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Innovative Cryptocurrency Trade Websites' Marketing Strategy Refinement, via Digital Behavior

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ABSTRACT Nowadays, the cryptocurrency market is thriving, through the rise in cryptocurrency trading, opening the way for cryptocurrency trading websites' optimization. Optimization of customer satisfaction is a vital part of cryptocurrency trade organizations' digital marketing problems. It is vital to keep digital advertisement costs low while driving more traffic to a website. This study aims to define a digital marketing strategy for cryptocurrency trading websites by utilizing digital behavior metrics. Web analytics data were gathered from 10 world-leading cryptocurrency trade websites over 80 days. Statistical analysis of cryptocurrency trade web analytics, Fuzzy Cognitive Mapping modeling, and Agent-Based Model development have been deployed. Enhancement of cryptocurrency trade digital engagement levels can boost organizations' SEO and SEM strategy campaigns. Outputs of the study provide a handful of insights regarding cryptocurrency trading websites' digital promotion strategy optimization and the parameters of digital behavior mostly connected with websites' digital marketing costs and traffic. Cryptocurrency trade organizations should utilize both organic and paid campaigns, observe regularly their website KPIs connected with visitors' behavior and enhance their website users' experience, by increasing their engagement.

INDEX TERMS Strategic digital marketing, digital behavior, innovation, decentralized payment networks, big data, e-commerce, decision support systems.

I. INTRODUCTION

Investors purchase currency with the idea of reselling it for a higher profit [1]. Cryptocurrencies have also been formed and largely accepted as a new electronic alternative trade payment system, with significant consequences for developing countries and the global market in general [2]. Cryptocurrencies have entered nearly all financial activities, and as a consequence, cryptocurrency trading is often regarded among the most popular and intriguing types of successful investments. The virtual currency has a lot of favorable characteristics that engage an increasing variety of different sorts of consumers that utilize a particular technology for their specialized reasons [3].

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With the development of blockchain technology, such currencies are used for a variety of reasons [4], including the mechanism of paying various users [5]. Traders are determined to engage in the cryptocurrency market relying on their predictions for the currency's value in the future.

The advancement of cryptocurrency and blockchain technologies provided transaction anonymity by combining cryptocurrency money to disguise the route back to the asset's primary source [6]. Consumers can benefit from the flexible payment deadline, while sellers can receive revenue sooner to preserve a better liquidity position owing to upfront payment [7].

Cryptocurrencies have been used to provide a payment alternate solution to credit and debit cards or PayPal for e-commerce and multinational transactions [8]. Furthermore, this is being incorporated in financial organizations and many other industries, with applications that range from facilitating

and improving efficiency trade finance to monitoring seller engagement, etc. [9], [10].

Cryptocurrencies, that emerged from the blockchain movement, are a comparatively fresh payment alternative that gives organizations' websites a strategic advantage [11]. Organization marketers and strategists may employ a range of methodologies to boost digital users' engagement [12], as well as organizations' brand name or profitability [13]. It should be mentioned that electronic payment options that are offered by websites to their users, tend to enhance overall their value [14].

Regarding the research's purpose, it should be mentioned that organizations possess efficient tools for enhancing their digital marketing strategies, such as paid and organic traffic campaigns. This study analyzes the innovative potential of refining and predicting cryptocurrency trade organizations' organic and paid traffic campaigns, based on their website users' engagement metrics.

II. THEORETICAL BACKGROUND

The broad adoption of cryptocurrencies as a payment alternative can benefit entrepreneurship and startup businesses since decentralized payment networks (cryptocurrencies) enable a form of payment with less taxation. In this way, organizations and enterprises seeking to optimize their monetary transactions, via taxation reduction, could turn to cryptocurrencies.

Each individual entering a website, leaves a trace of their digital characteristics, meaning that, through websites visitors' engagement metrics. Once visitors enter a website, information regarding on-site behavioral stats, e.g., average time of remaining on websites, average pages seen per visit, etc. This information concerns the behavior displayed by website users, often called digital behavior.

A. LITERATURE REVIEW

Applications of blockchain technology are carried out in many markets and sectors and expanding. Blockchain usage has been marked as highly important for information systems' infiltration into various domains, like cybersecurity [15]. Batta *et al.* [16] highlighted the potential benefits for the logistics sector from the blockchain technology adoption, despite the exploration phase of its implementation. Although many industries, like insurance, have been preparing to adapt to emerging technologies and blockchain applications, the adoption of academic consulting research could provide further aid in this way [17].

In the same context, Grover *et al.* [18] discerned the stages of blockchain diffusion among various markets, like finance and insurance, while evidence of the technology's utilization and knowledge in other sectors like digital marketing is limited. Jain *et al.* [19], indicated that exploration of blockchain connection with marketing and data analytics sectors is diminutive and went on to suggest significant aspects of future research in blockchain, digital marketing, and analytic data. Furthermore, by harvesting big data analytics, Tandon *et al.* [20] could predict with great accuracy

the impact of social media messages on cryptocurrencies' value.

This constitutes an application of data analytics in blockchain derivatives, similar to the research approach of this paper. The references of the recent blockchain research and customers' behavior and data analytics over digital marketing applications are limited. More relative topics could emerge and cover the literature part of digital marketing in blockchain applications, instead of blockchain applications in marketing.

B. INNOVATIVE STRATEGIC CRYPTOCURRENCY TRADE WEBSITE ORGANIC TRAFFIC VS PAID TRAFFIC, CAMPAIGNS

1) DIGITAL PROMOTION OF CRYPTOCURRENCY TRADE WEBSITE CAMPAIGNS

A major issue that should be properly examined in the upcoming years is the use of cryptocurrency data, such as website visitor analytic metrics, financial and strategic trading metrics, etc. [21]. Any innovative network for the concept is closely related and production considering the user's cryptocurrency demands would assist in cryptocurrency trading, depending on customer behavior [22].

Marketing strategists use digital technology to provide a variety of advertisements for attracting consumers' interests and enhancing client loyalty [23], [24]. Such a strategy can be achieved through utilizing web analytics [25]. Thus, organizations could benefit from analyzing users' digital behavior to refine their organic and paid campaigns.

2) WEB ANALYTICS IMPORTANCE IN ORGANIC VS PAID TRAFFIC

Throughout mapping analysis concepts [26], it is discovered that behavioral intention, is amongst the most dominating endogenous elements in engagement research [27]. Users perceive cryptocurrency adoption as a valuable innovation that has a considerable effect on their lives, with multiple advantages, e.g., practicality, and time-saving reliability. Consumers also genuinely think that cryptocurrency adoption is much more precious than the amount paid for such innovation [28].

