

# *Dynamic Pricing System Using Web Scraping and Automation for Competitive E-Commerce Markets*

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## ABSTRACT

Dynamic pricing has become an essential strategy in modern e-commerce platforms to maintain competitiveness in rapidly changing markets. This research presents a dynamic pricing system that collects competitor pricing data using automated web scraping and adjusts internal product prices accordingly. The proposed system integrates automation tools, databases, and a web interface to update prices in real time. A pricing algorithm is applied to set product prices slightly lower than competitor prices. The system improves operational efficiency, reduces manual monitoring, and enables businesses to react quickly to market changes.

KEY WORDS - Dynamic Pricing, Web Scraping, Automation, E-Commerce, Price Optimization

## I. INTRODUCTION

E-commerce has significantly transformed the retail industry by enabling customers to purchase products online with convenience and accessibility. As the number of online retailers increases, competition between businesses has become more intense. Pricing strategies play a crucial role in attracting customers and maintaining profitability.

Dynamic pricing refers to the strategy of adjusting product prices automatically based on market conditions, competitor prices, customer demand, and other external factors. Many large e-commerce companies such as Amazon and Flipkart use automated pricing strategies to stay competitive.

However, many small and medium businesses still rely on manual monitoring of competitor prices, which is inefficient and time consuming. Automation technologies such as web scraping and robotic process automation can help collect pricing data from competitor websites and adjust prices automatically.

This research proposes an automated dynamic pricing system that integrates web scraping, pricing algorithms, and database storage to provide an

## II. PROBLEM STATEMENT

In modern digital marketplaces, pricing competition is extremely high. Businesses must frequently monitor competitor prices to remain competitive. However, traditional pricing methods face several challenges:

- Manual monitoring of competitor prices is time-consuming.
- Price updates are slow and may result in lost sales opportunities.
- Human errors may occur during manual price adjustments.
- Businesses may fail to respond quickly to market changes.

Therefore, there is a need for an automated pricing system that can collect competitor pricing information and adjust product prices dynamically.

## III. LITERATURE SURVEY

Dynamic pricing and automated pricing strategies have been widely studied in recent years.

Smith (2019) discussed the impact of dynamic pricing strategies on digital retail markets and emphasized the role of real-time data in pricing decisions.

Kumar and Patel (2020) developed a web scraping framework that collects competitor product information from e-commerce websites to support pricing analysis.

Lee (2021) introduced automated pricing algorithms that update product prices based on competitor pricing trends.

Another study by Chen and Liu (2022) highlighted the importance of integrating data-analytics with automated pricing systems to improve decision-making.

Although these studies focus on pricing strategies and automation tools, many existing systems lack integration between automated data collection, pricing algorithms, and user interfaces. This research aims to address these limitations by proposing an integrated dynamic pricing system.

#### IV. METHODOLOGY / APPROACH

The proposed system consists of multiple components working together to automate the pricing process.

##### A. Data Collection

Competitor prices are collected using automated web scraping tools. The system periodically visits competitor websites and extracts product information including product name and price.

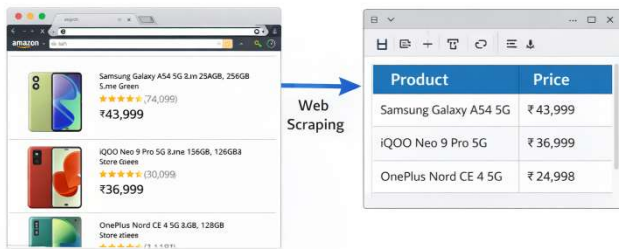


Fig 2: Competitor Price Data Extracted using Web Scraping

##### B. Pricing Algorithm

After collecting competitor prices, the system applies a deterministic pricing algorithm. The algorithm automatically sets the internal product price ₹100 lower than the competitor price to maintain competitive advantage.

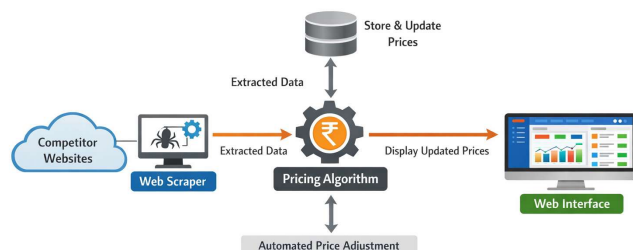


Fig 1: System Architecture of Dynamic Pricing System

##### C. Data Storage

Two databases are used in the system:

MongoDB – Stores real-time product data including price, category, and stock information.

SQL Server – Stores historical pricing data for analysis and reporting.

##### D. User Interface

A web-based interface allows administrators to monitor product pricing and system updates. The interface also provides category filtering and product visualization features.

