attention to the customer's needs and improve the service quality as much as possible to achieve the goal of creating a comprehensive service terminal (Kokbi, Khairi and Heydarzadeh, 2019). In this situation, consumer behavior can greatly facilitate the marketing system of the e-commerce platform in effectively attracting customers (Safavi et al., 2019).

Mainly through the use of big data platforms, user tracking, data analysis, and user purchasing behavior can be revealed. Moreover, by understanding customers' purchasing needs and promoting similar products and prices, companies can expand their market research through consumer behavior. Furthermore, it provides favorable conditions for studying consumer behavior and further promotes the growth of e-commerce platforms (Beauvisage & Mellet, 2020).

Furthermore, research conducted on consumer behavior shows that consumer response to advertisements can be influenced by factors such as information analysis, motivation, feedback, and people's perceptions of advertisements (Deilmi, Ahmadi, & Hosseini, 2021; Arbab, Hamaidi, & Gharakhani, 2020).

Current technologies and digital advancements have brought about significant transformations in the retail industry. These changes include the ability to offer immediate service to consumers, leveraging digital opportunities, establishing a network of cooperative communication between companies and consumers to better understand customer needs, predicting customer behaviors, promoting services through various platforms, and reducing costs and transportation expenses (Allahdadi, Tajzadeh Namin, Irandoost, & Sultan Panah, 2017). The changes brought about by the digital environment have altered the way consumers perceive advertisements, consequently influencing their behavior (Miller, 2015). From the beginning, numerous authors have examined how the Internet has altered the conventional parameters of user persuasion towards the message (Pintado, Sanchez, Carcelén, & Alameda, 2017). Many

businesses are also looking to develop e-commerce platforms based on e-marketing components (Foroudi, Gupta, Sivarajah, & Broderick, 2018).

This research analyzes the impact of e-commerce platforms on consumer purchase behavior from the perspective of consumer behavior. On the one hand, from the perspective of consumer behavior, it examines the role of consumer behavior in promoting the marketing system of e-commerce platforms. Moreover, in terms of the purchasing experience, it highlights the essential purchasing needs of consumers and the marketing methods used to create online marketing scenarios (Kingsnorth, 2019). It is clear that in order to have an effective marketing role, e-commerce platforms must identify consumers' purchasing needs and provide them with new purchasing experiences through price wars and opportunities for purchases.

This means that investigating the problem of digital content marketing and the factors affecting it, by determining the relevant and involved knowledge areas, is considered a research priority in order to develop the dimensions of this phenomenon (Vahabi, Rahiminik, and Heydari, 2023).

The reason why this research analyzes the impact of e-commerce platforms on sales and economic growth from the perspective of consumer behavior is because e-commerce platforms should facilitate online purchases and provide new experiences to consumers. Therefore, this research aims to identify the intelligent pattern of digital consumer behavior based on big data.

### **Literature Review**

The use of big data in customer management has proven to be highly effective and transformative in several ways (Fong et al., 2021). Firstly, big data presents challenges in processing consumer behavioral information due to its vastness and the ambiguity of information boundaries. Secondly, big data expands the scope and depth of customer management. Thirdly, big data has a significant impact on enhancing the effectiveness of customer management (Chierici, Mazzucchelli, Garcia-Perez, and

Vrontis, 2019). Lastly, big data enhances the ability to control financial risks in customer management. In summary, harnessing the power of big data can minimize the likelihood of systemic risks in customer management, while also improving the accuracy of future forecasting (Ge, Wang, Sun, Fu, & Sun, 2020).

In general, consumer behavior refers to the overall decision-making process of consumers when it comes to acquiring, consuming, and disposing of goods (Sharifipour, Bastam, Hosseinzadeh, and Pouya, 2019), as well as services, time, and opinions of various decision-making entities over a specific period of time (De Mooij, 2019).

In response to recent changes in the consumption environment, academic research has made significant advancements in the study of consumer behavior (Taghdemi, Mashbaki Esfahani, Salehi Amiri, & Navabakhsh, 2018).

This means that we conducting an in-depth study on studying the consumer decision-making process in the online channel environment (Han, 2018).