All the above lead to rising numbers of potential cryptocurrency users landing on trading websites for acquiring and trading cryptocurrencies. In this way, cryptocurrency trade organizations face an increase in their paid and organic website traffic.

C. CRYPTOCURRENCY PAYMENT AND DECENTRALIZED SYSTEMS

1) BLOCKCHAIN TECHNOLOGY'S INNOVATIVE IMPLEMENTATION

It is obvious that all types of innovation have a favorable impact on the general profitability of businesses and consequently economies. Innovation is an essential component of commerce and may be viewed as a tool used by entrepreneurs

to obtain a competitive advantage [29]. Distributed ledger technology, makes sure that the data is securely handled in decentralized databases. This gets rid of the middlemen and the inability to control [30].

Blockchain technology generates credibility and has the power to change many industries, including payment network organizations [31], electronic payments [32], government services [33], brand image management systems [34], and security service providers [35]. Payments are allowed to be made without the participation of a third-party provider, such as can be a bank or PayPal [36].

2) CRYPTOCURRENCY TRADE DIGITAL BEHAVIOR, ORGANIC CAMPAIGNS, AND PAID CAMPAIGNS KPIS

Emphasis has been given to the regularity of updating the data collection rate from online trading platforms and other traffic sources [37]. Accordingly, the use of blockchain innovation to optimize digital marketing and advertising has inadvertently boosted customer privacy [38].

Innovations, like those of cryptocurrencies, may have lasting potential, especially when fostering a speedier, more private, and more effective payment system [39]. Therefore, the approach to cryptocurrencies should reckon them as technological platforms rather than as financial tools [40], multiple implementations, e.g., payments, smart contracts, etc.

Search engines handle the vast bulk of website traffic and determine the performance of digital marketing campaigns [41]. Cryptocurrency trade organizations are in an advantageous position to exploit their website visitors' analytics to assess and evaluate the efficiency of organic and paid traffic campaigns.

D. RESEARCH APPROACH AND HYPOTHESES

Throughout the literature review cited above, the need for further study on the connection between cryptocurrency users and digital marketing campaigns is accrued. Organizations offering cryptocurrency trading services experience a growing influx of visitors to their websites. This research aims to estimate the effect of website users' digital behavior on organic and paid campaigns of cryptocurrency trade organizations. Furthermore, the contribution of each campaign to organizations' brand name efficiency is estimated.

For cryptocurrency trade organizations to assess their campaigns' performance through website digital behavior, can account for improved website visibility, traffic engrossment, and campaign cost reduction. Organic and paid traffic campaigns' determinant variables are organic/paid traffic, keywords, and costs, as for visibility, the global rank metric was summoned (Table 1). Expressly, publication of this research could participate in the enhancement of:

- Cryptocurrency trade organizations traffic strategy, so as managers to consider users' behavior for website traffic maximization and costs limitation.
- Website optimization in terms of user-friendliness and engagement, for programmers to deploy improved website layouts.

Therefore, for better comprehension of the examined cryptocurrency trade web metrics relationship, the authors adduce the paper's 5 hypotheses, as observed below:

Hypothesis 1 (H1): *Cryptocurrency Trade website Organic Campaigns get significantly affected by Digital Behavior.*

Throughout the first research hypothesis, the paper's main goal is to investigate whether organic traffic and keywords metrics of cryptocurrency trade websites can be accurately explained by web users' engagement metrics. The authors needed to observe the significance of organic traffic and keywords' variation from all involved digital behavior metrics, to flag the importance of analyzing user on-site behavior.

Hypothesis 2 (H2): *Digital Behavior has a significant effect on Cryptocurrency Trade website Paid Campaigns.*

Interpreting cryptocurrency trade website paid traffic and keywords fluctuation, through the engagement metrics of web users, could potentially point to the metrics that imply a significant impact on paid traffic and keywords and aid their prediction process.

Hypothesis 3 (H3): *The impact of Digital Behavior on Cryptocurrency Trade website Organic Traffic Cost vs. Paid Traffic Cost is significant.*

After having elaborated on the effect of digital behavior on organic and paid traffic and keywords, the authors proceed to examine how organic and traffic costs react to user engagement's influence and if this effect is significant enough. If significant, this effect could provide a handful of intelligence for predicting cryptocurrency trade organizations' traffic costs by analyzing digital behavior metrics.

Hypothesis 4 (H4): *Cryptocurrency Trade website Global Rank metric get significantly affected by Organic Campaigns vs. Paid Campaigns metrics individually.*

The fourth hypothesis, emphasizes measuring the importance of each traffic campaign's (organic or paid) impact on cryptocurrency trade websites' global rank. Traffic campaigns consist of traffic, keywords, and cost metrics. Therefore, the authors are keen to observe whether the implementation of either campaign could affect significantly cryptocurrency trade websites' global rank and assess their attribution.

Hypothesis 5 (H5): *The combination of Organic and Paid Campaigns has a significant effect on the Cryptocurrency Trade website's Global Rank metric.*

Reaching the last hypothesis, and by Hypothesis 4, the authors seek now to test if the combined implementation of organic and paid traffic campaigns could pose significant variation to cryptocurrency trade websites' global rank. In this phase, the results should be juxtaposed to the previous research hypothesis and give valuable insights, regarding traffic campaign rendition in terms of website global rank enhancement. Research hypotheses convocation is pictured in Figure 1.

TABLE 1. Description of the examined web metrics.

Web Analytics/KPIs	Description of the WA/KPIs
Global (Web) Rank	The overall appeal of a website is defined by popularity rating order, where the smaller numbers indicate higher popularity and visibility [42].
Organic Traffic	Such indicator provides measurable evidence that organizations' work is yielding additional visits and conversions [43].
Organic Keywords	Organic keywords are free to target vs paid keywords that cost money to rank for in the search engines [44].
Organic Traffic Cost	Organizations need ongoing investment in their organic traffic results (SEO) to achieve and maintain desired results [45].
Paid Traffic	Paid traffic indicates the estimated cost of paid search traffic from all the keywords an organization's website ranks for via pay-per-click (PPC) [46].
Paid Keywords	Paid keywords are keywords, for which organizations paid a fee for each click, to appear in their sponsored action for keywords related to their website [46].
Paid Traffic Cost	Refers to the monetary cost required to perform paid traffic campaigns, through paying for paid ads or pay-per-click (PPC) traffic [46].
Digital Behavior metrics	They refer mostly to website bounce rate, average time on site, average pages per user, unique visitors, and returning visitors [47].

