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Article

Logistics SMEs' marketing budget re-engineering for sustainable digital marketing development

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Abstract: Nowadays, the survival and sustainability of SMEs and the promotion of their services have become key goals for the economic growth of many countries. Logistics SMEs seek to improve their digital marketing development, by managing the re-engineering process of their marketing budget. To achieve this goal, logistics SMEs should capitalize on big data from their websites that are capable of depicting their digital development level. The authors selected 5 SMEs from the logistics sector and collected big data from their websites for 365 days. Then, statistical analysis tools (correlation and linear regression models), as well as Fuzzy Cognitive Mapping (FCM) models were utilized. It is highlighted that various marketing budget levels affect the digital development of logistics SMEs differently. More specifically, a marketing budget of 500$ to 2500$ could bring more users (new and returning) to logistics SMEs' websites, but only if the investments transcend 5000$ could help these firms rank higher in the search engines (authority score). Thus, logistics SMEs could simulate the course of specific digital development metrics by setting the desired levels of their marketing budget.

Keywords: re-engineering; digital marketing; development; big data; logistics; SMEs; FCM simulation; decision support systems

1. Introduction

Nowadays, SMEs in the supply chain sector, whether this includes logistics, transportation, etc. firms, are facing various struggles that relate to financial, organizational, innovation, and other areas. To tackle some of the referred bumps, SMEs could utilize re-engineering procedures to key business operations. Re-engineering is defined as a sweeping tweak to a company's expenses, manufacturing schedule, services, and quality through the application of various methods and instruments that view the business as a sophisticated system of customer-focused operations rather than merely a collection of administrative tasks (Caselli, 2010). Thus, the re-engineering processes can be focused on various aspects and sectors of a firm's operations and divisions to enhance decision-making and corporate efficiency (Oprean, 2014).

The utilization of digital marketing platforms varied across companies based on their size. The three most prevalent digital marketing strategies employed by businesses include company websites, email marketing, and social media marketing (Muramalla et al., 2022). Among social media platforms, Facebook, Twitter, and Instagram were the most commonly used. The advent of the internet and various e-commerce tools has facilitated this shift. By providing small and medium-sized enterprises with access to virtual technical offices, the Internet and e-commerce have reduced the reliance on traditional brick-and-mortar offices (Muramalla et al., 2022).

Green Supply Chain Management (GSCM) establishes a value chain and an extensive information integration system involving all stakeholders to fulfill various organizational objectives, including environmental goals. GSCM offers a competitive edge that is challenging to replicate (Alreahi et al., 2023). Additionally, it can enhance environmental, operational, and financial performance while elevating the standard and caliber of products and services delivered. Despite its benefits, the adoption of GSCM may encounter hurdles, prompting decision-makers to acknowledge and plan for potential challenges to exercise caution in implementation (Alreahi et al., 2023).

Budget process re-engineering refers to the redesign and restructuring of an organization's budgeting procedures and practices to improve efficiency, effectiveness, and overall performance (Bergmann et al., 2020). The goal of budget process re-engineering is to streamline and enhance the budgeting process, making it more responsive to organizational needs, strategic goals, and changing business environments. This approach often involves a comprehensive review of existing budgeting methodologies and the implementation of innovative techniques to achieve better results. By re-engineering the budget process, organizations aim to create a more agile, responsive, and strategic approach to financial planning (Bergmann et al., 2020). This can lead to improved resource allocation, better decision-making, and increased organizational resilience in the face of challenges and opportunities.

A marketing budget re-engineering is a completely different process compared to budget restructuring. Marketing budget re-engineering or development involves redesigning brand-new budget levels, usually to suit a new methodology, a change in focus, vision, business objectives, and operational goals, and/or the incorporation of a new department or function (Miranda and Hillman, 1996). It is uncommon for SMEs to undergo budget re-engineering, as SMEs generally do not have the resources or scale to invariably make proportionate investments. However, budget re-engineering, given that some SMEs could afford a more aggressive marketing budget, could indicate specific levels and their following effects on various performance and operational sectors of SMEs.

On the other hand, marketing budget restructuring, or rather the act of reworking the existing budget is quite commonplace in higher-echelon SMEs. In more cases than not, marketing executives make redundant advertising investments, in times of project stagnancy, cut promotional costs in times of excessive business, and repurpose the marketing budget to accommodate newer methodologies. Normally, SMEs tend to undertake budget restructuring every five and a half years. At a time when trends are changing in a nanosecond, the gap between the five and a half years can only stretch. As a result, marketing professionals need to make proactive or corrective decisions to the marketing budget—time and again. Given that the digital development of an organization is directly proportional to the efficiency and precision of its marketing budget, the need for these reworkings and amendments is indispensable.

Ghobakhloo et al. (2011) emphasize the significance of a marketing budget for logistics SMEs seeking to implement ICT and improve their digital development. For SMEs, engaging in the digital marketplace and investing in marketing by increasing the available budget to achieve digital development is no longer an option, but a requirement (Mazzarol, 2015). Practical instruments for strategic leadership and company process reengineering, as well as an organizational structure, have been

established to define the connection among the primary phases of corporate strategy planning (Mandych et al., 2021).

Therefore, the present paper is focused on analyzing the impact of various levels of SMEs' marketing budget on their digital development. This research aims to explore marketing budgetary practices in the logistics sector. By re-engineering and analyzing the specific levels of marketing budget levels, marketers and decision-makers of logistics SMEs can discern their individual effects on the various digital development metrics. To perform this task, web analytics that reflects digital development and customer engagement metrics were collected, from logistics SMEs' websites. Light should be shed on the various marketing budget values and their unique effect on each digital development metric. In this way, potential re-engineering proposals for SMEs' marketing budget could be extracted.

This paper was created based on the following stages. In the first stage, an introduction to the research themes and research gaps is performed, followed by the literature review and research motivations of the study. Next, the collection process of the study's analytics and the developed research hypotheses are presented. This stage is followed by the deployment of the linear regression models and the diagnostic FCM scenarios that intend to extract any potential insights regarding the website big data analytics' connection with logistics SMEs' marketing budget. Lastly, in the stage of the Discussion and Results, the paper's structure aims to consolidate the acquired knowledge over the re-engineering of SMEs' marketing budget through the utilization of web analytics.

2. Materials and methods

2.1. SMEs marketing budget re-engineering

Numerous international firms are shifting from a product-dominant rationale to a service-dominant rationale as services, instead of items, have grown into the basis of digital marketplace development and distinction (Standing and Standing, 2015). Companies must re-engineer their operations for increased efficiency, productivity, and client satisfaction. In an ever-changing corporate circumstance, novel concepts, enhanced company procedures, and excellent development are unavoidable for company expansion and financial viability (Eze et al., 2019). Many businesses are devoting resources to company procedure re-engineering, such as marketing (Giakomidou et al., 2022). As a result, re-engineering business processes has emerged as a single choice that executive departments have thoroughly investigated to enhance financial efficiency and boost the profitability of enterprises (Aziz, 2019). Therefore, re-engineering necessarily affects the finances and business financing, with changes in this area known to be radical. These radical changes are termed as financial or budget re-engineering due to their direct connection with other business operations, like marketing (Kubicova, 2015).

Financial re-engineering can be defined as the fundamental reconsideration and radical redesigning of firm operations to create significant gains in critical, modern performance analytics (Dada et al., 2023). SMEs are increasingly adopting ICT-based digitalization to achieve advantages in competitiveness and gain entrance to worldwide markets in international marketplaces (Al-Qirim, 2003).