Consumer behavior does not only include the purchase of goods, but also encompasses the utilization of services, engagement in activities, and formation of opinions (Kumar & Reinartz, 2016). It is also possible that marketing strategies have the ability to convince consumers to buy the product. Marketing strategies are an important factor for the success of product sales (Sohrabi and Aghighi, 2018). Consumers are shopping online with a simple click of a button. In addition, the consumer market is undergoing significant changes as mobile phone functionalities improve (Chung, 2017). Also, the level of information provided and received in cyberspace is changing significantly. The diversity of marketing communication channels affects the decision-making process of consumers (Pihlaja, Saarijärvi, Spence, & Yrjölä, 2017). As a result, customer behavior has garnered increased attention in recent years due to its significant importance (Alomari, Maqableh, Salah, Alshaketheep, & Jay, 2020). This significantly affects the performance of a

business (Lin, Li, & Wang, 2017). Research conducted on consumer behavior shows that consumer response to advertisements can be influenced by factors such as information analysis, motivation, feedback, and people's perceptions of advertisements (Arbab, Hamaidi, & Gharakhani, 2020).

In fact, digital marketing aims to develop new and innovative strategies for selling goods and services through the Internet. Therefore, with the development of the Internet, it is expected that a new era in marketing attitudes will be created (Salehin, Talha, Hasan, Dip, Saifuzzaman, & Moon, 2020). In this way, marketing activities will be presented in innovative formats for the media. In addition, the ease and speed of accessing information and processing on the Internet allow sellers to organize their products according to individual customer demand. Furthermore, the ability to adapt to changing customer preferences opens up the possibility of offering packaged products (Hasan, Popp, & Oláh, 2020). Companies and factories have adopted e-business plans to improve the management of their internal business processes and to facilitate communication with the external environment. This necessitates a thorough theoretical examination of e-business. The internet has brought geographically dispersed buyers and sellers closer together, significantly increasing market potential. Automated interactions have also become increasingly important. The digital revolution has compelled numerous traditional businesses to transform into modern and digital enterprises (Sharma & Aggarwal, 2019).

It is not easy to fully promote the utilization of big data in making digital business decisions. In reality, there are many shortcomings, such as outdated concepts among business managers, inhibition of innovation, poor internal information sharing, limited financial risk awareness, inadequate control ability, and insufficient control ability among financial information technology staff. For example, the business site Alibaba has described the information resources brought by the big data domain as another factor in the field of customer, innovation, and capitalism.

They have launched a cloud computing platform called "Ali Cloud" to build a cloud computing platform. » Provides essential technical support for constructing a customer-centric big data industrial chain (Shaw et al., 2021). Big data brings valuable information resources in consumer management and has become a crucial asset for companies to seize business opportunities, expand markets, cut costs, boost revenue, and innovate business models. (Ahmad & Zhang, 2020). The effective use of traditional data management and data analysis methods can be challenging (Vaziri, Gohar, & Abdul Hosseini, 2018) and may result in the failure to recognize the value of information and make it harder to record and utilize information.

In addition, traditional decision-making based on experience will become precedent, and the impact of decision-making will vary due to the varying levels of difficulty in obtaining market information through specific information channels (Church et al., 2019).

At present, the financial decision system is only used in large Internet companies.

Although most companies have realized that online data mining analysis is the future trend (Moon et al., 2021), they are still in a wait-and-see state and have not recognized the necessity of applying big data for their business growth. still in a wait-and-see state and have not recognized the necessity of applying big data in their business growth. are

In this perspective, the challenges associated with managing consumer behavior should be examined as a framework for designing e-commerce maps using big data. Based on the presented materials, the objectives of the research are as follows:

Identification of Factors Affecting the Knowledge Pattern of Digital Consumer Behavior Based on Big Data

Designing a knowledge model of digital consumer behavior based on big data.

### **Research Method**

This research was conducted using a qualitative approach. In the first step, the qualitative method of thematic analysis is used, and in the second step, the big data analysis technique is employed. The

population studied in the qualitative analysis included experts in the field of marketing. The sample size was determined using the snowball method and theoretical saturation, consisting of 10 people. The data collection tool includes interviews conducted by experts using a thematic analysis technique. MAXQDA software was used to analyze the data. In the following analysis, the customer's behavioral trend has been investigated based on the data available from Digikala Internet company, using the Big Data technique. Coding in MATLAB software is based on specific formulas.