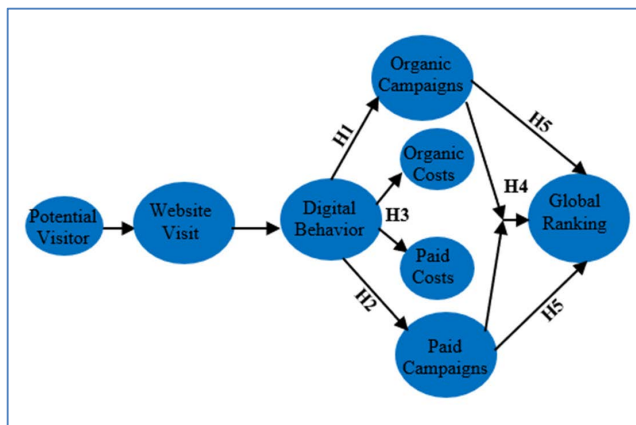


FIGURE 1. Conceptual framework for cryptocurrency trade websites.

III. METHODOLOGICAL FRAMEWORK

During this paper, the need to produce and propose a methodological context for digital behavior on cryptocurrency trade organizations' marketing strategy refinement, is crucial. To acquire such knowledge, the collection of data from cryptocurrency trade websites should be implemented, by utilizing information systems and platforms.

Throughout this process, the most significant results should be a handful for acquiring intelligence regarding cryptocurrency trade websites' promotion strategy. Paper's first stage, correlation, and linear regression analysis take place for tracking the most important coefficients. In the second stage of the proposed methodology, a diagnostic model is being developed, for satisfying the exploration of selected metrics' relationships.

To do so, web metrics should be accurately lined up with the paper's desirable KPIs. In the final stage of the

methodological context, the authors aim to perform simulations and predictions of cryptocurrency trade websites' paid and organic campaign courses through specific periods.

A. DATA PROVENANCE

Reaching the data provenance and retrieval section of the paper, the observation and selection of the data took place. The focus of the study turns to cryptocurrency trade organizations and their websites' analytic data. Each time visitors enter a website; they leave a behavioral trace. Authors emphasized collecting website analytic data, that indicate digital behavior.

The key argument for selecting and examining web analytics is their capacity to calculate large volumes of data. The websites of interest were selected based on visitors' preferences and usage rates [48]. In more detail, the authors examined the following 10 cryptocurrency trade and exchange websites: Binance [49], Coinbase [50], Crypto [51], Kraken [52], Gemini [53], Gate.io [54], KuCoin [55], Bitstamp [56], Bittrex [57], and BitFlyer [58].

Data originated from the above websites refer to daily website analytics insights, during 180 days. Collection of the dataset needed was held via utilizing a website-based Decision Support System (DSS). The total amount of gathered data is numbered up to 3,000,000 behavioral values of specific metrics. Starting date of data observation and collection was set for the 1st of December 2020 and the completion date was the 31st of May 2021.

B. DATA EXTRACTION

After specifying the cryptocurrency trading websites of the research's sample, the process of data extraction should be analyzed. The sample of 3,000,000 analytic metrics, from

the above websites, were extracted by using a well-known platform-based information system, which requires monthly or yearly subscriptions. The utilized DSS is the Semrush platform [59], where the authors put into examination the 10 cryptocurrency trading websites for 6 months. Through this process, the extraction of the referred vast dataset was enabled, into an editable format, easing the statistical analysis that follows.

C. DATA PROCESS

The paper's methodological context implicates three stages of data processing, starting with the correlation and linear regression analysis. The extracted dataset underwent extensive statistical elaboration, as the necessary correlations and linear regression coefficients were derived. In the next phase, the most significant data correlations are imported to the developed exploratory model, based on the platform application of Fuzzy Cognitive Mapping (FCM), called Mental Modeler [60]. The whole process has been deployed for the depiction of the research's macro-level analysis [61].

The third and final stage of the framework concerns the development of a Hybrid Modeling (HM), consisting of both Agent-Based (ABM) and Dynamic Modeling (DM) processes. Through the HM the research's simulation can be accomplished by applying micro-level analysis [62]. In particular, the created model is performed in 180 simulation days, seeking to estimate the course of cryptocurrency trade organizations' organic and paid campaigns and their global ranking. The model's execution was based on the following specifications:

- Type of data: numerical data deduced by regression coefficients, correlations, and descriptive statistics, that were inserted into Hybrid Model's agent movement and dynamic variables connections.
- Repetition of data measurement: usage of a one-time snapshot of data was required, combined with real-time digital behavioral data, to present a dynamic outcome of the simulation.
- Agents and Dynamic Variables involvement: application of regression coefficients and descriptive statistics to model agents individually provokes their unique movement in every routine. The application of descriptive statistics to the dynamic variables triggers the connection among them. For some dynamic variables, the Normal distribution was utilized to replicate real-time scenarios. Throughout the model's operation, agents' movements impact dynamic variables' interaction, based on the regressions' coefficients.

IV. RESULTS

Section 4 of the present paper, deals with the regression and descriptive statistics that emerge from collected data analysis, from the cryptocurrency trade websites. In Table 2 the results of Cronbach's Alpha [63] and KMO [64] stats are shown, which indicate that results near 0.7 and above make for appropriate data and variables for further statistical and

regression analysis. In this case, the tests show that digital behavior variables are suitable, valid, and coherent for further analysis, due to their values being close enough to 0.7 levels.

TABLE 2. Internal consistency of cryptocurrency trade digital behavior.

	Cronbach's Alpha	Kaiser-Meyer-Olkin Factor Adequacy	% of Total Variance Explained
Digital Behavior metrics	0.689	0.529	90.554

Next, in Tables 3 to 6, the authors get the linear regressions of cryptocurrency trade websites' organic traffic, keywords, and paid traffic and keywords with the digital behavior metrics of bounce rate, average pages/visit, average time on site, unique, and returning visitors. All 4 regressions have significant levels of *p-values*, below 0.01, with $R^2 = 1.00$ and all engagement metrics appear to have a significant effect on each regression model with a *p-level* = 0.000. With every 1% increase in bounce rate, organic traffic rises by 8.4%, organic keywords lower by 115.5%, paid traffic increases by 242.1%, and paid keywords increase by 482.1%. Average pages per visit 1% increase can lead to organic traffic reduction by 33.1% and organic keywords by 148.6%, paid traffic increase by 183.3%, and paid keywords by 597.9%. Increased average time on site by 1% increases organic traffic by 42.6% and organic keywords by 50.8%, paid traffic decreases by 70.5% and paid keywords by 260.2%. A rise of 1% in unique visitors causes organic traffic to rise by 215.7% and organic keywords by 303.3% and paid traffic and keywords to decrease by 585.3% and 1659.2% respectively. At last, an increase of 1% in returning visitors provokes a decrease of 122.8% in organic traffic and 174.4% in organic keywords, and a rise of 620.2% and 1629.5% in paid traffic and keywords accordingly. Through the above, the authors can verify research Hypotheses 1 and 2, since all digital behavior metrics (bounce rate, average pages/visit, average time on site, unique and returning visitors) cause a significant effect on organic traffic and keywords (Hypothesis 1) and paid traffic and keywords (Hypothesis 2), explaining the total of their volatility.