SMEs have a propensity to hire generalists instead of experts, depend on planning for the short term, have unstructured and flexible plans and methods of decision-making, and an absence of regulation of operational practices (Dibrell et al., 2008). According to Bako and Banmeke (2019), there exists a significant association between implementing technologies and current corporate procedures in attempts to increase budget efficiency as an indicator of economic development. According to Olarewaju and Sunkanmi's (2022) research, re-engineering business processes as a tactical strategy will increase the competitive edge, which is mostly determined by revenue. Implementing marketing budget process re-engineering in SMEs can have significant implications for their digital development (Dorokhova et al., 2023; Kumar et al., 2021).

Usage of digital development aids businesses in gaining new clients (Hamill and Gregory, 2010). Regarding firms' digital marketing activities, it has been stated that through extensive restructuring and re-engineering of key digital marketing strategies (affiliate marketing, video marketing, etc.), enhanced digital presence and promotion of the firm's products and services can be achieved (Sakas et al., 2023b, 2023c). For this purpose, the study proposes that the marketing budget of logistics SMEs should be re-engineered, to reflect optimized marketing budget levels and their effects on these firms' digital development metrics.

The appropriate marketing budget level for SMEs can be categorized based on the aggressiveness and scope of the marketing strategy. The basic levels of marketing budget incorporated by various firms are introductory, intermediate, integrative, and aggressive levels (Webtek, 2023):

1) Introductory Marketing Budget:

Percentage of Revenue: 2%–5%. This budget level is suitable for new businesses or those entering a new market. Basic digital marketing, social media, and local advertising may be included.

2) Intermediate Marketing Budget:

Percentage of Revenue: 5%–10%. The budget allows for more comprehensive digital marketing efforts, including content creation, social media advertising, and basic search engine optimization (SEO).

3) Integrative Marketing Budget:

Percentage of Revenue: 10%–15%. This budget level is suitable for businesses looking to integrate multiple marketing channels and strategies.

4) Aggressive Marketing Budget:

Percentage of Revenue: 15% and above. This high-budget level is appropriate for businesses with aggressive growth goals, intense competition, or those operating in highly dynamic markets.

2.2. SMEs' digital presence and development

Consumers are constantly increasing their online and mobile development, which will successfully necessitate organizations seeking to draw in and keep customers to adopt digital internet technologies as well as participate in digital development, digital business, social-CRM, and online advertising (Mazzarol, 2015). The main aspects of digital presence and development enhancement for SMEs can affect their overall

business strategy. A strong digital presence can enhance brand visibility, customer engagement, and competitiveness.

Embracing a Market-oriented Approach (MARO) yields favorable outcomes for small and medium-sized logistics enterprises (SMEs). By adopting MARO, these SMEs can align themselves with the needs of their customers and stay attuned to market dynamics (Ngo, 2023). This alignment fosters market intelligence by offering valuable insights into customers' demands for logistic services and the strategies of competitors. Consequently, SMEs can tailor their logistic offerings to better serve customer requirements, thereby expanding their market presence. Furthermore, understanding competitors' capabilities in providing logistic services empowers SMEs to assess their strengths and weaknesses in comparison, facilitating informed strategic decisions (Ngo, 2023). On the other hand, logistic SMEs face a variety of technological problems that need addressing, such as the lack of digitalization strategies, the lack of technology awareness, and the fact that digitalization is perceived as unattainable (Macias-Aguayo et al., 2022). Moreover, Macias-Aguayo et al. (2022), discussed the potential implications of affordable digitalization opportunities, to discern digital solution areas that could be deployed at low cost in logistics SMEs.

The intersection of big data analytics and digital marketing represents a pivotal juncture in contemporary business strategy. Through the harnessing of vast quantities of data generated from digital sources, organizations can gain profound insights into consumer behavior, preferences, and trends (Sakas et al., 2022). Big data analytics empowers marketers to delve deeply into this wealth of information, extracting actionable intelligence to inform and optimize marketing campaigns. By leveraging advanced analytics techniques such as machine learning and predictive modeling, businesses can personalize marketing efforts with unprecedented precision, delivering targeted messages to the right audience at the right time through the most effective channels (Abdalla, 2022). This synergy between big data analytics and digital marketing not only enhances the efficiency and effectiveness of marketing initiatives but also enables organizations to adapt swiftly to evolving market dynamics, driving competitive advantage and fostering sustained growth (Sakas et al., 2023g).

Marketing re-engineering can be achieved by restructuring various operations and procedures of firms' activities to enhance their development in specific key areas. To this point, the adoption of big data and analytics assists the decision-making process and enables the re-engineering initiatives. The impact of re-engineering business activities, like marketing budget, could assist in the task of enhancing an SME's digital development (Al Hawamdeh, 2021). Hence, this study focuses on the examination of the benefits of re-engineering marketing budget, and indicating various optimal levels and their impact on logistics SMEs' digital development.

The importance of marketing budget for SMEs' digital development is highlighted, as crucial, and its re-engineering processes gather increasingly the interest of decision-makers. Several business operations, like financial re-engineering, have a major impact on a firm's development (Dada et al., 2023). Company strategy, organizational framework, and culture of operation have been recognized for having a major beneficial effect on the financial development of logistics firms, whereas company procedures had a minor adverse effect and technological innovations in

business had a positive yet minor effect (Dada et al., 2023). According to Chiekezie et al. (2022), there is an important beneficial connection connecting company procedure re-engineering and financial viability.

2.3. Methodological concept

After mentioning the literature basis for the development of the present study, the authors adopted a 3-staged methodological concept (Sakas et al., 2023h) for the elaboration of marketing budget levels' impact on SMEs' digital development. This concept, as seen in **Figure 1**, involves the extraction methods of big data from corporate websites, regarding visitors' behavior and web analytics, and the calculation of the coefficients for the linear regression analysis. From there, the extracted coefficients of the statistical analysis would be utilized for the deployment of the FCM modeling. More specifically:

1) Data observation and collection. Following the selection of the case study's firms, the analysis then focuses on the SMEs' websites, where through an online platform, big data that refer to digital development and customer engagement would be collected. The period of observation and data gathering was set to 365 days (a whole year). Website analytical data were retrieved from the selected logistics SMEs' webpages, referring to digital marketing and customer analytics, by utilizing the Semrush (2023) online platform. The selection of the sample firms was based on the purposive sampling technique (Campbell et al., 2020) to include the most-known firms that spend higher amounts of financial resources on marketing initiatives.

2) Statistical analysis. In the second stage, the authors performed advanced statistical analysis on the collected data to extract important coefficients from their connection, support the formulation of the research hypotheses, and supply the FCM model. More specifically, a descriptive statistics analysis, followed by a correlation analysis, based on Pearson's coefficient, and a simple linear regression (SLR) model, have been adopted to examine the impact of SMEs' marketing budget and web analytics on key development metrics of digital development. To perform the aforementioned statistical analysis the authors opted to utilize the statistical software of Jamovi (2024) and noted the significant relationships of the variables (based on their p-values).

3) FCM modeling. The last part of the methodology includes the capitalization of the dependent and independent variables' coefficients (regression and correlation analysis) to perform various scenarios. For the deployment of the FCM model, the online DSS platform of MentalModeler (2023) was utilized. The model was based on the correlation coefficients of the study's variables and blue (positive relationship) and red (negative relationship) arrows were created to connect the variables. Then, the FCM scenarios were deployed based on the variation of SMEs' marketing budget (4 levels—introductory, intermediate, integrative, and aggressive). Each of these budget values would produce a unique variation of the dependent variables (authority score, bounce rate. new and returning website users) and, as a result, this will lead to the extraction of valuable insights.