**Findings**

1- Open coding (initial): In data-oriented theorizing, open coding is an analytical process during which concepts are identified and expanded based on their characteristics and dimensions. After the open coding stage, primary indicators were extracted. In this step, 53 primary indicators were extracted.

2- Axial coding: The basis of classification in axial coding is the examination of previous

studies, along with a comprehensive understanding and knowledge of the subject. It requires theoretical expertise in the subject being studied and the ability to gain insights to identify common indicators related to a specific axis. In this step, seven components were identified. These components include marketing methods. 2- Innovation, 3- Digital marketing strategy, 4- Dynamic digital marketing, 5- Customer management, 6- Consumer cooperative behavior, and 7- Consequences of consumer response.

3- Selective coding: Finally, to demonstrate the relationships between the identified concepts and components, selective coding was performed. This is illustrated in Figure 3, which displays the output of MAXQDA18 software during the selective coding process. In Table 1, the specified codes were extracted. The Kappa index obtained for the validity of the analysis was 0.936. Therefore, the codes were approved.

**Table 1. Extractive codes in qualitative analysis**

Optional code	Axial code	Open coding	Weight
Consumer behavior with digital marketing approach	Marketing practices	Use of special messages	1
		Provide discount codes	1
		Recommending the brand to friends and word-of-mouth advertising	3
		Social media and creating customer advertising channels	3
		Email marketing	1
		Mobile SMS	2
		Traditional marketing such as TV advertising	1
	Innovation	Product innovation	4
		Use of innovation networks	1
		Process innovation	1
		Innovation in the service process	2
		Innovation in advertising	3
		Innovation in marketing	1
		Innovation in interaction and communication with customers	1
	Digital marketing strategy	A marketing plan suitable for the company's goals	1
		Strategy to reach and reach the target customer	1
		Strategy to communicate and interact with customers	2
		A strategy to engage customers by increasing awareness	2
		Strategy in order to identify the daily needs of customers	1
		Advertising content strategy to introduce products and services	2
		Customer-oriented and market-oriented strategy	1

	Dynamic digital marketing	Elements of dynamic marketing	1
		Continuous and dynamic financial support	1
		Dynamic life cycle in the organization	3
		Dynamics of target customers	2
		Dynamic and effective human resources in the organization	2
		Non-human resources of a dynamic organization	1
		Positive dynamics of economy and import and export	2
		Dynamic competitive environment	2
	Customer management	Customer time management	3
		Management of timely communication with customers	4
		Cost management for marketing and advertising	1
		Management of production of products based on needs	2
		Human resource management in customer interaction	2
		Management of distribution channels	1
	Participatory consumer behavior	Management of service channels	2
		Motivating and using people's opinions and ideas	1
		Social identity of the consumer	2
		Consumer social influence	2
		Value that is perceived by customers	2
	Consequences of consumer response	Social reactions	1
		Increasing the willingness of consumers to buy	1
		Brand preference	1
		customer commitment	3
		Diversity in customer and target market	1
		Creating special brand value for customers	1
		Increasing individual awareness and knowledge of the brand	3
	Social participation of people in the brand	1	

According to the concepts and categories, the theoretical model is as follows:

