# Research on Digital Marketing Strategy Optimization Based on 4P Theory and Its Empirical Analysis

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**Abstract:** Objective: This study explores an optimization model for digital marketing strategies based on the 4P theory, addressing the limitations of traditional marketing in digital environments, enhancing corporate profitability, user conversion rates, and customer satisfaction, and verifying the effectiveness of the optimized strategies. Methods: Based on the 4P theory, combined with dynamic pricing models and omnichannel layouts, we constructed an optimization model aimed at maximizing profits. Through simulation experiments, we compared experimental and control groups of electronic products, clothing, and daily necessities on an e-commerce platform. The evaluation indicators included profit growth rate, user conversion rate, and customer satisfaction index. Results: The optimized strategies significantly improved marketing performance: the experimental group's profit growth rate increased by 25%-33.3% compared to the control group, user conversion rates improved by 50%-66.7%, and the average customer satisfaction index increased by 6-8 points. Conclusion: The optimization strategies based on the 4P theory have significant value in digital environments, providing support for enhancing enterprise competitiveness and resource allocation efficiency. Future work can expand multi-scenario validations and integrate artificial intelligence to achieve real-time strategy optimization.

***Keywords*:** 4P Theory, digital marketing, strategy 0ptimization, dynamic pricing

## 1. Introduction

As digital technologies progress, the personalization of consumer actions is on the rise, presenting obstacles to conventional marketing tactics like ineffective resource distribution. The fusion of internet technologies and marketing theories in digital marketing opens up fresh avenues for businesses to accurately connect with their clientele. Adjustments in the digital realm are necessary for the 4P theory (Product, Price, Place, Promotion), encompassing aspects like product customization, fluctuating pricing, comprehensive channel integration, and specific promotional strategies. The research develops a model for optimizing digital marketing, focusing on profit maximization, grounded in the 4P theory and integrating both dynamic pricing and tailored advice. The efficacy of this approach is confirmed through empirical studies, offering both theoretical and practical backing for digital marketing strategies.

## 2. Research Background and Theoretical Foundation

### 2.1 Core Concept of the 4P Theory and Its Digital Extension

McCarthy's 4P theory, a traditional marketing model, comprises four key components: Product, Price, Place, and Promotion. The focus is on methodically refining tactics to satisfy consumer needs and boost a company's competitive edge. During the era of digitalization, the 4P theory has become intricately intertwined with contemporary marketing technologies, broadening its scope[1]. In the digital realm, 4P strategies become more adaptable: products emphasize customization and variety, pricing integrates large-scale data and fluctuating pricing, channels evolve towards all-encompassing integration, and promotions utilize social media and focused delivery for more effective interactions.

### 2.2 Characteristics and Current Development of Digital Marketing

The essence of digital marketing lies in internet technologies, and it attains targeted marketing via data mining and analysis. Digital marketing, in contrast to conventional approaches, offers insights based on data, exact customer engagement, and effective communication. This facilitates the segmentation of customers and precise positioning via extensive data analysis and algorithmic methods. The focus of digital marketing lies in tailoring services and engaging users, leveraging technologies like social media and search engine optimization to provide offerings that more effectively satisfy consumer requirements[2]. Yet, as its applications grow and become more complex, digital marketing encounters challenges like disjointed strategies and ineffective resource distribution, necessitating theoretical direction and the backing of optimization models.

### 2.3 Practical Application and Optimization Needs of the 4P Theory in Digital Marketing

Within the digital realm, optimizing the 4P theory to match internet features is necessary. The design of products should prioritize digitalization and accurate suggestions, with dynamic pricing boosting pricing adaptability, omnichannel configurations enhancing resource allocation, and specific promotions fortifying user interactions. Yet, the conventional 4P theory falls short in adequately addressing real-time interaction and engagement, thereby restricting its practical use in digital marketing[3]. Developing an optimization framework grounded in the 4P theory serves to connect theoretical concepts with practical application, aiding businesses in their digital evolution.

