AI-driven strategies for category management rofitability

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Abstract: *Category Management (CM) is undergoing a transformation thanks to artificial intelligence (AI). AI automates tasks such as data analysis, market segmentation, and demand forecasting, which streamlines and simplifies the work of category managers. It also allows the creation of innovative strategies and campaigns that are relevant to customer needs. This paper focuses on identifying ways in which AI can help to create innovative strategies needed to optimize prices and product lines within category management with the aim to maximize profitability. The paper deals deeper with price optimization, where AI significantly impacts CM. AI analyzes price elasticity and suggests optimal prices for products, which affects the maximization of profitability. Thanks to AI, category managers no longer have to rely on manual analysis and intuition, but they can set prices with much greater accuracy and efficiency. Based on the findings and case studies in the article, the implementation of AI in CM brings companies significant benefits in terms of efficiency, innovation, and profitability. However, it requires strategic planning, investment in technology, and talented people. It is also important to be responsible and ethical when using AI to avoid negative impacts on customers and society.*

Keywords*: CATEGORY MANAGEMENT, UMELÁ INTELIGENCIA, OPTIMALIZÁCIA CIEN, ZISKOVOSŤ, CENOVÁ ELASTICITA*

1. Introduction

In the dynamic and competitive world of business, Category Management (CM) has emerged as a pivotal strategy for the success of retailers and manufacturers. CM transcends the realm of ordinary product management and focuses on strategic planning for product categories to maximize profitability and customer satisfaction.

CM is undergoing a profound transformation driven by advancements in Artificial Intelligence (AI), which opens up new possibilities for optimizing pricing, product assortments, and overall category strategy. This article explores the intersection of AI and CM and summarizes its impact on the work of category managers in the future.

This transformation presents both opportunities and challenges for category managers. They must learn to utilize AI-powered tools, interpret complex data analytics, and adapt their strategies to rapidly changing market conditions.

Traditional CM methods relied on intuition and manual data analysis, which was time-consuming and error-prone. AI introduces sophisticated algorithms and tools to process massive amounts of data from various sources, including sales, prices, inventory, marketing campaigns, and online reviews. With real-time analysis and predictive models, category managers gain deep insights into the market, customers, and competitors, enabling them to make more informed and strategic decisions.

CM is a strategic tool with significant benefits for retailers and manufacturers. Implementing CM can lead to revenue growth, increased profitability, enhanced brand image, and stronger customer loyalty. In the era of AI, CM becomes an even more powerful tool, empowering businesses to make informed and strategic decisions for sustainable growth and success.

2. The significance of pricing in CM

Category management is a strategic approach to managing product categories in retail. It aims to maximize category profitability and market share by optimizing product assortment, pricing, promotion, and distribution. Category managers collaborate with suppliers to achieve shared goals and ensure that category products meet customer needs.

Price is a crucial factor influencing product demand and category profitability. Lowering a product's price can lead to increased demand but also reduced profit margins per unit. Conversely, raising the price can decrease demand but potentially increase profit per unit.

Category managers must consider various factors when setting prices to find the optimal price that maximizes category profitability. These factors include:

1. Cost of production and distribution – Category managers must consider all costs associated with producing and distributing the product, such as materials, labor, transportation, and marketing.
2. Price elasticity of demand – This measures the extent to which product demand changes in response to price changes. Products with low price elasticity are less sensitive to price changes, while those with high elasticity are more sensitive. Understanding price elasticity allows managers to predict demand changes based on price adjustments.
3. Competition – Category managers must consider competitive product prices when setting their own. If competitors offer lower prices, customers may switch to their products. Conversely, higher competitive prices may attract customers to the company's products.
4. Customer expectations – Understanding customer price expectations is crucial for maximizing product line profitability. If a product's price is too high, customers may not buy it. Conversely, if the price is too low, they may perceive the product as low quality.

Factors affecting price elasticity of demand:

1. Product type – Basic products like bread and milk typically have low price elasticity, while luxury items like jewelry and cars often have high elasticity.
2. Availability of substitutes – If multiple product substitutes exist, demand for that product is likely more elastic. Conversely, with fewer substitutes, demand is less elastic.
3. Product importance to consumers – If a product is highly important, demand is likely less elastic. Conversely, for less important products, demand is more elastic.
4. Time horizon – Price elasticity may vary depending on the time frame. In the short term, demand may be less elastic, while in the long term, it may become more elastic [1, 7].

3. Practical applications of price elasticity in CM

Category managers can implement various pricing strategies to maximize profitability and achieve category goals by understanding price elasticity. This section delves into various pricing strategies and their practical applications in CM.