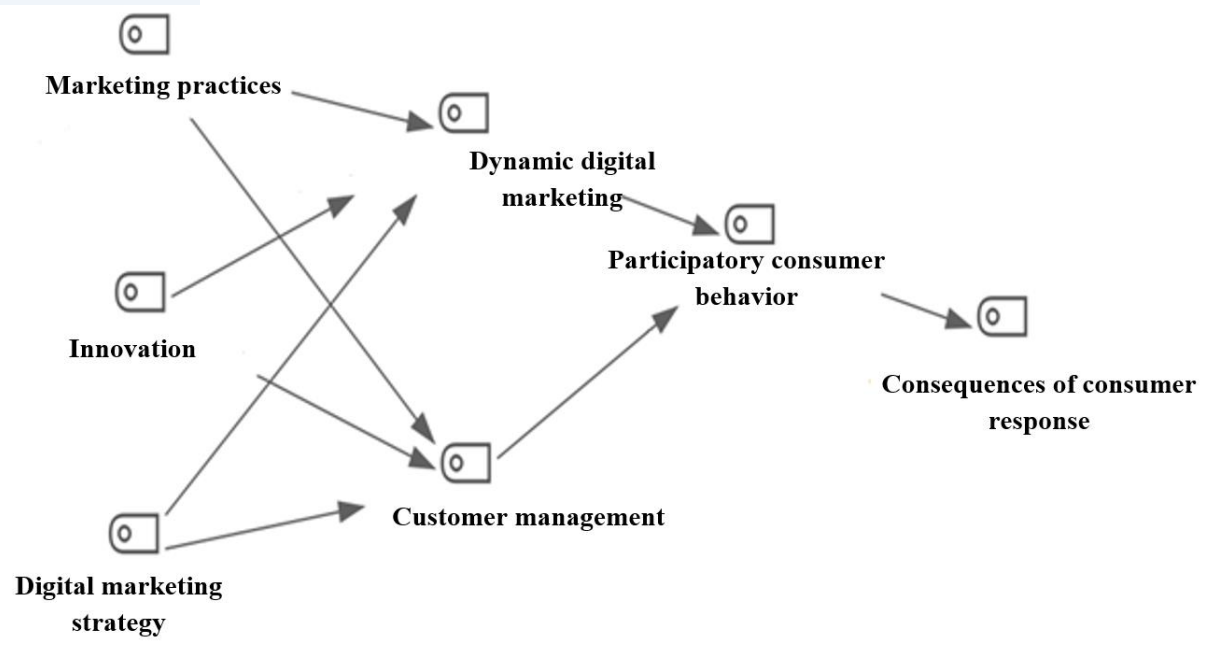


Figure 1. Research conceptual model (source: research findings) in MAXQDA18 software

At present, most customer management information systems play an important role in economic growth but have poor performance. In the customer management and operations process, financial functions are not utilized, and customer behavior accounting systems are not systematically employed. Based on Formula 1, the sharing of economic data and consumer behavior can be achieved.

$$\begin{aligned}
 & tab_M: \text{financial data} \\
 & tab_R: \text{consumer behavior data} \\
 (1) \quad & tab = tab_M \cap tab_R (\setminus) \\
 & \rho = \lim_{\Delta X \rightarrow 0} \frac{f(x - \Delta x) - f(x)}{M(X) + \Delta x}
 \end{aligned}$$

The data sharing platform includes various components such as data access, cleaning, transformation, and loading. Data access involves retrieving data from different storage media and identifying data in various formats. Data cleaning focuses on tasks such as data validation, filtering, consistency comparison, removal of outliers, incomplete data, and error rejection. Data integration and transformation involve activities like data transformation mapping, data partitioning, integration, finding dictionary table relationships, standardization processing, and error exception handling. Lastly, data loading refers to the process of loading data into the target repository while ensuring the accuracy and reliability of the data. After these four stages of data processing, a consumer behavior data warehouse is finally formed. This warehouse includes various internal data marts that are based on milestone identification.