Moving to Tables 7 and 8, the authors face the linear regression of organic and paid traffic costs with the digital behavior metrics. Again, the regressions' outcome has significant *p-levels* = 0.000 and $R^2 = 1.00$, with all variables having also *p-values* below the 0.01 level of significance, thus verifying the regression models. The potential variation of organic traffic costs is 1.217 from bounce rate, 2.061 from average pages/visit, -1.015 from average time on site, 1.956 and -1.389 from unique and returning visitors. Equivalently, the variation of paid traffic costs from bounce rate is 0.952, from average pages/visit -3.23, from average time on site 0.314, and unique and returning

TABLE 3. Impact of digital behavior on cryptocurrency trade website organic traffic.

Variables	Std. Coefficient	R ²	F	p-Value
Constant	0			0.000**
Bounce Rate	0.084			0.000**
Average		1.0	-	0.000**
Pages/Visit	-0.331	0		
Average Time on Site	0.426			0.000**
Unique Visitors	2.157			0.000**
Returning Visitors	-1.228			0.000**

* and ** indicate statistical significance at the 95% and 99% levels respectively.

TABLE 4. Impact of digital behavior on cryptocurrency trade website organic keywords.

Variables	Std. Coefficient	R ²	F	p-Value
Constant	0			0.000**
Bounce Rate	-1.155			0.000**
Average	-1.486			0.000**
Pages/Visit		1.00	-	
Average Time on Site	0.508			0.000**
Unique Visitors	3.033			0.000**
Returning Visitors	-1.744			0.000**

* and ** indicate statistical significance at the 95% and 99% levels respectively.

TABLE 5. Impact of digital behavior on cryptocurrency trade website paid traffic.

Variables	Std. Coefficient	R ²	F	p-Value
Constant	0			0.000**
Bounce Rate	2.421			0.000**
Average	1.833			0.000**
Pages/Visit		1.00	-	
Average Time on Site	-0.705			0.000**
Unique Visitors	-5.853			0.000**
Returning Visitors	6.202			0.000**

* and ** indicate statistical significance at the 95% and 99% levels respectively.

visitors -2.151 and 2.896 accordingly. With every 1% increase in bounce rate, average pages/visit, average time on site, unique and returning visitors, organic traffic costs rise by 121.7%, 206.1%, decrease by 101.5%, rise by 195.6%, and lower by 138.9% respectively. On the same page, paid traffic

TABLE 6. Impact of digital behavior on cryptocurrency trade website paid keywords.

Variables	Std. Coefficient	R ²	F	p-Value
Constant	0			0.000**
Bounce Rate	4.821			0.000**
Average	5.979	1.00	-	0.000**
Pages/Visit				
Average Time on Site	-2.602			0.000**
Unique Visitors	-16.592			0.000**
Returning Visitors	16.295			0.000**

* and ** indicate statistical significance at the 95% and 99% levels respectively.

costs increased by 95.2%, decrease by 32.3%, increase by 31.4%, lowered by 215.1%, and rise by 289.6% correspondingly. Above outputs, support and verify Hypothesis 3, which refers to digital behavior metrics' impact on organic and paid traffic costs as significant.

TABLE 7. Impact of digital behavior on cryptocurrency trade website organic traffic costs.

Variables	Std. Coefficient	R ²	F	p-Value
Constant	0			0.000**
Bounce Rate	1.217			0.000**
Average	2.061			0.000**
Pages/Visit		1.00	-	
Average Time on Site	-1.015			0.000**
Unique Visitors	1.956			0.000**
Returning Visitors	-1.389			0.000**

* and ** indicate statistical significance at the 95% and 99% levels respectively.

TABLE 8. Impact of digital behavior on cryptocurrency trade website paid traffic costs.

Variables	Std. Coefficient	R ²	F	p-Value
Constant	0			0.000**
Bounce Rate	0.952			0.000**
Average	-0.323			0.000**
Pages/Visit		1.00	-	
Average Time on Site	0.314			0.000**
Unique Visitors	-2.151			0.000**
Returning Visitors	2.896			0.000**

* and ** indicate statistical significance at the 95% and 99% levels respectively.

Furthermore, in Tables 9 and 10, the authors examine the impact of cryptocurrency trade websites' organic and paid

campaigns on their global ranking through linear regression modeling. Both regression models came out as not significant with p -levels = 0.131 and 0.123 > 0.05, and $R^2 = 0.911$ and 0.791, without any one of the organic and paid campaign metrics' p -values ascertaining the aliquot variables' impact. These results show that neither organic nor paid campaigns individually can explain significantly global ranking's volatility, which leads to the rejection of Hypotheses 3 and 4, where the impact of organic and paid campaigns on cryptocurrency trade websites' global rank is significant.

TABLE 9. Impact of organic campaign metrics on cryptocurrency trade website global rank.

Variables	Std. Coefficient	R ²	F	p-Value
Constant	0			0.131
Organic Traffic	0.753	0.911	6.819	0.512
Organic Keywords	-1.386			0.136
Organic Traffic Costs	-0.284			0.736

* and ** indicate statistical significance at the 95% and 99% levels respectively.

TABLE 10. Impact of paid campaign metrics on cryptocurrency trade website global rank.

Variables	Std. Coefficient	R ²	F	p-Value
Constant	0			0.123
Paid Traffic	2.641	0.791	0.123	0.186
Paid Keywords	-1.075			0.063
Paid Traffic Costs	-2.631			0.171

* and ** indicate statistical significance at the 95% and 99% levels respectively.

