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An Upside-Down Logic-Based Neutrosophic Methodology: Assessment of Online Marketing Effectiveness in E-Commerce Enterprises

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Abstract: Online marketing plays a central role in the growth and competitiveness of e-commerce enterprises. However, evaluating its performance remains a complex task due to the presence of conflicting indicators, unpredictable user behavior, and shifting contextual factors. Standard evaluation models, which rely on fixed logic and linear metrics, often fall short of capturing the multi-layered realities of digital marketing environments. This paper proposes a novel framework that combines Upside-Down Logic with Neutrosophic Methodology to better interpret the effectiveness of marketing efforts. By integrating the dimensions of truth, falsity, and indeterminacy, the approach enables a more accurate representation of real-world scenarios where data signals can be ambiguous or contradictory. A case study of a mid-sized e-commerce business was developed to apply this methodology over a six-month simulated campaign period. Key marketing indicators including click-through rates, conversion, and retention—were analyzed using a neutrosophic model and logical transformations. These tools allowed for scenario-based interpretations that reflect changes in context, timing, and audience response. The outcomes highlight the limitations of traditional performance analysis and demonstrate how this logic-based model uncovers deeper insights. Campaigns that appear ineffective under conventional metrics may reveal hidden value when viewed through a more dynamic and flexible lens. The paper contributes to both theoretical understanding and practical strategy development in digital marketing, especially in environments characterized by uncertainty and non-linear behavior.

Keywords: Online Marketing; E-Commerce; Upside-Down Logic; Neutrosophy; Performance Evaluation; Contradiction; Fuzzy Logic; Contextual Analysis; Digital Metrics.

1. Introduction

In today's digitally interconnected economy, online marketing has become indispensable for the success of e-commerce enterprises. These businesses rely heavily on digital platforms to reach and influence consumers at scale, with strategies ranging from paid advertising and influencer collaborations to search engine optimization (SEO) and content-driven engagement [1]. Despite the apparent accessibility of data in online contexts clicks, impressions, bounce rates, and

conversion rates evaluating the true performance of online marketing remains challenging due to inherent uncertainty, contradictions, and behavioral unpredictability in user interactions [2]. Traditional performance evaluation models are largely based on deterministic or linear approaches, assuming that actions have predictable outcomes. However, online consumer behavior is often illogical, emotionally driven, and context-sensitive, rendering such models inadequate for capturing reality [3]. For instance, a campaign may achieve a high engagement rate but fail to generate sales, or a product with negative reviews may still achieve high conversions under certain promotions. These paradoxes call for non-traditional logic systems capable of handling ambiguity, contradiction, and incomplete knowledge. To bridge this gap, this paper introduces a novel methodology based on Upside-Down Logic and Neutrosophic Reasoning, a framework originally developed by Smarandache [4]. Upside-down logic refers to the structured inversion of truths and falsehoods transforming a "true" condition into a "false" one by shifting context, time, or perspective, and vice versa. This reversal allows us to explore performance under conflicting or misleading indicators, common in online environments [4]. Building upon this, Neutrosophic Logic offers a three-dimensional evaluation: truth, falsity, and indeterminacy. Instead of evaluating marketing success as a binary outcome (effective or not), this approach quantifies uncertainty and models mixed realities, for example, a campaign that is 70% effective, 20% inconclusive, and 10% counterproductive [5]. It provides a flexible, reality-reflecting methodology that is particularly suited for the digital marketing context where metrics are often noisy, interdependent, and contradictory. Incorporating these advanced logics, the methodology proposed in this paper allows for a more realistic and adaptable evaluation model. It is particularly useful when data patterns conflict, such as high ad reach with low engagement, or variable retention rates across platforms. By doing so, we contribute a structured decision-support model that considers ambiguity as an asset rather than a barrier to evaluation.

The rest of the paper is structured as follows: Section 2 presents a critical literature review of online marketing performance assessment and logic-based models in digital systems. Section 3 defines the study's objectives and motivations. Section 4 details the proposed neutrosophic upside-down methodology, including mathematical models and logic transformations. Section 5 demonstrates its application through a simulated case study. Section 6 presents sensitivity analysis and model validation. Finally, Section 7 concludes with insights and future research directions.

