Original Research Article

The intergenerational differences in digital consumption behavior and the dynamic adaptation mechanism of marketing mix

Jingxuan Tang

University College Dublin, National University of Ireland, Dublin, 150010, Ireland

Abstract: Objective: To study the dynamic adaptation mechanism of marketing mix for intergenerational differences in digital consumption behavior, and explore the influence of demand differences among different generations in digital consumption on marketing strategiess.Methods: A multi-objective optimization model was adopted to simulate the consumption behaviors of Generation X, Generation Y and Generation Z.The consumption preferences of different generations and the fit degree of marketing mix were evaluated based on big data analysis.Results: The experimental results showed that Generation Z had the highest sales growth rate (18%) with the most proactive technology acceptance and interactive needs; Generation Y had the sales growth rate of 12% with stronger demand for personalization and brand interaction; while Generation X was more price-sensitive but had relatively smaller market potential (sales growth rate of 5%).Conclusion: Marketing optimization recommendations for different generations are proposed based on generational differences.Firms should flexibly adjust their strategies in product, price, channel and promotion according to different generations, so as to improve the market responsiveness and consumer satisfaction.

Keywords: Intergenerational consumption behavior; Marketing mix; Dynamic adaptation; Digital consumption

1. Introduction

The differences of consumers' behavior in different generations become increasingly obvious under the condition of the continuous advancement of digital technology.There emerge differences in technology acceptance, consumption habits, and purchasing decisions among different generational groups.These differences bring new challenges to corporate marketing strategies.The research on how to optimize marketing mix based on generational differences is of important significance to enhance the competitiveness and market share of corporations. In this paper, we choose Generation X, Y, and Z as research objects, and by the methods of simulation modeling, we study the digital consumption behaviors of different generational groups and the dynamic adaptation mechanisms of different generational groups in marketing mix.

2. Analysis of intergenerational differences in digital consumption behavior

2.1. Definition and characteristics of intergenerational consumption behavior

Intergenerational consumption behavior refers to the differences in preferences and purchasing decisions among age groups or social groups for the same products or services. As digital technologies advance, generational differences in consumption methods and buying habits become more pronounced[1]. Traditional models focus on static factors such as economic status and education, while innovations like mobile internet and big data highlight the growing diversification of consumption behaviors. This paper explores these differences, including information acquisition channels, brand loyalty, preferences, and technology acceptance, to guide marketing strategies for different generations.

2.2. Digital consumption characteristics of different generations

In the digital age, generational groups exhibit distinct consumption behaviors. Generation Z tends to buy products linked to social media and short video platforms, valuing social interactions and feedback. Generation Y shows stronger brand loyalty, utilizing a mix of digital and physical shopping. In contrast, Generation X and older groups still rely on traditional shopping methods but adapt to digital products when needed. Companies must develop tailored marketing strategies based on these differences in technology acceptance and information acquisition.

2.3. Factors influencing intergenerational differences on consumption behavior

Several factors contribute to intergenerational differences in consumption behavior, including technological adaptability, information processing methods, social environment, and economic conditions. Younger generations are more open to new technology and prefer online information, while older groups rely more on traditional sources. Additionally, younger generations are accustomed to quickly browsing information, whereas older generations engage in more thorough processing[2]. Social and economic factors also play a role, as internet culture influences younger consumers, while older groups face different economic pressures, leading to varied market demands.

3. Dynamic adaptation mechanism of marketing mix

3.1. Basic theories and models of marketing mix

The Marketing Mix theory is central to corporate marketing strategy, traditionally consisting of 4Ps: product, price, place, and promotion. As marketing enters the digital age, this model must be expanded to align with changing consumer patterns and market environments. Personalization and customization are increasingly important due to diverse consumer demands and information acquisition methods. The 4Ps model is gradually being replaced by the 4Cs model (customer needs, cost, convenience, communication), which better fits the digital transformation. Marketing mix theories are continually evolving towards a more consumer-centric approach..

3.2. Dynamic changes in intergenerational group needs

The needs of intergenerational groups in technology acceptance, product expectations, and service preferences are dynamic. Generational changes influence technology adoption, and needs evolve with environmental shifts. Therefore, marketing mix adaptation mechanisms must be flexible to respond to these changes. Generation Z seeks personalized, interactive experiences; Generation Y prioritizes brand identity and comprehensive experiences; Generation X values stability and quality assurance. Marketing strategies should be adjusted to meet these varying needs. Companies should enhance the flexibility of their marketing mix using methods like data mining, market forecasting, and consumer behavior models to stay competitive.