## 3. Optimization Model and Theoretical Formulas

### 3.1 Optimization Goals of the 4P Theory in Digital Marketing

Digital marketing tactics grounded in the 4P theory aim to optimize corporate earnings, taking into account both user experience and market dominance. Within the digital realm, the growing personalization and dynamism of consumer needs render conventional static marketing approaches inadequate for the swiftly evolving markets. Achieving the optimization objective necessitates meticulous modifications in product design, pricing tactics, channel configurations, and marketing techniques to ensure synchronized alignment in all aspects. This approach aims not just for immediate financial gains but also for enduring enhancements in brand impact and maintaining user loyalty..

### 3.2 Profit Maximization Formula Based on the 4P Theory

To optimize digital marketing strategies, this study constructs a formula centered on profit maximization, performing quantitative analysis of how the various dimensions of the 4P strategy impact overall profits, thereby providing a decision-making basis[4]. The specific formula is as follows:

$$maxP = \sum_{i=1}^{N} \left( R_i - C_i \right) \cdot S_i$$

Where $P$ represents the total profit, $R_i$ is the revenue of a single product, $C_i$ is the cost of a single product, and $S_i$ represents the channel weight. The formula indicates that profit optimization is not only related to the difference between revenue and cost but also influenced by channel strategies. By modeling and analyzing sales data across different products and channels, it is possible to dynamically adjust strategy weights for each dimension, thereby optimizing overall marketing effectiveness.

### 3.3 Dynamic Pricing Model and Its Mathematical Principles

The dynamic pricing model is a critical component of digital marketing optimization strategies. Its core lies in adjusting prices based on real-time changes in market demand and user behavior data. The pricing formula is as follows:

$$Price_i = \frac{a \cdot D_i + b}{1 + e^{-k \cdot (D_i - \quad)}}$$

Where $D_i$ irepresents the market demand forecast value, and a, b, k, θ are model parameters. This formula ensures that pricing reflects market competition dynamics while maximizing profits within consumers' acceptable ranges by incorporating demand elasticity and market dynamics. By optimizing and adjusting the parameters, personalized pricing for different products, regions, and user groups can be achieved, providing data-driven support and algorithmic guarantees for the pricing strategy under the 4P theory.

## 4. Simulation Experiment Design

### 4.1 Experimental Design Concept and Objectives

The research utilizes a simulated experiment to confirm the efficacy of the refined digital marketing strategy model, grounded in the 4P theory, in real-world scenarios. The primary aim of this study is to assess the efficacy of conventional marketing tactics against enhanced digital ones in boosting business earnings, increasing user conversion, and elevating customer contentment. This study concentrates on the quartet of aspects - product, pricing, location (channel), and digital marketing - by simulating the effects of various strategy pairings on marketing efficacy and examining the data to discern

the influence of crucial elements.

### 4.2 Experimental Variables and Group Setup

This study focuses on electronic goods, apparel, and everyday essentials via a designated e-commerce site, categorizing the participants into a control and an experimental segment. The control group utilizes conventional marketing tactics, encompassing set prices, absence of tailored suggestions, exclusive online platforms, and widespread promotions. Based on the 4P theory, the test group adopts refined tactics including flexible pricing, tailored recommendation systems, all-channel configurations, and focused content marketing[5]. Spanning 30 days, the study gathers crucial metrics like sales income, click-through frequencies, conversion percentages, and customer contentment ratings for a comparative study.

### 4.3 Selection and Explanation of Evaluation Metrics

To comprehensively evaluate the effectiveness of the optimized strategies, the experiment selects the following three key indicators:

(1) Profit Growth Rate (PGR): This metric measures the degree of profit improvement. The calculation formula is:

$$PGR = \frac{P_{exp} - P_{con}}{P_{con}} \times 100\%$$

Where $P_{exp}$ and $P_{con}$ represent the total profits of the experimental group and control group, respectively.

(2) Conversion Rate (CR): This metric assesses the proportion of visitors who are converted into purchasing customers. The calculation formula is:

$$CR = \frac{N_{buy}}{N_{visit}} \times 100\%$$

Where $N_{buy}$ represents the number of purchasing users, and $N_{visit}$ represents the total number of visitors.

(3) Customer Satisfaction Index (CSI): This metric is calculated based on scores from questionnaire surveys, using a 100-point scale and taking the average score of the sample.