2. Literature Review

The landscape of online marketing performance evaluation has evolved significantly over the past two decades, paralleling the growth of digital technologies and consumer analytics. Early approaches to performance assessment focused on basic web metrics such as page views, impressions, and click-through rates (CTR). However, with the increasing sophistication of user behavior and marketing platforms, traditional models have struggled to account for complexity, ambiguity, and context-driven responses [6]. Several studies have attempted to build data-driven performance models, integrating conversion funnels, attribution modeling, and customer journey

mapping. Chaffey and Ellis-Chadwick [1] emphasized the role of multi-touch attribution and behavioral targeting in understanding consumer conversion patterns. These models often rely on quantitative inputs and linear causality, assuming that more exposure or higher engagement directly leads to greater ROI. Yet in reality, user behavior online is non-linear and influenced by psychological, social, and contextual variables that are hard to quantify precisely [3]. More advanced work has incorporated machine learning and artificial intelligence to predict customer behavior and optimize marketing strategies. Wedel and Kannan [2] highlight that while these models increase predictive power, they still operate under frameworks that assume well-structured data and clear causal relationships. They often fail to handle contradictory signals—such as when a campaign with poor initial metrics leads to long-term brand uplift. A promising shift in research has been the introduction of fuzzy logic, probabilistic reasoning, and hybrid models that deal with uncertainty. Fuzzy logic allows the modeling of imprecise states, such as "high engagement" or "moderate satisfaction," which align more realistically with how consumers perceive marketing stimuli [7]. However, fuzzy models do not directly capture contradictions or indeterminacy critical aspects in digital markets where reviews, feedback, and user actions often conflict. In this context, Neutrosophic Logic has emerged as an advanced framework for handling ambiguity, contradiction, and incomplete information. Developed by Smarandache [4], this logic introduces three components for every proposition: the degree of truth (T), the degree of falsity (F), and the degree of indeterminacy (I). Neutrosophic models have been applied in areas like decision-making [8], engineering risk assessment [9], and information retrieval [10], but its application in marketing performance evaluation is still unexplored marking a significant research gap this study seeks to address. Moreover, Smarandache's Upside-Down Logic provides a philosophical and operational mechanism to invert accepted truths, enabling researchers to test scenarios by altering context, logic, or interpretation. This is particularly relevant in online marketing, where a campaign may appear unsuccessful under standard metrics but prove effective when viewed under different temporal or behavioral conditions [4]. For example, a "failed" campaign may have seeded brand recognition that matures over time a classic case where traditional evaluation methods fall short.

This paper contributes to the literature by combining Neutrosophic Logic with Upside-Down Logic, creating a novel framework to evaluate digital marketing strategies in e-commerce enterprises. This approach acknowledges the dynamic, uncertain, and paradoxical nature of consumer behavior, and offers a structured yet flexible model to handle it.

3. Motivations and Objectives

Understanding the effectiveness of online marketing has become not just a technical challenge, but a strategic imperative for e-commerce enterprises. In digital ecosystems where customer

preferences shift rapidly, and signals from web metrics can often be conflicting or ambiguous, the need for more adaptive and insightful evaluation models is more pressing than ever.

3.1 Motivation

This research was born out of the observation that conventional performance metrics like click-through rate, cost per acquisition, or return on ad spend frequently fail to capture the true impact of marketing initiatives, especially in cases where success is not immediate or linear. Marketing managers may launch a campaign that receives modest engagement at first, only to discover months later that it triggered brand awareness, returning customer activity, or even viral spread through indirect channels. Traditional models struggle to interpret these "delayed effects" or "indirect influences."

Moreover, in practical scenarios, metrics often send mixed messages: a campaign might generate strong engagement but poor conversion, or low engagement but long-term retention. These cases are usually categorized as “anomalies” or “outliers,” when in fact they reflect the real complexity of consumer behavior online. This misalignment between measurable data and actual business impact leads to poor decision-making, wasted budget, and missed opportunities.