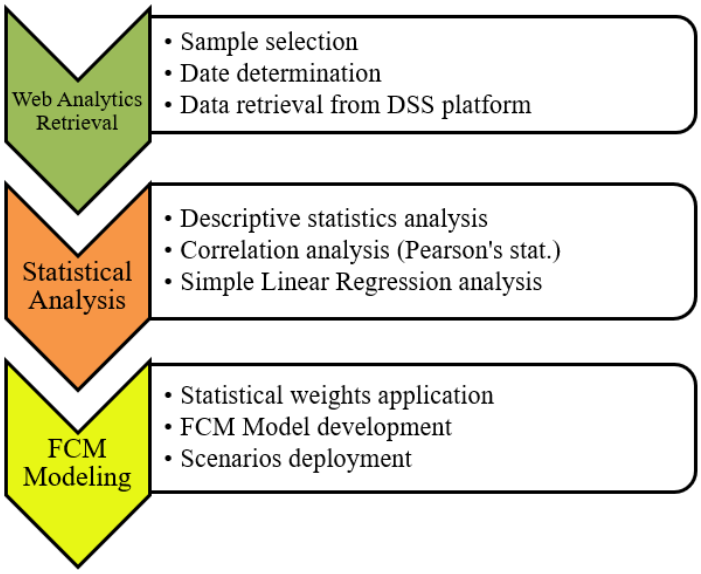

Figure 1. Methodological concept.

2.4. Selection of firms (case study)

To perform the required statistical analysis (descriptive statistics, correlations, and linear regressions) the authors should acquire the necessary big data from the case study's SME website. The 5 firms of the research, consist of a case study (Indrayan and Mishra, 2021) of innovative logistics SMEs, that were selected from a wide list of SMEs in the logistics sector, among 528 firms (Lidsky, 2022). The authors performed a purposive sampling technique (Campbell et al., 2020) to discern the 5 most known, in terms of website visibility and returning website users, to examine the impact of the marketing budget re-engineering on their digital marketing sustainable development. This sampling method and firms' selection have been adopted due to the extent of adoption of digital marketing campaigns, including the higher marketing budgets, from the most-known logistics SMEs (Jadhav et al., 2023).

These firms refer to Flexport, Zipline, Convoy, Controland, and Berkshire Grey. More specifically, these SMEs were chosen due to them being the most innovative logistics SMEs for 2022, and are at the top of Lidsky's (2022) list, among other large and well-known logistics firms. SMEs are characterized as the overlooked engines of innovation (Gaskell, 2022). For research purposes, the following **Table 1** presents key information that refers to SMEs' geographic area of operations, their size, and the industry in which their services are included, within the logistics sector.

Table 1. Characteristics of selected firms.

SMEs	Investigated Geographic Area	Size	Industry - Sector	Website
Zipline	Bay Area, US	150	logistics and transportation services	https://getzipline.com/
Convoy	Oakville, Canada	200	shipping, freight, and supply chain	https://convoy.com/
Controland	NJ, USA	250	supply chain visibility and process optimization	https://www.controlant.com/
Berkshire Grey	MA, USA	243	logistics and supply chain automation	https://www.berkshiregrey.com/
Zuum Transportation	CA, USA	250	software solutions for logistics and supply chain management	https://zuumapp.com/

From the websites of the logistics SMEs data metrics were collected that are commonly referred to as key development indicators (KPIs) (Saura et al., 2017), in the context of website analytics and digital marketing (**Table 2**). These metrics collectively provide valuable insights into the development, user engagement, and authority of a website. They are crucial for understanding how well a website attracts and retains visitors, as well as for assessing its visibility and influence in search engine results. Monitoring and analyzing these KPIs regularly can help website owners and digital marketers make informed decisions to optimize their online presence and user experience (Järvinen and Karjaluoto, 2015). To do this, the authors utilized the website platform Semrush (2023), where a proper payment was made. The period of the data gathering was set from 1st July 2021 to 31st May 2022, or 365 days. Through this period, approximately 2,100,000 behavioral web analytics were gathered (**Table 2**). Then, based on the collected data, the authors will seek to estimate whether a re-engineering of logistics SMEs' marketing budget could provide a turning point for enhancing their digital development.

Table 2. Definition of selected web analytics.

Web Analytics	Description
Marketing Budget	Budget for online development and digital performance efficiency through digital marketing initiatives over a month (Lidsky, 2022).
Authority Score	Represents the quality of the website and its ranking on the search engines. The higher its values, the higher the quality of the website (SEO Glossary, 2023).
Organic Keywords	These are search terms used in search engine optimization to attract free website visitors (Ahluwalia, 2023).
Direct Sources	Traffic sent from users that directly entered a URL into a browser saved bookmarks or any links from outside the browser (such as on Microsoft Word) (Similarweb, 2023).
Referral Sources	Traffic is sent from one website to another, through a direct link. This kind of traffic includes affiliates, content partners, and traffic from direct media buying or news coverage (Similarweb, 2023).
Search Sources	Traffic is sent via organic (non-paid) results on search engines such as Google or Bing (Similarweb, 2023).
Paid Sources	Traffic is sent from paid search ads on a search engine such as Google or Bing (Similarweb, 2023).
Social Sources	Traffic is sent from social media sites such as Facebook or Reddit (organic and paid). Including direct media buying from Facebook (Similarweb, 2023).
New Website Users	Users that enter a firm's website for the first time.
Returning Website Users	Users that enter frequently a firm's website
Bounce Rate	The rate of abandonment of a website (exit website very soon after entering it).
Pages per Visit	The average number of pages a user "sees" on a website.
Time on Site	The amount of time users spend on a firm's webpage.

2.5. Research hypotheses

Following the analysis of the research motivations derived from the referred literature review, the authors proceeded to develop 4 main research hypotheses, based on the re-engineering processes of logistics SMEs' marketing budget. For SMEs, it is

vital to acknowledge the exact effects in their strategic decision-making procedures from the re-engineering and overall adjustment of various corporate processes. One of the most important factors that could indicate enhanced digital development is the authority score of firms' websites, as well as the increased number of new and returning website users, and low values of bounce rate. Logistics SMEs should know the exact levels of marketing budget that they have to apply, to achieve enhanced digital development. Due to the limitation of various SMEs to invest significant amounts of budget for marketing, they need to acknowledge the effect on their digital development from the different levels of investment.

Hence, for the first research hypothesis, the authors seek to examine the exact impact of marketing budget's re-engineering initiatives on logistics SMEs' website quality. If these firms could estimate the optimal levels of investment in marketing, then their ranking in the search engines could be predicted (Giannakopoulos et al., 2024). In this context, the process of re-engineering logistics SMEs' marketing budget provides an important aspect of enhancing their search engine ranking and digital development.

H1: "Re-engineering logistics SMEs' marketing budget could lead to enhanced ranking on the search engines".

Concerning the second hypothesis of the paper, the need to estimate the effect of logistics SMEs' new website users is crucial. Increased marketing budget should aim to the engagement of more new customers to firms' websites, thus promoting their digital development (Sakas et al., 2023h). So, for enhanced logistics SMEs' digital development, the knowledge of the marketing budget re-engineering process could provide important insights into this direction.