In the last Table (11), the authors proceed to analyze the effect of combined organic and paid campaigns on cryptocurrency trade websites' global rank. The authors performed linear regression modeling, using both organic and paid campaigns' variables to determine the volatility of global rank. The result of the regression is statistically significant with p -levels = 0.000 < 0.01 and an optimum R^2 equal to 1.00. The chosen variables, with significance levels lower than 0.01, for explaining global rank are organic traffic, organic keywords, organic traffic costs, paid keywords and paid traffic costs. Global rank's variation from organic traffic is -0.244, from organic keywords -0.455, from organic traffic costs -0.039, from paid keywords -0.528, and paid traffic costs 0.183. This means that with a 1% increase in organic traffic, organic keywords, organic traffic costs, paid keywords, and paid traffic costs, global rank decreases by 24.4%, 45.5%, 3.9%, 52.8%, and increases by 18.3% accordingly. Regarding Hypothesis 5, where the authors state the impact of combined organic and paid strategies on cryptocurrency

trade websites as significant, it comes to authors' knowledge that Hypothesis 5 is verified.

TABLE 11. Impact of combined organic vs paid campaign metrics on cryptocurrency trade website global rank.

Variables	Std. Coefficient	R ²	F	p-Value
Constant	0			0.000**
Organic Traffic	-0.244			0.000**
Organic Keywords	-0.455	1.00	-	0.000**
Organic Traffic Cost	-0.039			0.000**
Paid Keywords	-0.528			0.000**
Paid Traffic Cost	0.183			0.000**

* and ** indicate statistical significance at the 95% and 99% levels respectively.

From the integrated regression analysis, specific results regarding cryptocurrency trade websites' traffic strategy based on digital behavior metrics can be discerned. Given that cryptocurrency trade websites seek to improve their organic and paid campaigns, as well as to evaluate these campaigns, they need to examine their visitors' engagement. Regression results show that higher levels of bounce rate increase organic traffic, paid traffic, and keywords, as well as organic and paid traffic costs, while the more pages visitors see and the more time they stay on-site, the lower organic traffic, keywords, and paid traffic costs to get and the higher paid traffic, keywords and organic traffic costs grow. For unique and returning visitors the exact opposite results apply. As unique visitors increase, organic traffic, keywords, and costs rise with paid traffic, keywords and costs reduce, and when returning visitors increase organic campaign metrics deteriorate and paid campaign metrics improve.

Even though individually applied organic and paid campaigns do not seem to affect cryptocurrency trade websites' global rank, a combination of those campaigns can cause a desired modification to global rank. As can be seen from Table 11, cryptocurrency trade websites should target to refine their organic campaigns, invest in increasing organic traffic, keywords, and their costs, and optimize parts of their paid campaigns, like investing in paid keywords and keeping paid traffic costs low. In this way, their global rank would be improved, meaning it would take lower values than before, since the closer to 1 global rank gets, the better it is for a website's brand awareness.

A. EXPLORATORY AND DIAGNOSTIC MODEL DEPLOYMENT

Having analyzed the process of the sample selection and retrieval, the paper's next section focuses on devising an exploratory and flexible model. This has been a good computer simulation software. However, in the current study, it is employed to indicate the weights of the correlations between the elements as well as to provide a pictorial depiction of

the problem. We don't execute any routines in this processor since ABM and DM analyses lead to more extensive simulations. FCM was created with the help of an online editor Mental Modeler [60]. This model produces credible and operant results and is based on harvesting the negative or positive variables' intercorrelations. To accomplish the model's deployment, statistical tests concerning data normality and linearity achievement have to be performed.

Moreover, the utilization of estimation and forecasting modeling could provide considerable advantages to organizations' insights. Deployment of organizational macro-level diagnosis could not be performed without capitalizing on the Fuzzy Cognitive Mapping (FCM) models [61]. These models utilize all referred web metrics' correlations, and as a result, present an environment where organizational variables and factors coexist and affect each other, with their relationships being illustrated in a hierarchical system based on effect magnitude. Each variable/metric relationship is presented in FCM with red and blue arrows, based on their correlation result, as does the thickness of the arrows (the thicker the stronger the correlation).

In Figure 2, the authors get the diagnostic macro-level model development, where FCM depicts component correlations through quantitative loads. FCM macro-scale models provide cohesive and explicit insights and can be capitalized for highlighting digital advertising campaigns.

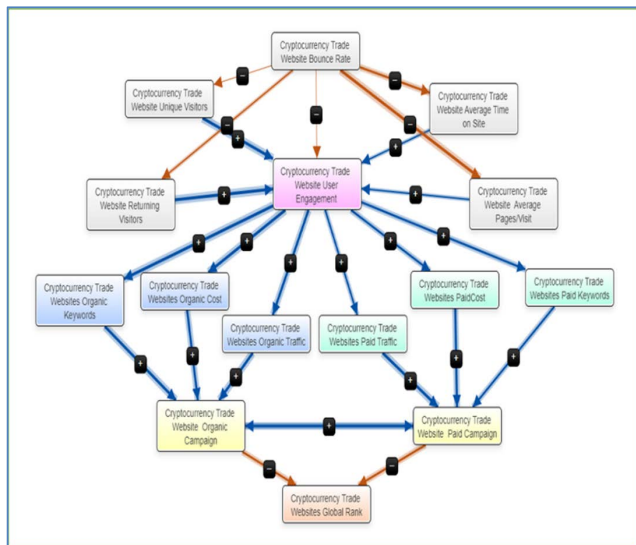


FIGURE 2. Fuzzy cognitive mapping depiction of macro-level approach.

B. SIMULATION AND PREDICTIVE HYBRID MODEL DEPLOYMENT (DYNAMIC AND AGENT-BASED)

Moving on, the Agent-Based Modelling (ABM) and DM (Dynamic Model) section are reached, where the micro-level environment of organizations becomes the center of interest. The topic of analysis focuses on variables and factors intercorrelations that cause variance in specific metrics, thus aiming to provide a more coherent prediction modeling

process [62]. ABM analysis provides a plethora of advantages for organizations' decision-making processes, since it illustrates the interactions of a specified number of agents [65], thus enhancing micro-level environment intelligence over chosen variables. Those agents receive user-input instructions, that settle their interactions through frequent operators (if, and, etc.) and capitalize on regression and correlation analyses outcome to deploy the desired model (see Table 12).

When it comes to the cryptocurrency trade organization, an advantage can be inferred by elaborating digital behavior metrics in ABM and DM for appointed decisions. Before any implementation of ABM and DM micro-level analysis, corporations should attempt to line the web metrics up with the correct KPIs. ABM and DM can help organizations predict organic and paid web traffic costs, by selecting appropriate advertisement strategies and engagement metrics records.