The Upside-Down Logic framework motivates a fundamental question: *What if we’ve been reading the data “upside-down”?* What if certain negative-looking results are, in fact, precursors to success and vice versa? This inversion of perspective opens a door to rethinking performance itself, not as a static truth, but as a contextual, reversible construct. Combined with Neutrosophic Logic, which allows us to model partial truth, partial falsity, and partial indeterminacy, we can build a performance evaluation system that reflects the real-world ambiguity of online interactions.

3.2 Objectives

This study sets out to achieve the following:

1. To propose a novel framework for evaluating online marketing performance using Upside-Down Logic and Neutrosophic principles.
2. To identify and model ambiguous, contradictory, or indeterminate signals in online marketing data that are typically overlooked in traditional models.
3. To construct a mathematical methodology that captures the three-dimensional nature of truth, falsehood, and uncertainty in performance metrics.
4. To apply the framework to a real-world or simulated e-commerce case study to demonstrate how the model interprets common but complex digital marketing scenarios.
5. To compare the results of the Neutrosophic-Upside-Down model with conventional performance evaluation approaches to showcase its explanatory and diagnostic power.

These objectives aim not only to introduce a new theoretical lens but also to offer practical value to marketing professionals who struggle with interpreting complex or contradictory data, helping them make more informed, context-aware decisions.

4. Methodology

Evaluating the performance of online marketing in e-commerce enterprises requires more than just data collection and statistical analysis it demands a way of thinking that aligns with the fluid, inconsistent, and context-sensitive nature of digital interactions. In this study, we propose a hybrid methodology that combines Upside-Down Logic and Neutrosophic Reasoning to build a performance evaluation framework that is both mathematically rigorous and conceptually flexible.

While conventional evaluation models often treat data as static and relationships as fixed, this methodology challenges that mindset by asking: *What happens when we reverse the logic? What if the "failure" of a campaign is a success in disguise?* These aren't just philosophical questions they're deeply practical in environments where user behavior defies traditional models.

4.1 Why Upside-Down Logic and Neutrosophy?

Upside-down logic, as defined by Smarandache [4], introduces a mechanism to reinterpret outcomes by altering the logical structure of assumptions. In marketing, this might involve evaluating a campaign not just by what it directly achieved, but also by what alternative meaning its outcomes might hold in a different context time, audience, or sequence.

For example, a paid ad with low CTR might still act as a seed for organic traffic later. Inverting its apparent "failure" through logical reversal allows us to analyze its value beyond first-glance metrics. To operationalize this concept mathematically, we introduce Neutrosophic Logic, which extends binary logic into three memberships :

1. T, the degree to which a marketing outcome is effective.
2. F, the degree to which it is ineffective.
3. I, the uncertainty due to time delay, conflicting signals, or missing context [9].

This triad makes it possible to handle partial success, paradoxical results, or outcomes that are context-dependent common phenomena in digital environments.

4.2 Neutrosophic Representation of Performance

Each marketing metric M is transformed into a neutrosophic set represented as: $M = (T_M, I_M, F_M)$

Where:

T_M is the truth membership value (effectiveness)

I_M is the indeterminacy membership value (ambiguity or uncertainty)

F_M is the falsity of membership value (ineffectiveness)

These values satisfy the general condition $0 \leq T_M+I_M+F_M \leq 3$. This flexibility allows us to model, for instance, a marketing campaign with: $M_{\text{Email Campaign}} = (0.6,0.3,0.1)$. This means 60% effectiveness, 30% ambiguity (due to delayed conversions or mixed feedback), and 10% ineffectiveness (measured by bounce rate or unsubscribes).

4.2.1. Neutrosophic Mapping Criteria

To transform traditional marketing metrics into neutrosophic values T, I, and F, a structured and repeatable mapping approach was used. This process involved the following steps:

Step 1: Normalization: Each metric such as CTR, conversion rate, and bounce rate—was first scaled between 0 and 1 based on typical performance ranges observed in the e-commerce sector.

Step 2: Threshold-based Interpretation:

2.1 A high CTR (above 3%) and a strong conversion rate (above 2%) were interpreted as indicators of campaign effectiveness and contributed positively to the T value.

2.2 A high bounce rate above 60% was treated as a negative indicator, increasing the F score.

2.3 If the values fell within ambiguous or borderline ranges e.g., CTR around 2%, bounce rate between 50–60%, a portion of the score was allocated to I to reflect uncertainty.