H2: "The marketing budget of logistics SMEs is closely connected with their new website users' count".

For the third and fourth research hypotheses, the connection between the marketing budget of logistics SMEs and the number of websites new and returning users is analyzed. Adjusting the budget of their marketing initiatives (Giannakopoulos et al., 2023), logistics SMEs could increase the number of new website visitors, as well as the returning ones. For these firms to be able to increase the engagement of new and returning visitors/users, their digital development would be enhanced.

H3: "The re-engineering of the marketing budget could impact the returning website users of logistics SMEs".

H4: "The abandoning rate of logistics SMEs' websites is affected by re-engineering their marketing budget".

3. Results and discussion

3.1. Statistical analysis

At this point, the authors opted to develop 4 linear regression models to validate the impact of logistics SMEs' marketing budget on various web analytics, through the analysis of their statistical significance. Before this, the descriptive statistics of the marketing budget and the web analytics of logistics SMEs (**Table 2**) were extracted. The selected descriptive statistics were the min, max, mean values, and the standard deviation metric (**Table 3**). Furthermore, in **Table 4**, the correlations of the collected

marketing budget of the logistics SMEs of the case study with the rest of the study's variables are presented, based on Pearson's coefficient (Havlicek and Peterson, 1976).

Table 3. Descriptive analytics.

Variables	Min	Max	Mean	St. Deviation
Marketing Budget	260.00	5532.00	2766.62	1610.15
Authority Score	46.20	49.40	48.25	1.41
Organic Keywords	12,362.60	17,790.20	15,157.83	2024.36
Direct Source	87,425.00	144,392.00	116,160.43	22,415.03
Referral Source	4288.00	20,812.00	11,735.09	5393.99
Paid Source	2439.00	5059.00	3768.09	954.87
Social Source	3872.00	7666.00	4904.37	1266.11
Search Source	36,986.00	61,302.00	48,024.97	7544.89
Bounce Rate	0.51	0.68	0.59	0.07
Pages per Visit	2.37	8.77	4.92	2.31
Time on Site	794.00	1607.00	1280.23	334.85
New Users	92,622.00	11,6753.00	102,073.49	8623.68
Returning Users	142,470.00	224,856.00	184,846.57	30,632.07

Table 4. Correlation analysis matrix of SMEs' marketing budget.

	Authority Score	Organic Keywords	Direct Source	Referral Source	Paid Source	Social Source	Search Source	Bounce Rate	Pages per Visit	Time on Site	New Users	Returning Users
Marketing Budget	0.273	−0.378	0.603	−0.100	0.572	−0.600	0.348	0.700	−0.569	−0.787*	0.478	0.511

* indicates statistical significance at the 95% level.

In **Table 5**, the linear regression of logistics SMEs' website authority score with all of the study's independent variables is shown. As can be seen, logistics SMEs' marketing budget affect significantly the value of their website authority score, since it has a p-value of $0.000 < a = 0.01$ level of significance. For the linear regression of logistics SMEs' new website users (**Table 6**), the marketing budget also appears to have a significant impact on them, with a p-value of $0.000 < a = 0.01$ level of significance. For every 1% increase in marketing budget, logistics SMEs' authority score and new website users decrease by 32.5% and by 19.5% respectively. Thus, the first and second research hypotheses of the study were verified, meaning that by re-engineering the logistics SMEs' marketing budget their website ranking on the search engines will be enhanced, and their marketing budget will be closely connected with their new website users' count.

Table 5. Impact of logistics SMEs' marketing budget on authority score.

Variables	Standardized Coefficient	R^2	F	p-Value
Constant	-			0.000**
Organic Keywords	−0.092			0.000**
Referral Source	0.145			0.000**
Search Source	−0.624	1.000	-	0.000**
Pages per Visit	−0.730			0.000**
New Users	−0.254			0.000**
Marketing Budget	−0.325			0.000**

** indicates statistical significance at the 99% level.

Table 6. Impact of logistics SMEs' marketing budget on new website users.

Variables	Standardized Coefficient	R^2	F	p-Value
Constant	-			0.000**
Referral Source	0.029			0.000**
Social Source	−1.227			0.000**
Search Source	0.382	1.000	-	0.000**
Bounce Rate	−1.536			0.000**
Pages per Visit	−1.548			0.000**
Marketing Budget	−0.195			0.000**

** indicates statistical significance at the 99% level.

Moving to **Tables 7** and **8**, the linear regression models of logistics SMEs' returning website users and bounce rate were produced. Logistics SMEs' marketing budget affect significantly the value of their returning website users since it has a p-value of $0.000 < a = 0.01$ level of significance. For the linear regression of logistics SMEs' website bounce rate, the marketing budget also appears to have a significant impact on them, with a p-value of $0.000 < a = 0.01$ level of significance. For every 1% increase in marketing budget, logistics SMEs' returning website users and bounce rate decreased by 4.7% and increased by 18.7% accordingly. Hence, the paper's third and fourth research hypotheses were verified, meaning that re-engineering the marketing budget could impact the returning website users of logistics SMEs, and their website abandoning rate is affected by the re-engineering of their marketing budget.

Table 7. Impact of logistics SMEs' marketing budget on returning website users.

Variables	Standardized Coefficient	R^2	F	p-Value
Constant	-	1.000	-	0.000**
Referral Source	0.468			0.000**
Social Source	−0.476			0.000**
Search Source	0.419			0.000**
Bounce Rate	−0.468			0.000**
Pages per Visit	−0.880			0.000**
Marketing Budget	−0.047			0.000**

** indicates statistical significance at the 99% level.

Table 8. Impact of logistics SMEs' marketing budget on bounce rate.

Variables	Standardized Coefficient	R^2	F	p-Value
Constant	-	1.000	-	0.000**
Social Source	−0.679			0.000**
Search Source	0.063			0.000**
Referral Source	0.644			0.000**
Paid Source	−1.422			0.000**
Pages per Visit	−1.686			0.000**
Marketing Budget	0.187			0.000**

** indicates statistical significance at the 99% level.

3.2. Diagnostic and exploratory model

Apart from the statistical analysis deployed above, there is a growing need to perform a simulation of the total variables of the study, in a unified environment. Such a goal can be completed through the FCM simulation and scenario-making application. To do so, the authors adopted the MentalModeler (2023) website platform DSS. FCM figures are harvested to represent the causation relationships among the variables of the research (Groumpos, 2014). FCM can be adjusted to include and estimate the effect of variables' relationships in the provided system, based on the human knowledge process (Papageorgiou et al., 2003). FCMs are a parameterized structure of comprehension in which permanent characteristics encompassing information can be generated by outlining fundamental structure features like method variables, positive or negative relationships between factors, and the degree to which one aspect may be connected. FCM research procedures take place by using graphs and schematic comparisons connecting all aspects of a structure, with the structure of concept maps serving as the basis. These frameworks could be used to model an operation influenced by many factors, with attempts undertaken to represent both the coefficients of correlation and the general structure (Sharif and Irani, 2006).

So, the variables that were analyzed in this research are the marketing budget, authority score, organic keywords, direct, referral, search, paid, and social sources, new, and returning website users, bounce rate, pages per visit, and time on site. Their relationships (based on Pearson's coefficient) are presented in the developed FCM model which is simple and modified, for the study, model compared to Groumpos's (2014) research. The colors of the FCM model's arrows represent the relationship of the factors (blue arrows show negative relationships and red arrows are positive), and the thickness of their significance, the thicker the arrow, the stronger the relationship. In **Figure 2** below, the FCM environment among the study's variables is presented.