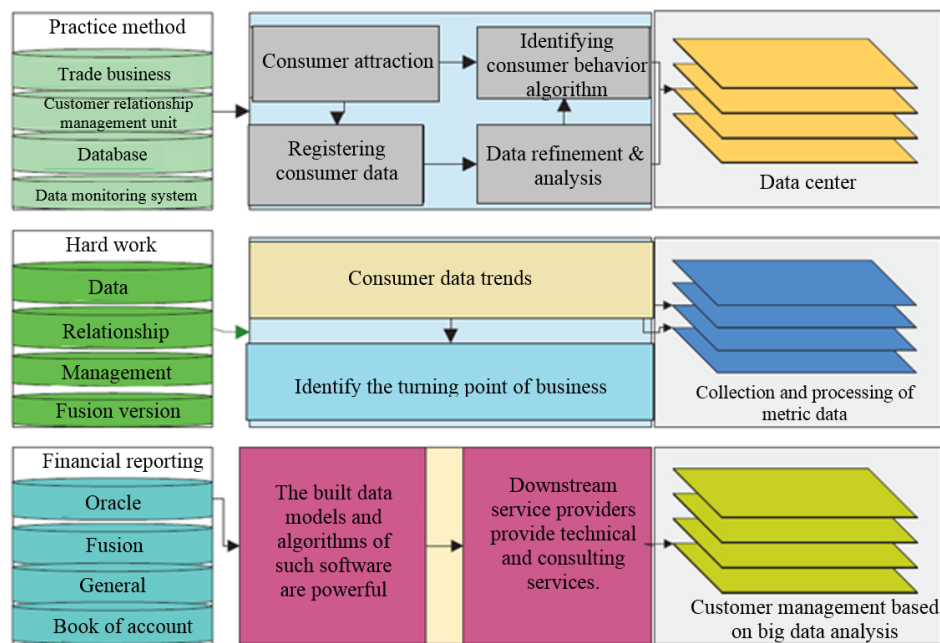
This data warehouse is based on data layer and data processing layer technologies, which are directly formed by the business decision analysis portal. Accordingly, data indicators are added layer by layer to partially extract information, stimulate human intelligence, and facilitate coherent and effective thinking and judgment in the analysis portal. This can be done through the use of charts, tables, text, dashboards, and pointers that are interconnected. Group management data is visualized to comprehensively define and

visualize integrated enterprise performance assessment, pre-predictive management process control plan, mid-event control, and post-event analysis.

Problems in organizational operations are revealed during the initial assessment. Comprehensive real-time interactive risk control and management are achieved through intelligent risk identification, reporting, and executive feedback. Formula 2 expresses the level of risk reduction in the intelligent business management system that is based on consumer behavior.

$$\begin{aligned}
 (2) \quad & Y = \sum_{ij=1}^m \frac{n_{ij} + n_{ijmin}}{n_{ijmax} - n_{ij}} W_{ij} \\
 & \overline{ML} = \sum_0^n m^n l^2 \\
 (3) \quad & M^* = argmax_{x \in \Omega_x} \{sup |b(x^3) + W^T S(x^2)|\} \\
 & M(x) = \omega_2 \sigma^2(\omega_1 x_1), \\
 & J = M(x^2, \{\omega_i^2\}) - x
 \end{aligned}$$

The main goal is to analyze consumer behavioral issues in current business management from various aspects that help companies make effective and scientific development decisions to increase profitability. The key point of big data analysis based on the above factors is the type of software that solves the main business processes of the business, which is first implemented in the production sector and then gradually implemented in other business sectors. According to the summary of the collected data, the practical method of identifying consumer behavior after a long period of development and progress, the algorithms and internal data models of such software are hard and powerful modules with a detailed structure and process transformation. In addition, most downstream service providers can provide consulting and technical services due to their long setup time. This software model has its own characteristics according to different market segments; It usually applies only to a few specific industries, a specific scale of companies, or a specific business model of companies, and cannot provide full industry coverage, as seen in Figure 1.



**Figure 2.** Intelligent model of digital consumer behavior based on big data (research findings)

An intelligent business system based on consumer behavior is a system that combines artificial intelligence and financial management. This system can be an extension of the customer management information development system. In-depth analysis and comparison of the effects guided by problem-solving in management show that the utilization of big data in business decision-making, specifically based on consumer behavior, plays a crucial role in enhancing organizational productivity, minimizing costs, and strengthening the core advantages of companies. The intelligent business system can connect the company's business activities with its sales and marketing activities. An intelligent financial system can also control every link in real time, enabling internal managers and stakeholders to make more rational and efficient decisions. Additionally, the system provides a more intuitive data display. Companies pay more attention to internal control in order to significantly reduce business risk and customer churn. But excessive emphasis on accuracy in internal control can often result in the repetitive approval of issues related to production, payment, ordering, contracts, and support.

### Discussion

In this research, experts identified and approved 7 components and 48 indicators to design a consumer behavior model with a digital marketing approach, based on the

foundation's data theory method. The process of customer retention, which is based on the identification of consumer behavior, can be enhanced through the utilization of smart finance. This, in turn, improves the effectiveness of business management.

In this research, the model suggests that marketing methods, innovation, and digital marketing strategy are effective causal factors that can influence dynamic digital marketing and customer management, ultimately impacting consumer cooperative behavior. The results also showed that consumer cooperative behavior and customer involvement play a significant role in influencing consumer response and willingness to make a purchase.