Step 3: Balancing the Scores: The final T, I, and F values were adjusted so that their sum did not exceed 1. This ensured the scores remained proportionate and logically consistent.

This mapping method provided a consistent way to represent the quality of each campaign in a neutrosophic format, making the analysis more transparent and easier to replicate in future studies.

4.3 Logical Reversal Through Contextual Mapping

Upside-down logic is introduced by altering context, defined as:

$$M' = f_c(M) \quad (1)$$

Where f_c is a transformation function that re-evaluates the metric M under a different condition:

i. Time-shifted: e.g., impact assessed after 30 days instead of 7.
ii. Platform-dependent: e.g., how Instagram engagement may affect website traffic.
iii. Target shift: when evaluating from the perspective of returning *vs*. new customers.

Example 4.1

A campaign that looks like:

M= (0.2,0.5,0.3) can be re-evaluated under Upside-Down Logic as M′=(0.3,0.5,0.2)

Where a different context (delayed brand impact) flips the interpretation of effectiveness and ineffectiveness.

4.4 Aggregation Model for Campaign Evaluation

To evaluate a marketing strategy composed of multiple campaigns $\{M_1,M_2,\ldots,M_n\}$, we use a weighted aggregation:

$P = (\sum(wi * Ti), \sum(wi * Ii), \sum(wi * Fi))$ (2)

Where:

W_i is the weight of each campaign based on budget, reach, or strategic importance. T_i, I_i, *and* F_i represent the Truth, Indeterminacy, and Falsity scores respectively for each campaign.

This aggregated set *P* represents the overall performance profile of the marketing program. A strong strategy would ideally show:

a. High total *T*
b. Low total *F*
c. Manageable *I* (uncertainty is not always bad it reflects the opportunity to learn)

For example, if we have five campaigns with various weights and scores as demonstrated in the earlier case study, applying this model enables marketers to synthesize diverse data points into a single interpretable performance vector.

This model is valuable for simplifying complex performance landscapes and making high-level budgetary or strategic decisions based on a composite view rather than isolated metrics.

4.6 Summary of Steps

1. Collect campaign data: metrics such as CTR, CPC, ROI, and time on site.
2. Transform metrics into neutrosophic values T, I, and F based on logic thresholds and contextual evaluation.
3. Apply Upside-Down Logic to reinterpret metrics under alternate assumptions.
4. Aggregate campaign performance into an enterprise-wide profile.
5. Visualize and analyze using ternary diagrams and context-sensitive benchmarks.

To ensure that the neutrosophic values T, I, and F assigned to each campaign are both meaningful and repeatable, we applied a combination of logic-based thresholds and contextual rules. For instance, a campaign with a high CTR above 3% and a low bounce rate below 50% was interpreted as generally effective and thus received a higher Truth score. Conversely, a campaign with poor conversion and a bounce rate above 60% was associated with a higher Falsity value. In cases where the indicators provided mixed signals such as moderate engagement but low conversion Indeterminacy was used to capture this uncertainty. This rule-based mapping allowed us to reflect real-world marketing variability without relying on rigid formulas or subjective assumptions. This methodology is not just a new evaluation tool; it is a new way to think about performance one that acknowledges ambiguity, embraces contradictions, and empowers decision-makers to derive meaning beyond surface-level numbers.

5. Application of Neutrosophic Upside-Down Logic to Online Marketing Campaigns

To demonstrate the practical applicability of the proposed methodology, we developed a detailed case study simulating the online marketing performance of a mid-sized e-commerce enterprise. The company operates in the fashion retail sector and runs multiple digital campaigns across various platforms. The aim is to evaluate these campaigns not solely on traditional KPIs but using the Neutrosophic-Upside-Down framework, which allows a deeper interpretation of ambiguous and conflicting performance signals.

5.1 Campaign Overview and Data Collection

Five major marketing channels were analyzed:

1. Google Ads
2. Instagram Influencers
3. Email Newsletter
4. SEO Content Strategy
5. Facebook Ads

For each campaign, core metrics were collected including CTR, Conversion Rate, and Bounce Rate. These were used to derive Neutrosophic performance scores, estimating the T, I, and F of each campaign's outcome. Each campaign was also assigned a budget weight (w), representing its share of total marketing spend. The results are summarized in Table 1.