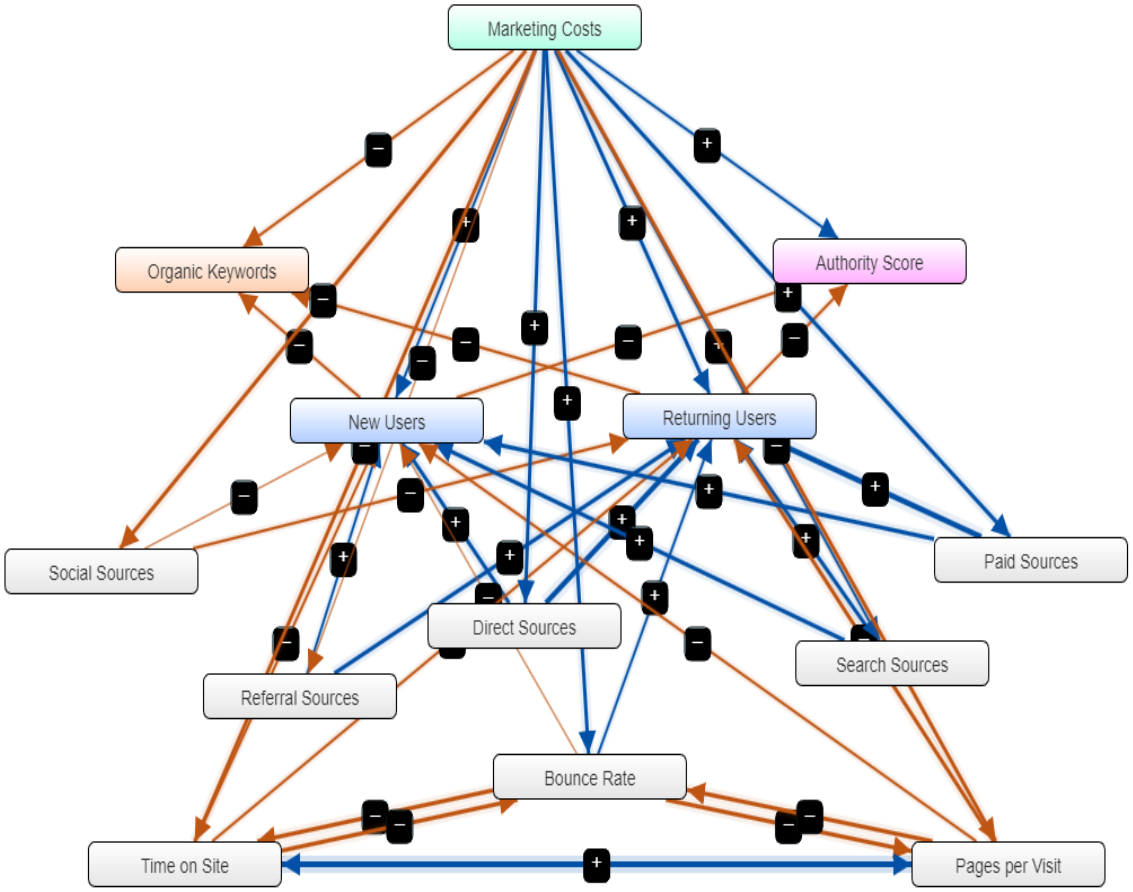

Figure 2. FCM of logistics SMEs' marketing reengineering environment.

3.3. FCM Simulation model

Coming from the representation and development of the total of the study's variables, the authors proceeded to create 4 different FCM scenarios. These scenarios will be utilized in favor of the research goals of estimating the effect of re-engineering the marketing budget of logistics SMEs. Hence, the FCM simulation aims to examine the impact of various levels of logistics SMEs' marketing budget on the selected digital development analytics (authority score, new and returning website users, and bounce rate). For this reason, 4 different levels of marketing budget were selected, based on the estimated values of Webtek (2023). These levels refer to 500–1000$ (introductory marketing budget), 1000–2500$ (intermediate marketing budget), 2500–5000$ (integrated marketing budget), and over 5000$ (aggressive marketing budget). Each of the marketing budget levels represents a unique FCM scenario. The hyperbolic tangent function (Liu et al., 2019) was utilized for the development of the FCM modeling, to depict the effect of the marketing budget on the referred digital development analytics. FCM simulation, as depicted by various research (Migkos et al., 2022), utilizes the relationships of the study's factors to calculate specific variables' outcomes. So, for this study, the variable of logistics SMEs' marketing budget is used as the regulatory factor that would affect the digital development analytics, when taking various values. These values were distinguished into 4 levels, 10% or 0.1, 20% or 0.2, 50% or 0.5, and 100% or 1 (Webtek, 2023) in the FCM scenarios presented below.

1) Application of Introductory Marketing Budget (500–1000$ ~ 10% of budget)

In the first scenario (**Figure 3**), the application of introductory levels of marketing budget for logistics SMEs is estimated. Introductory levels of marketing budget refer to 500–1000$, so the authors selected the minimum amount for this test. So, we applied the level of 0.1 or 10% (500$) in the marketing budget slot of the FCM simulation model. From this action, the variables of authority score, new and returning website users, and bounce rate were affected. More specifically, logistics SMEs' authority score decreased by 3%, their website bounce rate increased by 3%, and their returning and new users also increased by 5%, and 10% accordingly. This means that although logistics SMEs' marketing budget increased, their authority score and bounce rate got a bit worse, while their new and returning website users increased significantly.