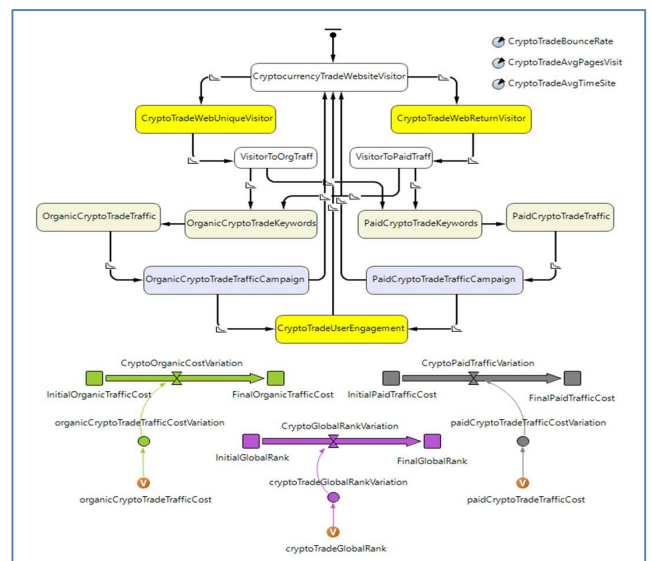


FIGURE 3. Agent-based model deployment for prediction of cryptocurrency trade digital behavior impact on global rank, organic and paid traffic campaigns.

To improve the model's efficiency and versatility, the implementation of correlation and regression coefficients in the hybrid model process is necessary. Figure 3 shows, the hybrid model which has been developed for 360 days, measured via a one-time snapshot. Agents' motion throughout the period is unitary and determined by the fluctuation of the model's parameters.

In Figure 3, the Hybrid Modelling simulation begins with potential visitors entering the statechart of cryptocurrency trade websites visitor. After that statechart, and depending on whether they have visited the same site again, get distributed to cryptocurrency trade website unique visitors or cryptocurrency trade website returning visitors statecharts. For entering cryptocurrency trade websites, visitors (unique and returning) type-specific keywords, either paid or organic, to lead them to the website, so they either follow cryptocurrency trade websites' organic keywords and traffic state or

TABLE 12. JAVA coding route for defining cryptocurrency trade organizations' organic and paid campaigns' efficiency.**JAVA coding route for defining cryptocurrency trade organizations' organic and paid campaigns' efficiency**

```

case CryptocurrencyTradeWebsiteVisitor: // (Simple state (not composite))
statechart.setActiveState_xjal( CryptocurrencyTradeWebsiteVisitor );
{
cryptoPotentialVisitors++;
};
transition.start();
transition1.start();
return;
case CryptoTradeWebUniqueVisitor: // (Simple state (not composite))
statechart.setActiveState_xjal( CryptoTradeWebUniqueVisitor );
{
cryptoTradeUniqueVisitors = cryptoPotentialVisitors
};
transition12.start();
return;
case VisitorToOrgTraff: // (Simple state (not composite))
statechart.setActiveState_xjal( VisitorToOrgTraff );
transition9.start();
transition21.start();
return;
case OrganicCryptoTradeKeywords: // (Simple state (not composite))
statechart.setActiveState_xjal( OrganicCryptoTradeKeywords );
transition18.start();
return;
case OrganicCryptoTradeTraffic: // (Simple state (not composite))
statechart.setActiveState_xjal( OrganicCryptoTradeTraffic );
{
organicCryptoTradeTraffic = organicCryptoTradeKeywords*(0.928)
};
transition6.start();
return;
case OrganicCryptoTradeTrafficCampaign: // (Simple state (not composite))
statechart.setActiveState_xjal( OrganicCryptoTradeTrafficCampaign );
{
organicCryptoTradeTrafficCost = CryptoTradeBounceRate*(1.217) +
CryptoTradeAvgPagesVisit*(2.061) + CryptoTradeAvgTimeSite*(-1.015)
+ cryptoTradeUniqueVisitors*(1.956) + cryptoTradeReturnVisitors*(-1.389);

if(organicCryptoTradeTrafficCost<0) organicCryptoTradeTrafficCost = 0
;};
transition2.start();
transition4.start();
return;
case CryptoTradeUserEngagement: // (Simple state (not composite))
statechart.setActiveState_xjal( CryptoTradeUserEngagement );
{
cryptoTradeUserEngagement = (1-CryptoTradeBounceRate) +
CryptoTradeAvgPagesVisit + CryptoTradeAvgTimeSite +
cryptoTradeUniqueVisitors + cryptoTradeReturnVisitors;

cryptoTradeGlobalRank = organicCryptoTradeTraffic*(-0.244) +

```

TABLE 12. (Continued.) JAVA coding route for defining cryptocurrency trade organizations' organic and paid campaigns' efficiency.

```

organicCryptoTradeKeywords*(-0.455) +
organicCryptoTradeTrafficCost*(-0.039) + paidCryptoTradeKeywords*(-0.528) + paidCryptoTradeTrafficCost*(0.183)
;};
transition16.start();
return;
case PaidCryptoTradeKeywords: // (Simple state (not composite))
statechart.setActiveState_xjal( PaidCryptoTradeKeywords );
transition19.start();
return;
case PaidCryptoTradeTraffic: // (Simple state (not composite))
statechart.setActiveState_xjal( PaidCryptoTradeTraffic );
{
paidCryptoTradeTraffic = paidCryptoTradeKeywords*(0.566)
};
transition7.start();
return;
case PaidCryptoTradeTrafficCampaign: // (Simple state (not composite))
statechart.setActiveState_xjal( PaidCryptoTradeTrafficCampaign );
{
paidCryptoTradeTrafficCost = CryptoTradeBounceRate*(0.952) +
CryptoTradeAvgPagesVisit*(-0.323) + CryptoTradeAvgTimeSite*(0.314)
+ cryptoTradeUniqueVisitors*(-2.151) +
cryptoTradeReturnVisitors*(2.896);

if(paidCryptoTradeTrafficCost<0) paidCryptoTradeTrafficCost = 0
;};
transition3.start();
transition5.start();
return;
case CryptoTradeWebReturnVisitor: // (Simple state (not composite))
statechart.setActiveState_xjal( CryptoTradeWebReturnVisitor );
{
cryptoTradeReturnVisitors = cryptoPotentialVisitors
};
transition13.start();
return;
case VisitorToPaidTraff: // (Simple state (not composite))
statechart.setActiveState_xjal( VisitorToPaidTraff );
transition10.start();
transition22.start();
return;
default:
super.enterState( _state, _destination );
return;
}
}