Table 1. Summary of Marketing Campaign Performance and Neutrosophic Scores

Campaign	CTR (%)	Conversion Rate (%)	Bounce Rate (%)	T	I	F	w
Google Ads	2.8	1.4	55	0.60	0.20	0.20	0.25
Instagram Influencers	3.5	0.9	62	0.40	0.40	0.20	0.20
Email Newsletter	1.2	2.3	40	0.70	0.20	0.10	0.15
SEO Content	4.1	1.8	48	0.65	0.25	0.10	0.25
Facebook Ads	2.2	1.1	60	0.45	0.30	0.25	0.15

5.2 Explanation of Neutrosophic Values

The Neutrosophic T values reflect the positive, measurable impact of each campaign. For example, Email Newsletters scored the highest on this scale 0.70, supported by its relatively high conversion rate and low bounce rate. In contrast, Instagram Influencer campaigns, though having the highest CTR, showed lower conversions and higher bounce rates, leading to a higher I = 0.40, suggesting mixed or unclear impact.

The F dimension captures signs of ineffectiveness, such as user disengagement or poor post-click experience. Facebook Ads, for instance, had a higher falsity score of 0.25, consistent with its modest conversion and relatively high bounce rate.

This model allows us to differentiate between campaigns that are "definitely effective," "possibly effective," and "probably ineffective", offering a richer performance profile than binary success/failure judgment.

5.3 Logical Reversal and Contextual Insights

Using Upside-Down Logic, we then explored how some campaigns might appear differently when the context shifts. For instance:

a. Google Ads, while appearing moderately effective in its default interpretation, may have delayed effects through retargeting, increasing its true impact over time.
b. The Email Newsletter, showing high effectiveness in a direct sense, could be reevaluated as even more influential when factoring in indirect returns such as repeat visits or cross-channel conversions.

By modeling these reversals, the campaigns were reinterpreted through transformed scores, validating the usefulness of Upside-Down Logic in revealing hidden performance layers.

5.4 Aggregated Neutrosophic Performance

To assess overall marketing performance, we applied Eq.(2) using the weights and scores from Table 1, the final performance profile for the entire strategy was computed as:

T = 0.25*0.60 + 0.20*0.40 + 0.15*0.70 + 0.25*0.65 + 0.15*0.45 = 0.5825

I = 0.25*0.20 + 0.20*0.40 + 0.15*0.20 + 0.25*0.25 + 0.15*0.30 = 0.2525

F = 0.25*0.20 + 0.20*0.20 + 0.15*0.10 + 0.25*0.10 + 0.15*0.25 = 0.165

This leads to an overall performance vector P= (0.5825,0.2525,0.165)

These results indicate that the overall marketing strategy leans toward effectiveness but still includes a notable share of uncertainty. Rather than discarding this indeterminacy, the model embraces it seeing it as a signal for further testing or learning, not as a failure.

This case study confirms that using Upside-Down Logic and Neutrosophy provides richer, more practical insights than traditional evaluation tools. It does not only assess what "worked," but explores why some things appear not to work revealing their latent, context-dependent value. This is a critical step for any e-commerce business operating in the complex and ambiguous terrain of online marketing.

The aggregated neutrosophic vector provides a multidimensional view of the overall strategy's performance, but its real value lies in guiding practical decisions. A high T score such as above 0.6 may justify scaling successful campaigns or reallocating more budget toward them. If I exceeds 0.25, it suggests informational gaps or unstable signals, indicating a need for further testing, audience segmentation, or data collection before making firm decisions. A F value above 0.20 could signal inefficiency, warranting budget cuts or strategic revision for the corresponding channels. These interpretive thresholds offer a starting point for translating neutrosophic outputs into actionable marketing strategies.

5.5 Comparison with Traditional ROI-Based Evaluation

To support the claim that the neutrosophic model offers more insightful analysis than traditional evaluation methods, a simple comparative assessment was conducted using a conventional ROI-based approach. In this baseline model, campaign performance was ranked primarily by conversion rate, which is commonly used in digital marketing as a proxy for effectiveness.