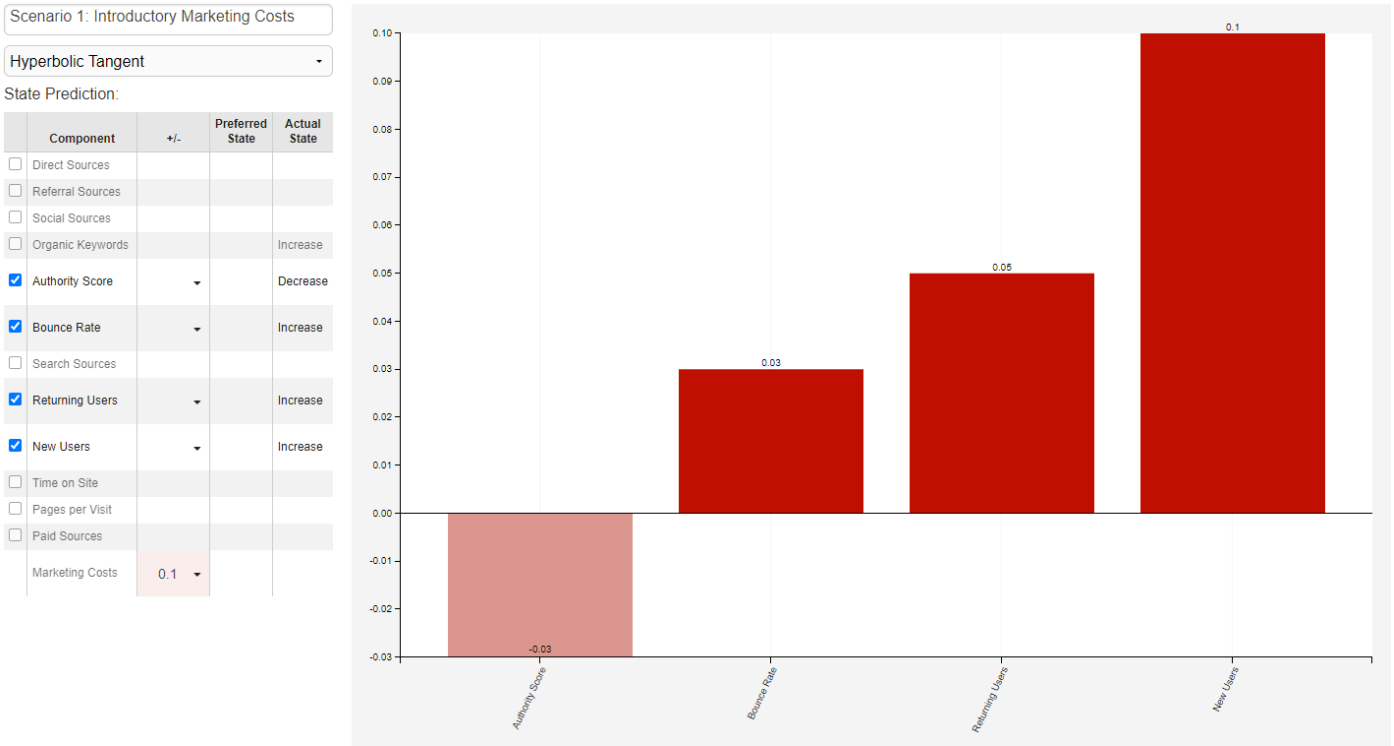

Figure 3. Illustration of the scenario of introductory marketing budget' impact.

2) Application of Intermediate Marketing Budget (1000–2500$ ~ 20% of budget)

In the second scenario (**Figure 4**), the application of intermediate levels of marketing budget for logistics SMEs is calculated. Intermediate levels of marketing budget refer to 1000–2500$, so the authors selected the minimum amount for this test. So, we applied the level of 0.2 or 20% (1000$) in the marketing budget slot of the FCM simulation model. From this action, the variables of authority score, new and returning website users, and bounce rate were affected. More specifically, logistics SMEs' authority score decreased by 4%, their website bounce rate increased by 5%, and their returning and new users also increased by 9%, and 18% respectively. This means that although logistics SMEs' marketing budget increased more, their authority score and bounce rate got a bit worse, even from the introductory marketing budget' level, while their new and returning website users increased even more than before.

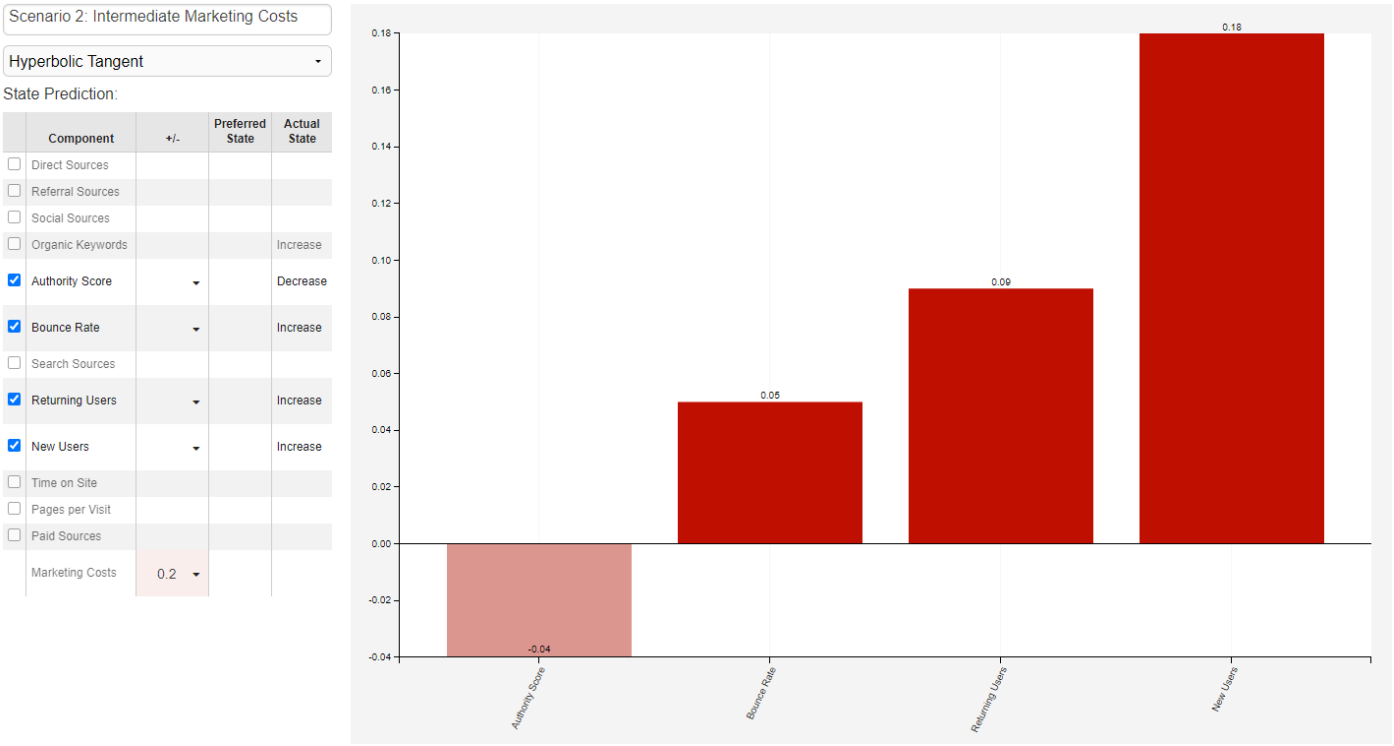

Figure 4. Illustration of the scenario of intermediate marketing budget' impact.

3) Application of Integrated Marketing Budget (2500–5000$ ~ 50% of budget)

In the third scenario (**Figure 5**), the application of integrated levels of marketing budget for logistics SMEs is calculated. Integrated levels of marketing budget refer to 2500–5000$, so the authors selected the minimum amount for this test. So, we applied the level of 0.5 or 50% (2500$) in the marketing budget slot of the FCM simulation model. From this action, the variables of authority score, new and returning website users, and bounce rate were affected. More specifically, logistics SMEs' authority score decreased by 3%, their website bounce rate increased by 8%, and their returning and new users also increased by 13%, and 30% respectively. This means that even though logistics SMEs' marketing budget increased more, their authority score improved a bit than the previous level, while their bounce rate got even worse than the intermediate marketing budget' level, and their new and returning website users continued to increase.