Penetration pricing involves setting a low initial price to gain rapid market penetration and acquire a large customer base. The goal is to attract a significant number of customers and establish a strong customer foundation. While initial profits may be lower, this strategy can lead to higher overall profitability in the long run if a substantial market share is achieved. This strategy is primarily suitable for new products, products with high price elasticity of demand, and products with high growth potential. Low prices not only motivate customers to buy but also stimulate demand and drive rapid sales growth.

In contrast to penetration pricing, skimming pricing involves setting a high initial price to maximize profits from products with high price elasticity of demand. The objective is to capitalize on the willingness of price-inelastic consumers to pay a premium for the product. Later, the price can be reduced to attract price-sensitive

consumers and increase overall sales volume. This strategy is primarily used for luxury products, high-value products, and products with low price elasticity of demand. Essentially, this strategy is suitable for products where demand is not significantly affected by price. Instead, price can strengthen the product's perceived value and increase its attractiveness to customers. Price-inelastic consumers are willing to pay a high price for luxury products.

Skimming pricing involves setting a high initial price for a product and gradually lowering it over time. The goal is to maximize profits from products with high price elasticity of demand in the initial phase while attracting price-sensitive consumers in later stages of the product's life cycle. Unlike the previous strategy, skimming pricing is primarily used for new products with a high degree of innovation, where demand for the product is very high in the initial market entry phase, and customers are willing to pay a high price due to the high value they perceive in the product. This type of strategy is particularly suitable for ICT products and their systematic advancement through the innovation process.

Psychological pricing utilizes various psychological factors that influence customer price perceptions to make products appear more attractive. Price determination assumes that the price will be perceived as more appealing to the customer.

One example of psychological pricing is the *"Bať a price"*, introduced by the renowned Czech entrepreneur Tomáš Bať a.

In this strategy, it is crucial that prices align with the overall pricing strategy and customer expectations. Excessive use of psychological pricing can lead to customers perceiving prices as unrealistic or manipulative ("Bať a prices" are becoming less effective). Therefore, it is necessary to test various psychological prices to determine the most effective ones for a given product category and target customer group.

While previous strategies focused on long-term price setting, promotional pricing involves temporarily lowering a product's price to promote the sale of specific products. The goal is to stimulate demand and increase sales in a short period. Promotional prices are often used to clear out excess inventory or introduce new models. This strategy is also applicable to seasonal products where the seller aims to increase revenue during the season. As the name suggests, promotional pricing is suitable for introducing new products to the market. To attract customer attention to new products, a "promo" price is set instead of or in conjunction with additional promotional materials, stimulating customers to purchase and try the new product. The most critical factor in using promotional pricing is to clearly communicate prices to customers and ensure they are time limited.

Personalized pricing involves setting product prices based on individual customer characteristics such as their purchasing habits, demographics, and interests. The goal is to maximize profit from each customer and build long-term relationships. Personalized pricing is becoming increasingly common as customer data becomes more accessible and artificial intelligence technologies advance.

This pricing strategy must adhere to data privacy regulations and protect customer privacy. It is the responsibility of every seller to ensure prices are transparent and customers understand how prices are determined. Optimal personalized pricing also involves identifying the most effective prices for specific products, product lines, and target customer groups.

This pricing strategy is most used in online environments, particularly e-commerce stores, where different product prices are displayed to different customers based on their purchase history and viewed products. The final pricing strategy discussed in the article is differentiated pricing. This strategy involves setting different prices for the same product to different customers or in different markets. The goal is to maximize profit from each sale and adapt to varying market conditions. Differentiated prices are often used based on various factors specific to a customer segment. Pricing is influenced by the customer's geographic location, with prices potentially varying depending on region, country, or even city. Local market conditions, competition, and purchasing power all play a role in determining the appropriate price for a specific location.

Customer volume can also influence pricing. Businesses may offer discounts for larger purchases, encouraging bulk buying and increasing overall revenue. The channel through which a product is sold can also impact pricing. Online retailers may offer lower prices compared to physical stores due to lower overhead costs. Pricing strategies may evolve throughout a product's lifecycle. Initially, higher prices may be set to recoup development costs, while lower prices may be introduced later to attract a wider audience.

Businesses must ensure that differentiated pricing practices do not constitute price discrimination, which involves charging different prices based on prohibited factors like race, religion, or nationality. Clearly communicate pricing policies and the rationale behind differentiated pricing to customers to avoid misunderstandings and maintain trust. Pricing practices should be fair and non-deceptive, avoiding misleading or hidden charges that could disadvantage certain customer groups.