Revised 2: Regarding the indicators obtained in this research, based on the weight obtained in the three steps of Delphi, the following indicators were identified: recommending the brand to friends and word-of-mouth advertising, utilizing social media and creating customer advertising channels, implementing mobile SMS, fostering product innovation, improving service delivery process, enhancing advertising strategies, developing strategies to communicate and interact with customers, engaging customers by increasing awareness, implementing advertising content strategies to introduce products and services, incorporating dynamic life cycle in the organization, considering dynamics of target customers, ensuring

effective human resources management in the organization, recognizing positive dynamics of the economy and import/export, adapting to dynamic competitive environment, managing customer relationships effectively, maintaining timely communication with customers, aligning production of products with customer needs, managing human resources in interaction with customers, optimizing service channels, considering social identity of the consumer, acknowledging social influence of the consumer, and assessing perceived value by the consumer.

### Conclusion

It is difficult to accept the intelligent management model of consumer behavior in e-commerce. In addition, the financial and behavioral data-sharing service center is in the early stages of formation and is currently in the pilot operation phase. Therefore, the business management has finally decided to expand the intelligent system for consumer behavior. The main evaluation index is relatively unique and cannot effectively stimulate the acquisition of new customers. Currently, the only evaluation comes from consumers who have a history of financial behavior and have registered on the digital platform. The Center for Financial and Behavioral Shared Services focuses on data analysis. Finally, another customer performance evaluation system explains that business milestones can be identified by analyzing customer behavior through a linear production process (Cuong, 2019). The value network model relies on digital technology because it facilitates interaction between end consumers as a relational medium. Based on the obtained results, it is suggested that:

1- When it comes to identifying consumer behavior, it is recommended to employ various methods such as using targeted messages, offering discount codes, encouraging word-of-mouth advertising and brand recommendations to friends, utilizing social media platforms, creating customer advertising channels, employing email marketing and mobile SMS, as well as traditional marketing channels like TV ads.

These strategies aim to enhance the desirability of consumer response.

2- Consumer behavior is influenced by intelligent innovation, which is achieved through product innovation, the utilization of innovation networks, improvements in the service process, innovative advertising and marketing strategies, and effective interaction and communication with customers. It is important to consider the desirability of the consumer's response.

Based on the digital marketing strategy, it is suggested to develop a marketing plan that aligns with the company's goals. The strategy should focus on reaching the target customers through effective communication and interaction. Additionally, it should include strategies to engage customers and increase brand awareness. By utilizing strategic approaches to identify the daily needs of customers and developing advertising content to introduce products and services, digital marketing effectively addresses the crucial issue of customer-oriented and market-oriented actions.

4- To leverage dynamic digital marketing, it is recommended to consistently and proactively utilize dynamic marketing elements and financial support. This should be done by incorporating the dynamic life cycle of the organization and the preferences of the target customers. Additionally, it is important to employ dynamic and efficient human resources within the organization, as well as non-human resources that align with the dynamic nature of the organization. By capitalizing on the positive dynamics of the economy, import and export, and the competitive environment, a dynamic organization can effectively address the challenges and opportunities of digital marketing.

5- It is suggested to effectively manage customer time and ensure timely communication with customers. This includes cost management for marketing and advertising, product production management based on customer needs, as well as human resource management for customer interaction and distribution channel management. And service channels should be

established to effectively manage customer interactions and meet consumer expectations.

Based on consumers' cooperative behavior, it is suggested to motivate and utilize people's opinions and ideas, while also considering their social identity. This can be achieved by taking into account the consumer's social influence, the value perceived by customers, and the social reactions to cooperative behavior. Consumers should pay based on the desirability of their response.

Based on the consumer's response, it is suggested to increase consumers' willingness to buy and preference for the brand. This can be achieved by enhancing customer loyalty and diversifying the customer and target market. Creating a unique brand value for customers and increasing individual awareness and knowledge of the brand are also important. Additionally, fostering social participation in the brand and ensuring the desirability of the consumer's response should be prioritized.

#### Declaration of Competing Interest

The author declares that he has no competing financial interests or known personal relationships that would influence the report presented in this article.

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