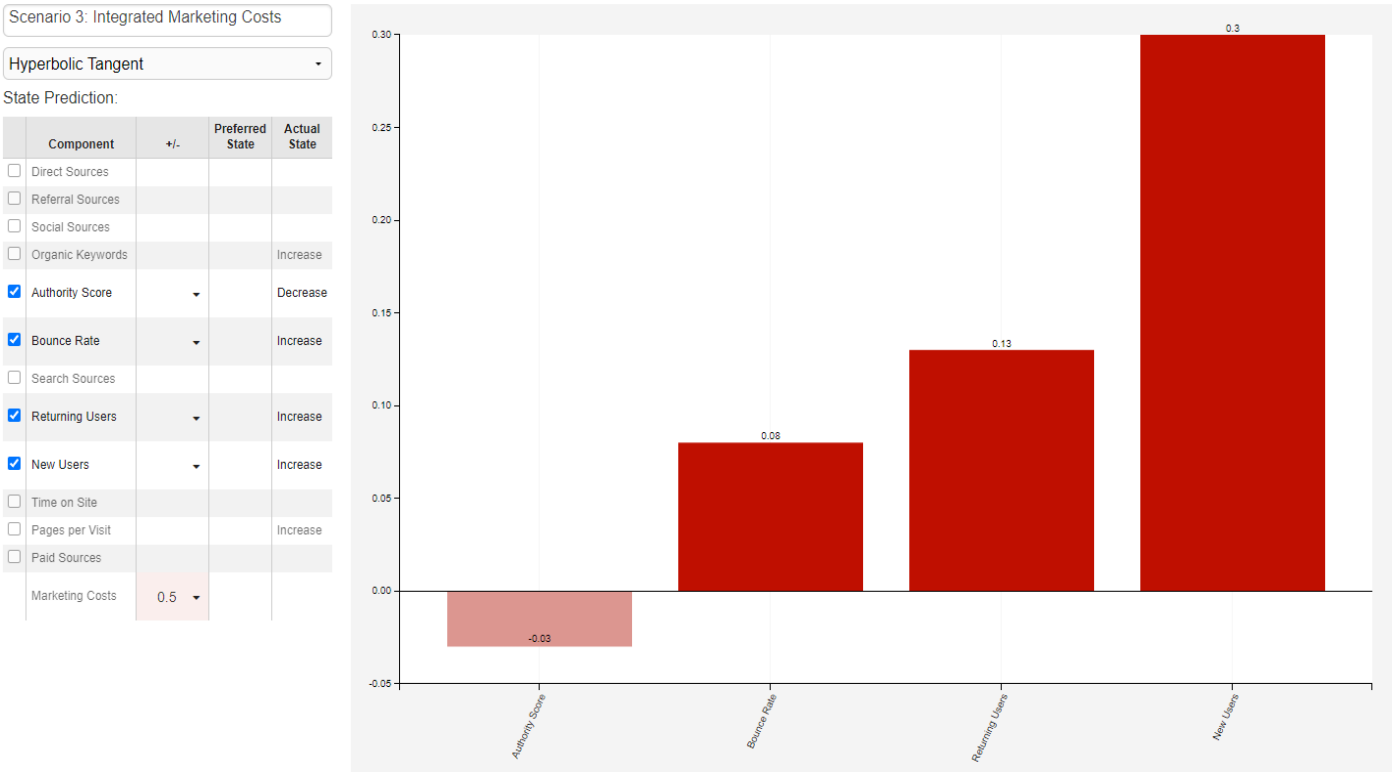

Figure 5. Illustration of the scenario of integrated marketing budget' impact.

4) Application of Aggressive Marketing Budget (5000+$ ~ 100% of budget)

In the final scenario (**Figure 6**), the application of aggressive levels of marketing budget for logistics SMEs is calculated. Aggressive levels of marketing budget refer to 5000$ and more, hence the authors selected the minimum amount for this test. So, we applied the level of 1 or 100% (5000$) in the marketing budget slot of the FCM simulation model. From this action, the variables of authority score, new and returning website users, and bounce rate were affected. More specifically, logistics SMEs' authority score was increased by 5%, their website bounce rate increased by 12%, and their returning and new users also increased by 15%, and 36% respectively. This means that through the increase in logistics SMEs' marketing budget, their authority score was finally enhanced, by reaching positive levels, their bounce rate continued to get worse by increasing even more, and their new and returning website users reached even more optimal levels.

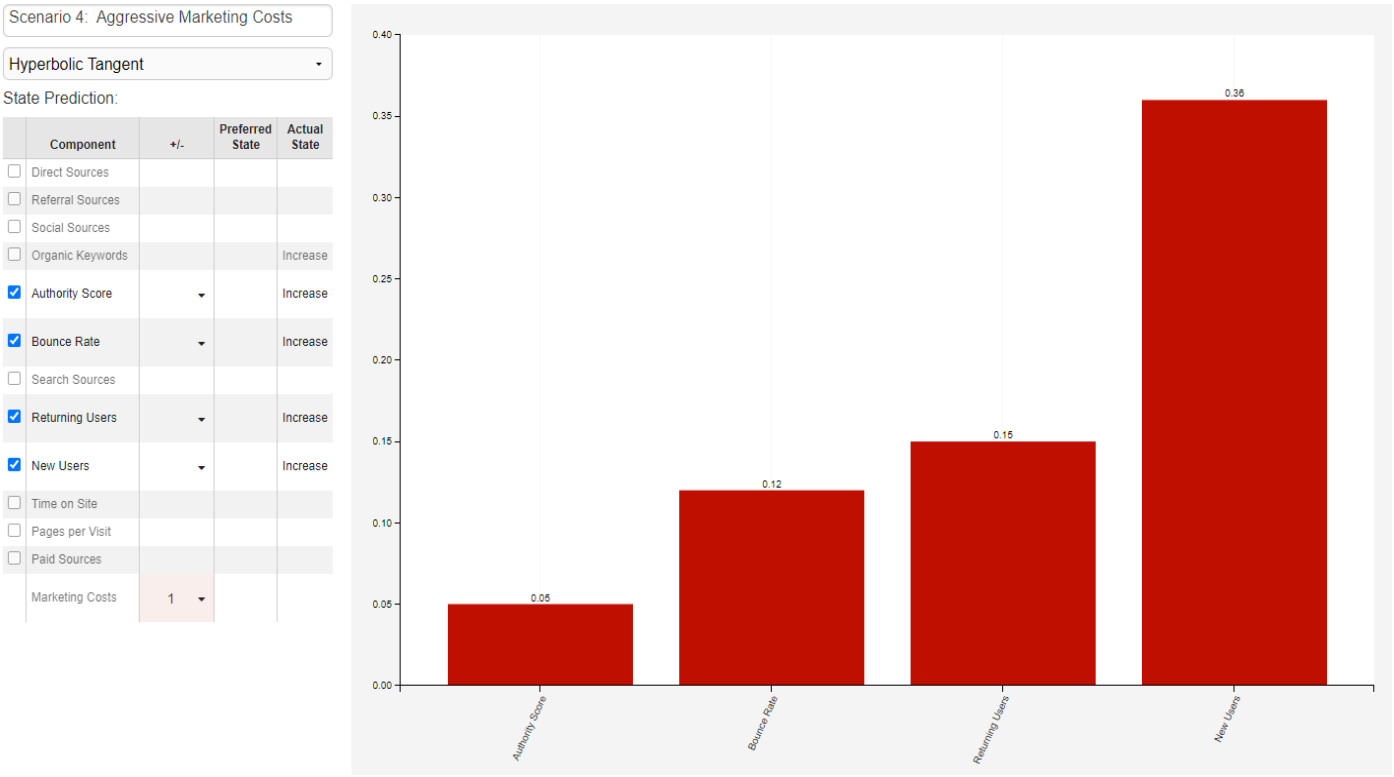

Figure 6. Illustration of the scenario of an aggressive marketing budget.

Discussion:

The deployed linear regression models were statistically significant, while marketing budget, as an independent variable, impacted significantly all the dependent ones. Logistics SMEs' authority score, new and returning website users tend to decrease when the marketing budget rises slightly, while the bounce rate tends to increase. All of the referred variables indicate reduced digital development (Sakas et al., 2023g). It is also worth noticing that all the research hypotheses of the study have been verified (H1, H2, H3, H4), which means that marketing budget can affect significantly logistics SMEs' digital development metrics (authority score, new and returning website users, and bounce rate). To extract more specific outcomes for the extent of the marketing budget's impact on logistics SMEs' digital development metrics, various levels of marketing budget were applied to the FCM model.