Under this traditional approach, the Email Newsletter campaign appeared as the top performer due to its high conversion rate 2.3% and low bounce rate. SEO Content and Google Ads followed, while Instagram Influencer campaigns ranked lower due to relatively weak conversion outcomes, despite having strong engagement levels CTR = 3.5%.

However, this method failed to capture important nuances. For instance, the Instagram campaign, while low in direct conversions, showed high user interaction, suggesting potential for delayed or indirect value e.g., brand awareness or repeat visits. This value was not reflected in the ROI score but was clearly identified in the neutrosophic evaluation, where it received a higher I score. Similarly, SEO Content received a balanced score in the neutrosophic model, acknowledging both its measurable performance and its partially ambiguous outcomes.

This comparison highlights how the neutrosophic model does not replace conventional analysis but supplements it with a more comprehensive and context-aware perspective. While ROI models offer a snapshot of immediate outcomes, the neutrosophic approach provides a layered interpretation that accounts for uncertainty, contradictions, and long-term potential making it better suited for complex, real-world marketing environments. Table 2 illustrates the ranking differences between a traditional ROI-based assessment and the neutrosophic evaluation model, highlighting how each method interprets campaign performance from a different analytical perspective.

Table 2. Comparison Between ROI-Based and Neutrosophic Evaluations

Campaign	ROI-Based Rank	Neutrosophic Evaluation
Email Newsletter	1	High Truth
SEO Content	2	Balanced (T > I)
Google Ads	3	Moderate T, Low I
Facebook Ads	4	Low T, High F
Instagram Influencers	5	High Indeterminacy

6. Sensitivity Analysis

The robustness of any performance evaluation model lies not only in its ability to represent real data but in its responsiveness to change. In marketing environments, conditions such as budget allocation, timing, and audience behavior are highly variable. This section presents a sensitivity analysis based on the neutrosophic framework to assess how different contextual shifts affect overall campaign performance.

The sensitivity scenarios were designed not as random variations, but to reflect plausible real-world changes often observed in digital marketing contexts. For instance, in Scenario A, the increase in Truth scores for Email and SEO campaigns simulates brand-building effects that typically become measurable over time an observation supported by longitudinal studies on content marketing impact e.g., Kotler et al., 2021 . Scenario B assumes higher indeterminacy in Google Ads and Instagram, based on recent platform-level changes such as privacy policy updates or algorithm shifts , which are known to introduce noise into performance metrics. Although these adjustments are modeled for simulation purposes, they are grounded in typical industry patterns reported in practice and literature. The results for each are displayed in full tabular form below, with interpretation integrated into the analysis.

6.1 Scenario A

In this scenario, we assume that delayed brand effects begin to manifest, revealing greater actual impact from Email Newsletters and SEO content campaigns. Their T values were increased, and both I and F were reduced accordingly. Table 3 presents scenario A, in which the effectiveness of Email and SEO campaigns has been improved to reflect their potential long-term impact.

Table 3. Scenario A Increased T in Email and SEO Campaigns

Campaign	T	I	F
Google Ads	0.60	0.20	0.20
Instagram Influencers	0.40	0.40	0.20
Email Newsletter	0.80	0.15	0.05

SEO Content	0.75	0.20	0.05
Facebook Ads	0.45	0.30	0.25

The shift in truth values repositions Email and SEO as top-performing campaigns, both in terms of absolute effectiveness and cost-efficiency. The overall strategy becomes more performance-heavy, and the balance between indeterminacy and falsity improves supporting the notion that timing and delayed results matter in evaluation.

6.2 Scenario B

Here, we simulate a situation where feedback becomes more mixed and less predictable for Google Ads and Instagram campaigns. Perhaps recent platform changes or external noise e.g., algorithm updates, and seasonal shifts introduce more ambiguity. Table 4 provides Scenario B, where uncertainty is increased for Google and Instagram campaigns, simulating platform-related ambiguity.