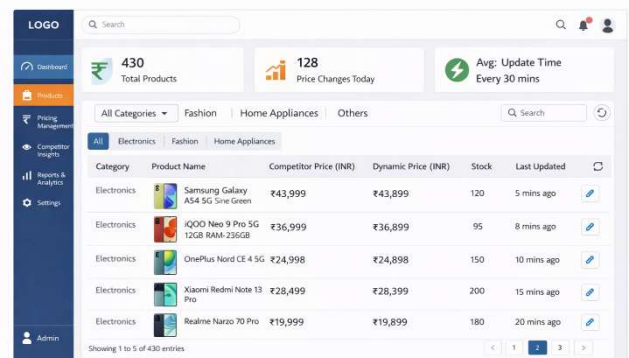


Fig 6: Admin Dashboard for Monitoring Product Prices

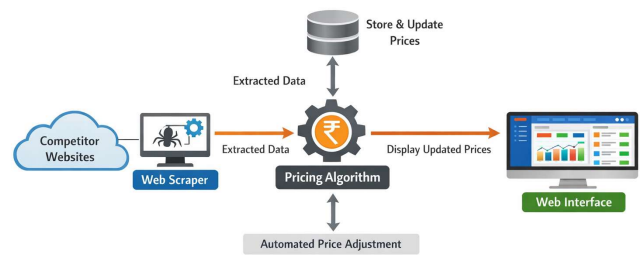


Fig 1: System Architecture of Dynamic Pricing System

#### V. RESULTS & DISCUSSION

The proposed system was tested using multiple product categories such as electronics, fashion, and home appliances. The automated system successfully collected competitor prices and updated internal product prices dynamically.

The system demonstrated faster price updates compared to manual pricing methods. Automated data

collection reduced the time required for monitoring competitor prices. The results indicate that businesses using automated pricing strategies can respond quickly to market changes and maintain competitive positioning.

Graphical analysis also shows that products using dynamic pricing maintain higher competitiveness compared to products using fixed pricing strategies.

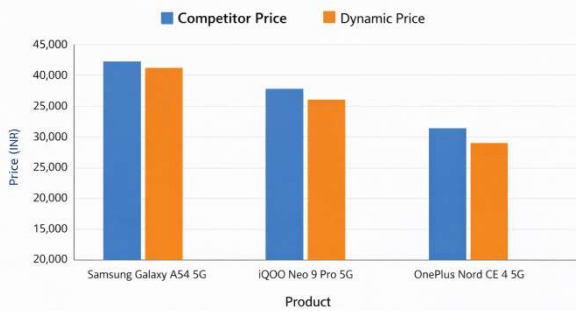


Fig 4: Comparison between Competitor Price and Dynamic Price

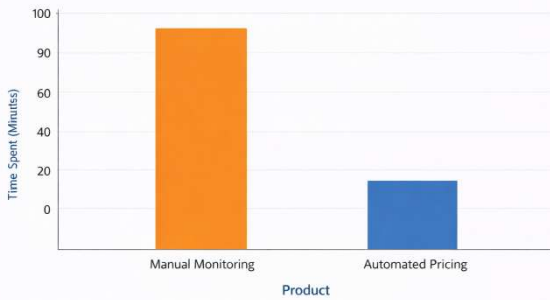


Fig 5: Time Comparison between Manual Monitoring and Automated Pricing

#### VI. ADVANTAGES OF THE PROPOSED SYSTEM

- Reduces manual monitoring of competitor prices.
- Enables real-time price updates.
- Improves operational efficiency.
- Helps businesses remain competitive in online markets.
- Reduces human errors in price management.

#### VII. DISADVANTAGES OF THE PROPOSED SYSTEM

- Requires stable internet connectivity for web scraping.
- Automated systems may face challenges if competitor websites change their structure.
- Initial setup cost may be higher for small businesses.
- Over-aggressive price reductions may reduce profit margins.

#### VIII. FUTURE SCOPE

The proposed system can be further enhanced using advanced technologies such as machine learning and artificial intelligence. Machine learning models can analyze customer demand patterns and competitor trends to predict optimal prices.

Future systems may also integrate real-time market analytics, demand forecasting, and personalized pricing strategies to further improve efficiency.

#### IX. CONCLUSION

This research proposed an automated dynamic pricing system that integrates web scraping, automation tools, and databases to adjust product prices according to competitor pricing. The system reduces manual effort and allows businesses to respond quickly to market changes.

Experimental results indicate that the proposed system improves pricing efficiency and competitive advantage in e-commerce environments. Future enhancements using artificial intelligence and predictive analytics may further improve pricing optimization and decision-making.

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