Regarding the results of the FCM scenarios, when applying different levels of marketing budget, the values of the digital development metrics (authority score, new and returning website users, and bounce rate) variated accordingly. For the FCM simulation, the platform of MentalModeler (2023) was utilized. It was noticed that when logistics SMEs' marketing budget is at a low level (introductory, intermediate, and integrated), around 500$ and 2500$, the amount of new and returning users to their website tends to increase, while the authority score decreases. This means that even though more traffic comes to logistics SMEs' websites, their quality remains low. To enhance the websites' quality (authority score) more investment in marketing activities should be made, meaning that the marketing budget should reach 5000$ and more (aggressive budget strategy). In this strategy, it was noted that authority score increases by 5%, new and returning website users by 15%, and 36% accordingly. The

bounce rate of logistics SMEs continues to increase in all the referred marketing budget levels, as an effect of increased website traffic that is not engaged to the content.

The allocation of marketing budgets in logistics SMEs can significantly impact their digital development. Various marketing budget levels cater to different needs and objectives, and the appropriate distribution depends on the company's goals, market conditions, and competitive landscape. Increasing the marketing budget from low or introductory to high or aggressive levels, the digital development of logistics SMEs accordingly. Nevertheless, the more logistics SMEs increase their marketing budget, the more their website abandonment rate increases. In summary, the appropriate marketing budget level for logistics SMEs' digital development depends on their specific circumstances, goals, and competitive landscape. Other than the budget size, a strategic and data-driven approach is crucial to maximize the impact of digital marketing efforts in the logistics industry.

Malisianou et al. (2024), studied the dairy sector's re-engineering of their digital marketing strategies and its impact on the efficient promotion of their products. More specifically, the web analytics of social traffic, backlinks, referring domains, organic traffic, etc. were found to enhance the ranking of their websites. Sakas et al. (2023g), studied the importance of social media analytics in the digital transformation and re-engineering of supply chain firms, while Aziz (2019) highlighted the need for supply chain SMEs to utilize organizational culture, knowledge, resources, and technology in the aim of achieving a successful business process reengineering (BPR) management. Lu et al. (2021), indicated the efficiency of integrating cutting-edge technologies like IoT to SMEs' goal of re-engineering the production process.

4. Conclusion

Re-engineering the marketing budget of logistics SMEs enables the distinction between various levels of investment and their impact on their digital development. For logistics SMEs to improve their digital development, an investment of 500$ to 5000$ could achieve this target, by attracting more visitors to their websites. Despite the increase in their websites' abandonment rate (due to the increase of website visitors that are unfamiliar with their services/content), logistics SMEs will increase the new and returning traffic to their websites, and thus their overall digital development. To achieve even more enhanced digital development results, the logistics SMEs should increase their marketing budget above 5000$. In this way, these firms could be able to enhance their websites' authority score, which would enable them to rank higher in the search engines of their potential customers (Sakas et al. 2023a).

The outcomes of this research are closely connected with multiple other studies in the fields of financial re-engineering for firms and SMEs. More specifically, Shahul Hameed et al. (2022), also highlighted the need for organizational and financial re-engineering of firms' processes and procedures to enhance digital development. Moreover, the importance of website customers in the development of competitive strategies for the achievement of digital development (Al-Shammari, 2023). Marketing processes should undergo extensive organization, as well as their estimated budget and its availability for spending to increase the firms' digital development (Lim, 2023; Salazar et al., 2023). In the logistics sector, SMEs and generally service

providers could benefit from budget re-engineering (Tripathi and Gupta, 2021), the public sector's impact on business budget re-engineering (Tsogkas et al., 2023), and specific business departments' development (Srinivas et al., 2020). Concerning digital development, SMEs can potentially exploit the re-engineering of the marketing budgets to further enhance them (Burhanuddin et al., 2021). Collaboration, adaptability, and a focus on data-driven decision-making are key elements in successfully discerning the optimal marketing budget levels in the context of logistics SMEs.

The utilization of big data in decision-making for logistics SMEs is highlighted as significant since it can depict the course of key indicators of firms' digital development. Therefore, this paper emphasizes the implication of various levels of the marketing budget as a factor in improving the digital development (Sakas et al., 2023d) of logistics SMEs. Big data can assist in re-engineering logistics SMEs' marketing budgets and define the optimal levels for promoting their digital development.

In conclusion, marketing budget process re-engineering in SMEs can lead to a more efficient, effective, and competitive approach to digital marketing. It empowers SMEs to leverage the full potential of digital channels, adapt to changing market dynamics, and achieve better outcomes in the online space. To grow and survive in the evolving field of marketing, SMEs must embrace changes. Changes are needed, at every level of the research, revising the existing process to reach improved efficiency. Our paper makes a mark at influencing policymakers within the company, and marketing experts to consider improvements to the marketing budget, based on the re-engineering outcomes, and defines the impact of each level of the marketing budget to SMEs' digital development metrics. We concluded this paper, by highlighting the need for a well-defined data project plan and a well-formatted collaboration among the company's different tiers of departments.

4.1. Limitations

Regarding the limitations of the present study, it is crucial to highlight that the sampling method employed may not provide a fully representative picture of the logistics SMEs' marketing budget re-engineering in sustainable digital marketing development. The specific sampling technique used can introduce inherent biases, potentially skewing the results and affecting the generalizability of the findings. For instance, if a convenience sampling method was used, the sample might over-represent certain groups while under-representing others, leading to an imbalanced view. Additionally, the range of data retrieval (365 days) was restricted to a particular timeframe or dataset, which may not adequately capture broader trends, seasonal variations, or long-term changes. This constraint limits the scope of the conclusions drawn, as the study's outcomes are based on a narrow dataset that might not reflect the full complexity or diversity of the research context. Moreover, the limited timeframe might omit significant events or fluctuations that could influence the results. Future studies should consider employing more diverse and randomized sampling methods to mitigate biases and expanding the range and duration of data collection, to 2 years or more, to enhance the robustness and applicability of their findings.

4.2. Future research

Based on the research outcomes and the importance of analyzing various re-engineering initiatives for SMEs, the authors could turn to other sectors for further elaboration. Apart from examining other production or market sectors, the analysis of other activities for re-engineering, as well as their effect on the digital development metrics of firms could be performed. The authors in previous research (Giakomidou et al., 2022) studied the SMEs in the energy sector and the re-engineering of their digital marketing processes. Throughout the study, it should be stated that, although the focus has been put on the logistics sector and its services, the methodology and attributes of the research could be adopted from other industries, such as the pharmaceutical.

For future research on marketing budget re-engineering for logistics SMEs, it is crucial to explore the long-term effects of digital marketing investments, assessing metrics like customer acquisition cost, lifetime value, and return on investment over multiple years to gauge sustainability. Additionally, integrating emerging technologies such as AI and machine learning for predictive analytics could enhance targeting and personalization, while blockchain could ensure secure, transparent transactions, boosting customer trust. Research should also investigate the efficacy of omnichannel marketing strategies that blend digital and traditional approaches, as well as the impact of social media and influencer marketing on brand recognition and community engagement. These avenues can provide logistics SMEs with comprehensive insights for optimizing their marketing budgets in an evolving technological landscape.

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