3.3. Implementation strategies of dynamic adaptation mechanism

To adapt the marketing mix to generational changes, companies should use technologies like big data, AI, and machine learning to track market and consumer behavior in real time. By analyzing purchase data, social media feedback, and market research, companies can better understand the needs of different generations and adjust product development, pricing, channels, and promotions accordingly. Additionally, companies should enhance cross-generational marketing by integrating online and offline strategies, boosting customer engagement, and improving interactivity to increase loyalty and purchase frequency[3]. Continuous innovation in marketing strategies is essential to adapt the marketing mix to generational shifts.

4. Simulation experiment and result analysis

4.1. Simulation model design and experimental setting

The design of the simulation model is to explore the dynamic adaptation mechanism of marketing mix for intergenerational differences in digital consumption behavior.This experiment constructs a simulation framework based on multi-objective optimization model, including consumer behavior model, marketing strategy model and its dynamic adaptation mechanism.The simulation model uses the following mathematical formulas to describe the consumption decision-making process of different generational groups and the degree of adaptation of the marketing mix:

Consumer behavior model:

$$B_i(t) = P_i(t) \cdot w_1 + C_i(t) \cdot w_2 + T_i(t) \cdot w_3 + E_i(t) \cdot w_4$$

Among them, the consumption behavior expressed by intergenerational groups at all times represents $B_i(t)tiP_i(t)C_i(t)T_i(t)E_i(t)w_1w_2w_3w_4$ product preference, price sensitivity, and technology acceptance, and social and economic factors.,,, are the weights of various factors.

Marketing group fitting degree function:

$$A(t) = \sum_{i=1}^{n} w_i \, B_i(t) \cdot M_i$$

Among them, the marketing mix appropriateness $A(t)tM_i iw_i i$ at a given moment represents the adjustment coefficient for the marketing mix corresponding to generational groups, which is the weight of the generational group.In terms of experimental design, the simulation system considers three major generational groups: Generation X, Generation Y, and Generation Z, and sets different marketing strategies for each group based on their distinct needs.The specific marketing mix includes product, price, channel, and promotional strategies[4].Each marketing mix's initial setup is adjusted based on historical data and consumer behavior prediction models, continuously optimized through real-time data feedback.

4.2. Experimental results and data analysis

We analyze key experimental indicators, such as marketing mix fit, customer satisfaction, sales growth, and changes in consumer behavior. This allows us to assess the responses of different generational groups to specific marketing strategies and adjust products, prices, channels, and promotions accordingly. **Table 1** shows the results after AECO adjusts its marketing mix for each generational group.

Table 1. Analysis of consumption behavior characteristics and sales growth of different intergenerational groups.

Intergenerational groups	Product preference	Price sensitivity	Technology acceptance	socioeconomic factor	consuming behavior	degree of satisfaction	Sales growth rate
X for generations	0.7	0.5	0.4	0.6	0.58	75%	5%
Y for generations	0.8	0.6	0.7	0.7	0.72	85%	12%
Z for generations	0.9	0.4	0.9	0.5	0.79	90%	18%