```

cryptocurrency trade websites paid keywords and traffic ones. This means that visitors enter the respective organic or paid cryptocurrency trade traffic campaigns and later get to the final statechart of cryptocurrency trade user engagement to

define the engagement level of each visitor, by capitalizing on the parameters shown in the upper right section of Figure 3. Each time visitors land in a user engagement statechart, cryptocurrency trade websites' global rank is varied. The same happens with their paid and organic traffic costs, when visitors reach cryptocurrency trade websites paid or organic traffic costs statecharts. User engagement variables vary when an agent enters the simulation, according to the Normal distribution variation:

$$f(x) = 1 / (0.01776\sqrt{2\pi}) e^{((-1)/2((x-0.3857)/0.01776)^2)},$$

for cryptocurrency trade websites' bounce rate,

$$f(x) = 1 / (0.33601\sqrt{2\pi}) e^{((-1)/2((x-4.7805)/0.33601)^2)},$$

for cryptocurrency trade websites' average pages per visit, and

$$f(x) = 1 / (99.82508\sqrt{2\pi}) e^{((-1)/2((x-1203.3167)/99.82508)^2)},$$

for cryptocurrency trade websites' average time on site (measured in seconds).

By running the above model, the authors get an agents' allocation output, like the one in Figure 4, with each color presenting a specific variable or metric.

Figure 4 is separated into 2 parts, depicting agents' allocation in a 360-model simulation days period. In both sub-figures can be seen agents with color differentiation, while they pass through different state charts of the AB model. With white color are displayed the potential agents that may enter a cryptocurrency trade website, with silver and grey color are displayed the agents that enter the website for the first time (unique) or return to it after a specific period (returning) accordingly, yellow color refers to agents entering the cryptocurrency trade website through organic traffic campaigns and red color through paid traffic ones, thus leading to gold color, where the number of engaged agents (visitors) to those websites. (a) the first phase of the figure presents agent allocation when cryptocurrency trade organizations use only organic (left) or paid (right) traffic campaigns, showing the level of engaged users (gold). (b) The next figure phase shows the result in cryptocurrency trade website user engagement levels (gold) by performing combined organic and paid traffic campaigns, which is higher than individual campaigns.

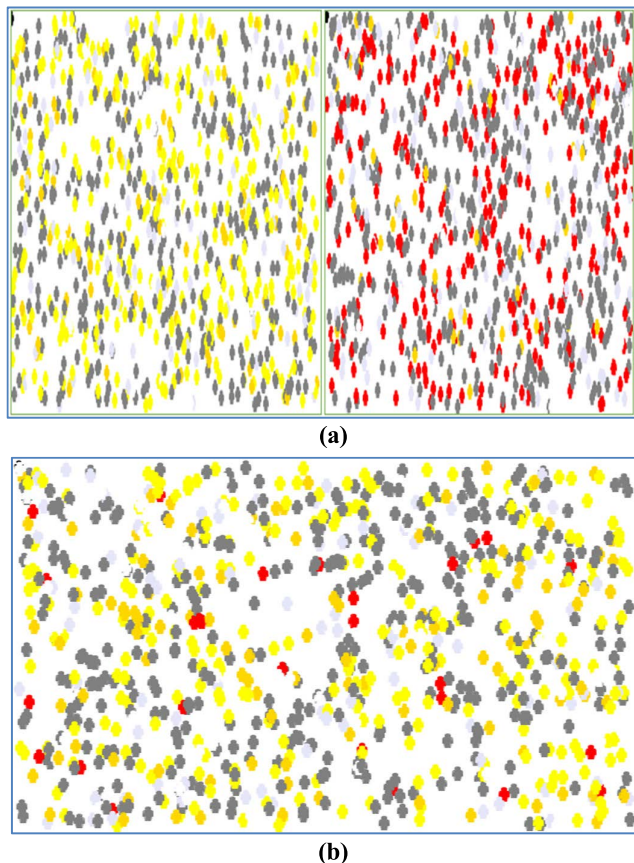


FIGURE 4. Population allocation in an experiment with 1000 agents. (a) shows the customer engagement (gold color) with either organic (yellow) or paid (red) campaigns and (b) depicts the customer engagement (gold) with performing both organic (yellow) and paid (red) campaigns.

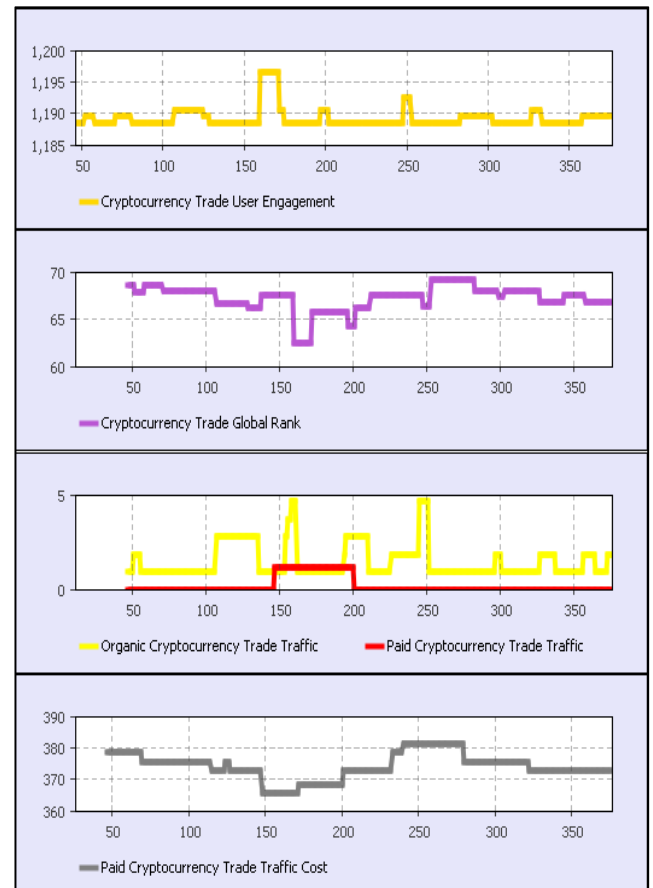


FIGURE 5. Depiction of cryptocurrency trade websites' digital behavior and its impact on their global rank, organic and paid traffic campaigns.