Table 4. Scenario B Elevated Indeterminacy in Google and Instagram

Campaign	T	I	F
Google Ads	0.45	0.40	0.15
Instagram Influencers	0.30	0.50	0.20
Email Newsletter	0.70	0.20	0.10
SEO Content	0.65	0.25	0.10
Facebook Ads	0.45	0.30	0.25

This scenario highlights a critical risk: even campaigns with good surface-level performance like high CTR may be hiding large degrees of uncertainty. The indeterminacy spikes suggest that reliance on conventional metrics alone might mislead decision-makers, reinforcing the importance of neutrosophic modeling in capturing this hidden volatility.

6.3 Scenario C

In this neutral baseline, we assume that all campaigns stabilize to an equal performance level, reflecting perhaps a mature marketing team standardizing practices or algorithmic rebalancing across platforms. Table 5 displays scenario C, which assumes uniform efficiency across all campaigns, reflecting a hypothetical balanced strategy.

Table 5. Scenario C Equalized Campaign Effectiveness

Campaign	T	I	F
Google Ads	0.60	0.20	0.20
Instagram Influencers	0.60	0.20	0.20
Email Newsletter	0.60	0.20	0.20
SEO Content	0.60	0.20	0.20
Facebook Ads	0.60	0.20	0.20

While this scenario appears “safe,” it shows reduced strategic diversity. Uniformity might simplify planning, but it removes the opportunity for targeted optimization. In real business conditions, such balance is rare and may even mask underperformance in certain channels.

6.4 Model Validation

To validate the method's credibility, we performed cross-comparisons between the aggregated performance vectors from each scenario using the same weighted summation method used in Section 5. Table 6 summarizes the aggregated neutrosophic scores T, I, and F across all scenarios, confirming the model's adaptability and reliability.

Table 6. The aggregated neutrosophic scores

Scenario	Aggregated T	Aggregated I	Aggregated F
Scenario A	0.6425	0.2225	0.135
Scenario B	0.495	0.33	0.175
Scenario C	0.60	0.20	0.20

Conclusion of Validation:

a. *Scenario A* shows enhanced overall effectiveness model captures the impact of long-term results.
b. *Scenario B* highlights the sensitivity to ambiguity, helping preempt potential failure points.
c. *Scenario C* confirms that the model behaves predictably when data is balanced.

These results validate that the neutrosophic-upside-down methodology responds meaningfully to real-world changes in marketing conditions, capturing nuance and offering actionable insights beyond surface metrics.

7. Conclusion and Future Research Directions

This paper presented a structured and adaptable framework for evaluating the performance of online marketing strategies in e-commerce settings, by integrating concepts from Upside-Down Logic and Neutrosophic Logic. Unlike traditional evaluation models that tend to classify results in binary terms either successful or unsuccessful this approach captures the complexities of real-world digital marketing, where outcomes are often ambiguous, delayed, or even contradictory.

The model was applied to five commonly used marketing channels in mid-sized e-commerce businesses: Google Ads, Instagram Influencers, Email Newsletters, SEO Content, and Facebook Ads. These channels represent a significant portion of digital engagement today. However, the study acknowledges that it does not include fast-evolving platforms such as TikTok, YouTube, or LinkedIn, nor does it account for offline channels that may influence online behavior. As digital ecosystems continue to diversify, future research should explore how the framework performs across a wider range of platforms and marketing environments. Through a detailed case study, the research demonstrated that campaigns which may appear weak under conventional analysis can reveal hidden potential when analyzed through a more flexible lens. The model responded effectively to different contextual scenarios and provided richer insights that support more nuanced decision-making.

At the same time, it is important to recognize that the methodology involves abstract logic and weighted computations, which may be challenging for marketing professionals who lack technical or analytical backgrounds. To bridge this gap, future development should focus on building user-friendly tools such as interactive dashboards, spreadsheet calculators, or basic software modules that simplify the process. These tools could automate the transformation of

standard marketing metrics into neutrosophic values and offer intuitive visual outputs, allowing decision-makers to benefit from the model without requiring advanced mathematical expertise. In summary, this research offers a practical and conceptually enriched way of understanding marketing performance one that embraces uncertainty, encourages deeper analysis, and brings human judgment back into the evaluation process in an increasingly complex digital landscape.

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