When implemented strategically and responsibly, differentiated pricing can be a powerful tool for businesses to maximize profitability, expand market reach, enhance customer satisfaction, and adapt to dynamic market conditions. By carefully considering customer segments, market characteristics, pricing objectives, and legal and ethical guidelines, businesses can leverage differentiated pricing to achieve their strategic goals and drive sustainable growth [2, 3].

4. Leveraging Artificial Intelligence in CM

AI has the potential to revolutionize the field of CM. AI tools and algorithms can analyze vast amounts of data on customers, products, competitors, and market trends, providing category managers with valuable insights for optimizing pricing and product assortments. This chapter delves into the intersection of AI and CM in the areas of pricing and product assortment optimization.

AI can significantly enhance pricing strategies by analyzing price elasticity. AI algorithms can scrutinize historical sales and pricing data to identify factors that influence product demand. This empowers category managers to set optimal prices that maximize profitability and cater to customer needs.

AI models can accurately predict future product demand based on various factors, including seasonal trends, marketing campaigns, and economic conditions. This enables category managers to optimize inventory levels, preventing stockouts or overstocking.

AI tools can analyze individual customer profiles and purchasing habits to offer personalized pricing. This personalized approach can boost customer satisfaction and drive sales growth.

AI algorithms can analyze sales, profitability, and margin data for individual products to identify underperforming items. This allows category managers to optimize product assortments, focusing on products with high profit potential.

AI-powered pricing automation involves dynamically adjusting prices in real-time based on various factors, such as competitor pricing, product demand, and inventory availability. This automation saves category managers time and resources while ensuring optimal pricing [4, 5].

Table 1. *Practical applications of AI in CM*

Company	AI applications
Amazon	Personalizes product prices for each customer based on their purchase history and preferences.
Walmart	Predicts product demand and optimizes inventory levels.
Procter & Gamble	Analyzes price elasticity and sets optimal prices for its products.
Coca-Cola	Develops personalized marketing campaigns and optimizes product distribution.
Unilever	Analyzes online reviews and customer feedback to improve products and services.

The integration of AI into CM offers a multitude of advantages, including:

1. Enhanced Profitability – AI empowers category managers to maximize profitability by optimizing pricing and product assortments. AI algorithms can analyze vast amounts of data to identify optimal price points and product mixes that align with customer demand and market trends, leading to increased revenue and profit margins.
2. Elevated Customer Satisfaction – AI enables category managers to deliver personalized experiences that enhance customer satisfaction. By analyzing customer data and purchasing patterns, AI can tailor product recommendations, pricing strategies, and marketing campaigns to individual customer preferences, fostering loyalty and satisfaction.
3. Improved Efficiency – AI streamlines processes and automates tasks, saving category managers time and resources. AI-powered tools can handle repetitive tasks such as data analysis, price adjustments, and inventory management, allowing category managers to focus on strategic decision-making and value-added activities.
4. Enhanced Decision-Making – AI provides data-driven insights that inform strategic decisions. AI algorithms can analyze vast amounts of data to identify trends, patterns, and correlations, enabling category managers to make informed decisions about pricing, product assortments, marketing strategies, and overall category management strategies.
5. Increased Competitiveness – AI empowers category managers to stay ahead of the competition. By leveraging AI for data analysis, pricing optimization, and personalized customer experiences, category managers can gain a competitive edge, attract and retain customers, and achieve sustainable growth [6].

5. Conclusion

Each Artificial intelligence (AI) holds immense potential to revolutionize Category Management (CM) practices in the future. As AI continues to evolve and innovate, category managers can expect to gain access to even more sophisticated tools and algorithms that empower them to achieve strategic goals.

AI is poised to enable category managers to create customized pricing offers and marketing campaigns for each customer based on their unique buying behavior, preferences, and demographics. AI models will also accurately predict product demand in real-time, allowing category managers to optimize inventory levels and minimize losses.

Dynamic pricing algorithms will adjust product prices based on various factors, such as competitor pricing, demand, and inventory availability, ensuring maximum profitability. Advanced data analytics will empower category managers to analyze vast amounts of data from diverse sources, gaining valuable insights into market trends, customer behavior, and competitive landscapes.

AI assistants will serve as intelligent partners, assisting category managers in tasks like information retrieval, data analysis, and decision-making.

The adoption of AI in CM will bring significant benefits to businesses in terms of efficiency, competitiveness, and profitability. However, it is crucial to emphasize that AI serves as a tool to augment category managers, not replace them. The human element will always play a pivotal role in strategic category management and building strong customer relationships.

AI stands as a powerful catalyst with the potential to elevate CM to new heights. By responsibly and ethically embracing AI, category managers can look forward to a future brimming with innovation, growth, and success.

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