By reaching Figure 5, the outputs of the model's simulation process, in the 360 days, are displayed. The vertical axis of Figure 5 shows the amount of cryptocurrency trade website users' engagement, global rank, organic and paid traffic, and costs, while the horizontal axis presents the period of the simulation. Throughout the prediction and simulation procedure, the authors observed that when cryptocurrency trade website user engagement rises, their global rank decreases (gets enhanced), organic traffic rises and despite low levels of paid traffic, paid traffic costs to decrease with engagement's increase. So, the authors can discern the importance of user engagement metrics evaluation for explaining and defining cryptocurrency trade organizations' visibility, visitation frequency, and traffic campaign costs and performance.

V. DISCUSSION

The accent of the paper's research has been the amenity of a credible and innovative methodological framework, based on the capitalization of web analytic metrics in favor of cryptocurrency trade organizations. In this way, such organizations could obtain valuable insights regarding organic and paid web traffic campaigns and ultimately enhance their websites' global ranking and assess campaign costs. Web metrics make website users' behavioral patterns available to organizations. The collected data spring from the 10 most used and preferred cryptocurrency trade websites in the second half of 2021 among cryptocurrency traders. This innovative framework supplies cryptocurrency trade organizations the much-needed knowledge over website digital behavior effect on their organic and paid traffic campaigns and their latter impact on on-site visibility.

Paper's parameters that set the organic and paid campaign results are organic and paid traffic, keywords, and costs, while the parameter that embodies website visibility is global rank. The outputs that emerge from the linear regression dissection indicate that digital behavior metrics make organic traffic, keywords and costs variate up to 215.7%, 303.3%, and 206.1% accordingly, and paid traffic, keywords, and costs variate up to 620.2%, 1629.5%, and 289.9% respectively. An important output is that individual implementation of either organic or paid campaigns produces no significant variation or impact on cryptocurrency trade website global rank; combined implementation of organic and paid campaigns produces quite a significant variation to the global rank metric.

Related research highlighted mostly the process of adopting blockchain in various markets and industries, whereas the opposite course of study is barely investigated. Through the literature review, it was noted that the connection between blockchain applications and digital marketing is barely investigated [18]. A few studies focused on the utilization of data analytics and big data in blockchain applications. Most recently, the importance of analyzing the significance of analytic data implementations in digital marketing [19]. As an implementation of data analytics to blockchain applications, social analytics can predict cryptocurrencies' prices [20],

with multiple benefits for organizations' financial decision-making process.

Thus, it becomes clear that this research contributes to this path, by providing extensive outcomes for blockchain applications, like cryptocurrency trade organizations, by harvesting website analytics to improve their digital marketing campaigns. Results have shown that for cryptocurrency trade organizations to achieve an innovative refinement of their organic and paid traffic campaigns, website digital behavior metrics should be examined. These results could provoke enhanced website visibility [66] and campaign strategical cost degradation.

VI. CONCLUSION

A. CONCLUSION ON PAID AND ORGANIC CAMPAIGN REFINEMENT THROUGH DIGITAL BEHAVIOR ANALYSIS

Refining cryptocurrency trade organizations' digital marketing strategy, has been one of the principal targets of the paper. To do so, paid and organic traffic campaigns were tested over potential variation from website users' engagement metrics. Blockchain technology innovation has triggered an ongoing change in various sectors, including supply chain management, logistics [24], digital marketing and promotion [49], etc. Hence, since the adoption of technologies and applications based on blockchain is rapidly increasing, the necessity for efficient website traffic campaigns' implementation is rising too, designating the role of effective digital marketing strategies.

It has been pointed out, throughout this research, that the significance of all cryptocurrency trade website digital behavior metrics' effect on organic and paid traffic, keywords, and costs. More specifically the paper highlights the following conclusions:

- 1) Enhancement of digital behavior metrics should be performed according to the desired effect they have on organic and paid traffic, keywords, and costs (traffic and keywords should be increasing and costs kept low).
- 2) Performing combined organic and paid traffic campaigns (advertisement placement, buying valuable keywords, building backlinks, Search Engine Optimization, Search Engine Marketing, etc.) leads to higher website visibility and enhanced digital brand name, than performed individually.
- 3) Cryptocurrency trade organizations should focus on enhancing their website users' experience, by increasing their engagement (create more interesting and easier-to-use interface).
- 4) Regular observation of the proper KPIs, especially those constituting the digital behavior metric, can aid the evaluation of organic and paid traffic campaigns' performance, which also affects organizations' global ranking metric [67].

This type of strategy performance measurement has been highlighted by many studies [68]. Especially in the digital marketing sector, web analytics' contribution is substantial [69], [70], due to the plethora of digital behavior information.

In this path, the paper's methodological framework focalized on acquiring the necessary data, and performing appropriate statistical analysis, after having discerned the suitable Key Performance Indicators.

B. RESEARCH IMPLICATIONS

Research implications contain insights regarding the importance of users' digital behavior to all variables of organic and paid traffic campaigns, as well as the adoption benefits of both campaigns to organizations' digital brand name. From the performed linear regression models, the R^2 statistics reveal the significance of the results, since they only had the maximum level of significance (1.00) [71].

Web Analytics, combined with suitable KPIs selection, give major assistance to organizations' sustainability, profitability [17], [18], and digital brand name [66] enhancement. Cryptocurrency trade organizations organic and paid traffic strategies can be utterly benefited and refined by being customized to reflect digital behavior metrics variation. This means that each examined traffic strategy should be assessed as to whether website users get more engaged, acknowledging which engagement metric is affected more (bounce rate, returning visitors, etc.).

Having concluded with the analysis part, it is time-wise to advise organizations offering cryptocurrency trade services to monitor, at regular intervals, the appropriate KPIs, based on website analytic metrics. By doing so, organic and paid traffic costs can be limited, while website traffic and keywords will be increasing. Organizations' digital brand name and sustainability will be improved over time, with the website's visibility and digital engagement levels rising. The context of the methodology expanded in this research presents potential ways of refining cryptocurrency trade organizations' website traffic strategies, indicating the importance of digital behavior metrics, and rendering invaluable insights to marketers and strategists.

C. FUTURE WORK

The main focus of this research has been the exploration of the effectiveness of cryptocurrency trade organizations' paid and organic traffic campaigns, by utilizing digital behavior metrics. As a result, particular KPIs of website analytic data and users' digital behavior were established for the research. Besides the cryptocurrency trade organizations, the implemented approach might be used by the supply chain management and green logistics sectors [66], or even by the finance and banking sectors. Acceptance might be boosted by the use of Neuromarketing technology, which could give useful information on website users' brain function [72] and are sufficient for articulating a wide range of behavioral characteristics.

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