## 5. Experimental Results and Empirical Analysis

### 5.1 Analysis of Profit Growth Rate Optimization

The comparison of profit growth rates between the experimental group and the control group is shown in Table 1.

**Table 1. Comparison of Profit Growth Rates Across Product Categories**

| Product Category | Control Group Profit (10,000 CNY) | Experimental Group Profit (10,000 CNY) | Profit Growth Rate (PGR, %) |
|---|---|---|---|
| Electronics | 40 | 50 | 25% |
| Clothing | 24 | 30 | 25% |
| Daily Necessities | 15 | 20 | 33.30% |

The study reveals a notably greater rate of profit increase for the experimental group compared to the control group in all product categories. Within this group, everyday essentials reached a peak profit increase of 33.3%, a figure intimately linked to the success of tailored advice and adaptable pricing tactics in markets sensitive to pricing. In summary, the refined 4P tactics markedly improved the profitability of companies.

### 5.2 Improvement in User Conversion Rates and Reasons

The user conversion rate data for the experimental and control groups are shown in Table 2.

**Table 2. Comparison of User Conversion Rates Between Experimental and Control Groups**

| Product Category | Control Group Conversion Rate (%) | Experimental Group Conversion Rate (%) | Increase (%) |
|---|---|---|---|
| Electronics | 12% | 18% | 50% |
| Clothing | 8% | 12% | 50% |
| Daily Necessities | 6% | 10% | 66.70% |

The marked enhancement in the rates of user conversion mirrors the success of the tactics employed within the experimental cohort. The most significant enhancement was noted in everyday essentials, credited to the success of specific marketing strategies in engaging the appropriate demographic and boosting the likelihood of purchases. Enhancements in the conversion rates for electronics and apparel stemmed from the adoption of tailored suggestions and omnichannel advertising, boosting consumer trust and ease in buying.

### 5.3 Changes in Customer Satisfaction Index and Evaluation of Marketing Strategies

The comparison of the Customer Satisfaction Index (CSI) between the experimental and control groups is shown in Table 3.

**Table 3. Comparison of Customer Satisfaction Index (CSI) Between Experimental and Control Groups**

| Product Category | Control Group CSI | Experimental Group CSI | Increase |
|---|---|---|---|
| Electronics | 80 | 88 | 8 |
| Clothing | 75 | 82 | 7 |
| Daily Necessities | 78 | 84 | 6 |

There was a notable rise in the Customer Satisfaction Index within the test group, suggesting that the refined approaches grounded in the 4P theory significantly enhanced the user experience. Customized suggestions and adaptable pricing strategies boosted consumer approval of products and pricing, the omnichannel approach improved shopping ease, and focused content marketing bolstered brand confidence and fidelity.