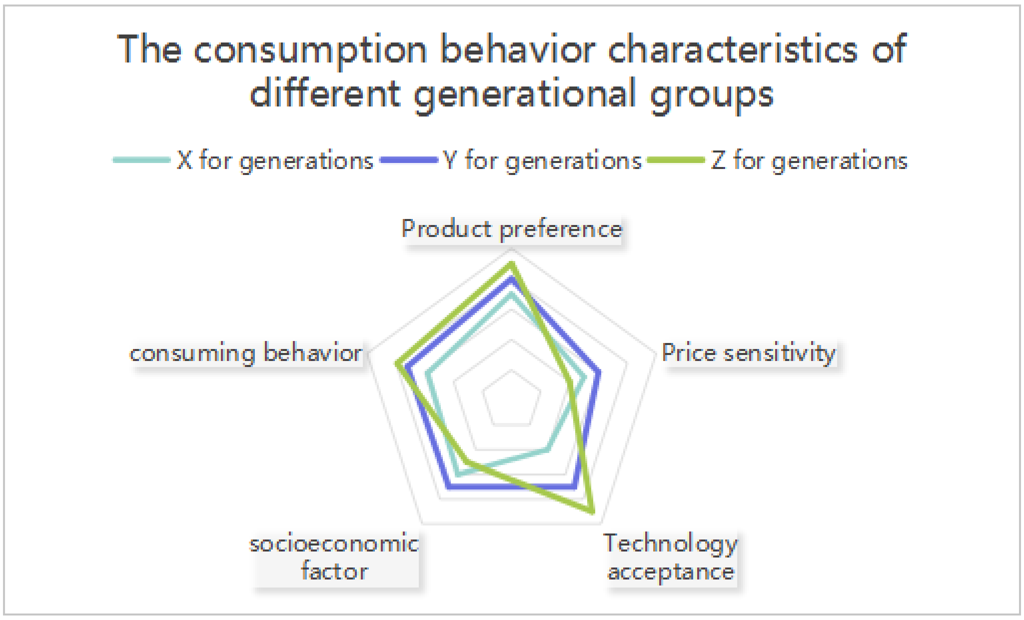

Figure 1. Characteristics of consumption behavior of different intergenerational groups.

From **Table 1**, we can see that the consumption behavior and satisfaction of different generational groups differ greatly.For example, the consumption behavior of Generation X is moderate (0.58), and the consumption behavior of the group with a high degree of price sensitivity is relatively low.Although the Generation X group has a lower acceptance of new technologies due to socioeconomic factors, their satisfaction is relatively high, with a score of 75, which means that this group of consumers has a relatively large market, with a sales growth rate of 5.

In contrast, Generation Y has the most positive consumption behavior among all groups (0.72).This group of consumers is very sensitive to price and technology.Firms can make marketing efforts based on the consumers' consumption behavior.This group of consumers has a strong demand for brand interaction and personalized services.They have a higher satisfaction level (85) and a higher sales growth rate (12).

In comparison, the technology acceptance of Generation Z is extremely high, with an acceptance level of 0.9.This indicates that this group of consumers has extremely high levels of consumption enthusiasm (0.79). This group of consumers has the highest degree of acceptance in terms of their preference for social media.Enterprises should pay attention to the performance of personalized needs with their consumption enthusiasm as the main driving force.This group of consumers has the highest level of consumer satisfaction, with a score of 90, and the highest sales growth rate is 18.This indicates that this group of consumers not only has high activity but also has a large potential for adaptation.

From the above data, we can see that different generational groups have different consumption behaviors. Enterprises should adopt a dynamic adaptation mechanism to adjust their marketing strategies.On this basis, they can appropriately adjust their marketing strategies according to the needs of different generations, which is conducive to improving the effect of marketing activities.

4.3. Marketing optimization suggestions based on experimental results

The analysis of experimental data shows that companies should choose cost-effective products and incentivize this group's purchasing intent through price discounts and loyalty programs.Since Generation X has a lower acceptance of new technologies, companies should avoid using complex technical descriptions when interacting with them, and instead simplify their marketing messages to make them more intuitive.Marketers of Generation Y should focus on building and engaging with brands through social media and digital advertising[5].At the same time, companies should enhance their brand social responsibility and analyze data to offer personalized recommendations to increase the participation of this generation.For Generation Z, companies can enhance their shopping experience through innovative technologies, such as virtual reality and augmented reality.Companies should also strengthen their marketing on social e-commerce and short video platforms to stimulate their desire to purchase, as well as promote the interaction between brands and consumers.

5. Conclusion

In this paper, the differences in digital consumption needs among different generational groups are revealed by using simulation and data analysis.The experimental results suggest that Generation Z has a high level of technology acceptance and interactive needs and is the main target group for current digital marketing; Generation Y has a strong demand for personalization and brand interaction, and companies can carry out deep marketing through social media platform; while Generation X is more price-sensitive and focuses on product quality, so companies should give them more discounts and loyalty programs.Companies should adjust their marketing mix according to the characteristics of different generational groups.

About the author

Tang Jingxuan (April 2001 -), male, Han ethnicity, native of Hebei Province, University College Dublin, Research Direction: Doctor of Management at Macau University of Science and Technology, 150010

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