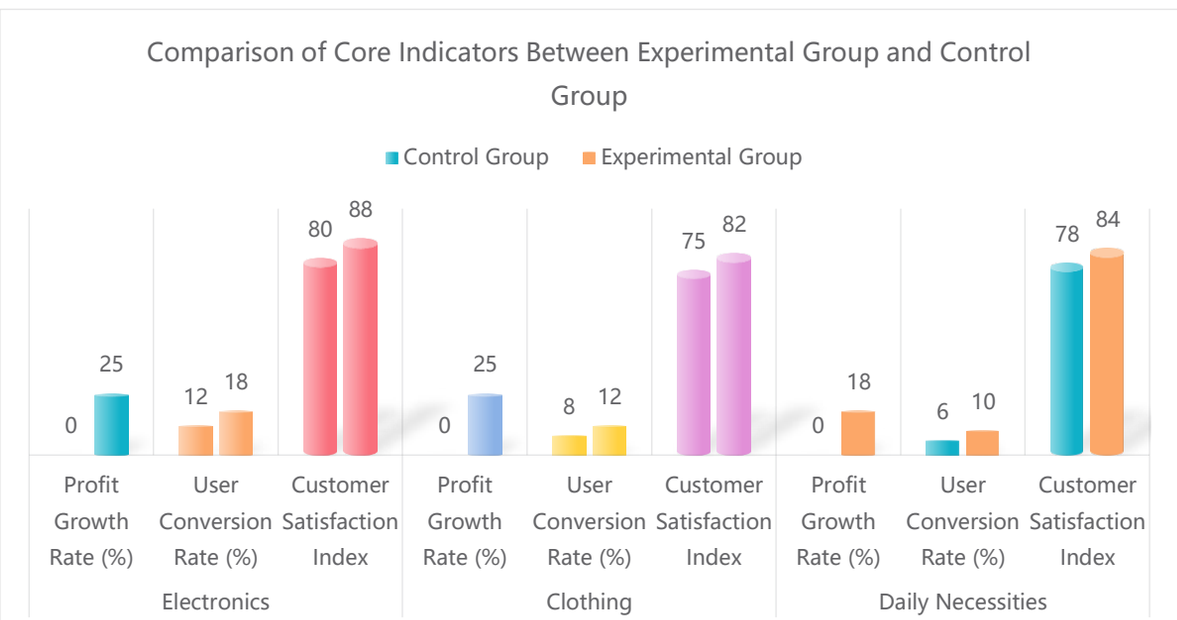


**Figure 1. Comparison Of Core Indicators Between Experimental And Control Groups**

Experimental findings reveal that the refined tactics based on the 4P theory markedly boosted profits, increased user conversion, and boosted customer contentment, thereby boosting a company's competitive edge in the digital marketing sphere. This offers concrete evidence and theoretical underpinnings for marketing strategies in the digital age.

## 6. Research Conclusions and Prospects

### 6.1 Research Conclusions and Key Findings

The research concentrated on refining the use of the 4P theory in digital marketing, developing a model for maximizing profits and confirming its efficacy via simulation tests. Findings suggest that a blend of product customization, adaptable pricing strategies, omnichannel designs, and focused marketing can markedly improve profitability, conversion rates, and client contentment. The experimental results reveal that the refined approaches surpass the control group in every aspect, confirming the 4P theory's relevance and capacity for enhancement in digital marketing. This offers a blend of theoretical

and practical backing for its application in digital contexts.

### 6.2 Practical Value of Optimized Digital Marketing Strategies

Enhancing digital marketing tactics using the 4P theory broadens their usability and provides distinct, actionable advice for businesses. Enhancing the design and recommendation processes of products can accurately satisfy consumer requirements; flexible pricing and integration of channels boost the efficiency of resource distribution; focused marketing efforts fortify the bond between brands and consumers, thereby boosting market competitiveness. Through the application of scientific data scrutiny and strategic modifications, the study's results significantly enhance user contentment and fidelity, diminish the squandering of resources, and secure enduring profit expansion.

### 6.3 Future Research Directions and Potential Expansion

Even with notable accomplishments, the development and implementation of models remain constrained. Upcoming studies should concentrate on validating across various industries and scenarios, conducting thorough analyses of consumer patterns, optimizing adaptability, and evaluating long-term strategies and brand value. The integration of emotional information and AI technologies has the potential to enhance the dynamic decision-making framework and develop instantaneous feedback mechanisms for the effective optimization of marketing tactics. This method is capable of harmonizing immediate tactics with enduring brand worth, offering businesses extensive support in digital marketing planning.

## 7. Conclusion

The research developed a digital adaptation of a marketing strategy optimization model, grounded in the 4P theory, and confirmed its substantial impact on enhancing corporate earnings, increasing user conversion rates, and boosting customer satisfaction via empirical analysis. Research shows that businesses can better satisfy consumer needs, boost market adaptability, and optimize resource distribution by fine-tuning product customization, variable pricing, omnichannel designs, and specific marketing strategies. Not only does this broaden the use of the 4P theory in digital marketing, but it also offers actionable and viable advice for businesses in the midst of digital transformation. Despite the notable outcomes of this study, additional investigation is required in multi-scenario validation, comprehensive consumer behavior studies, and the dynamic refinement of strategies. Looking ahead, the incorporation of artificial intelligence and instantaneous feedback mechanisms could enhance the model's practicality and precision, providing ongoing assistance for the continual refinement of digital marketing tactics..

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