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Application Of the Popularity-Based Ranking Model in An Augmented Reality Web-Based Furniture Marketing Information System (Case Study at D Furniture Company)

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Abstract

Application of a Popularity-Based Ranking Model in a Web-Based Augmented Reality Furniture Marketing Information System: A Case Study of D FURNITUR. This marketing information system is essential for delivering pertinent information to consumers and aiding them in purchasing decisions. This research aims to develop a web-based furniture marketing information system incorporating Augmented Reality (AR) and a popularity-based ranking model, employing the Rapid Application Development (RAD) methodology, with D FURNITURE as the case study. The RAD technique was selected to expedite development and facilitate ongoing enhancement based on user feedback. The research encompasses system design and development phases, commencing with needs analysis via surveys and interviews with D FURNITURE management and potential users, culminating in system implementation. The resultant solution enables customers to visualize product designs online via an interactive interface augmented by AR. Prominent features encompass an augmented reality display of products in the user's surroundings, product selection informed by popularity rankings, and a cohesive ordering mechanism facilitated via WhatsApp. The findings yield tangible benefits through a robust and efficient furniture marketing information system, minimizing faults in product display, improving user experience in information retrieval, and augmenting satisfaction via a popularity-based rating system. Implementing the RAD approach facilitates flexible and adaptive development to meet future requirements.

Keywords: *Augmented Reality, Furniture Marketing, Popularity-Based Ranking Model, Rapid Application Development (RAD) Method*

Introduction

Digital furniture marketing has emerged as a crucial component in the contemporary furniture sector, particularly in the age of advancing technology. Shifts in consumer consumption habits, increasingly reliant on digital platforms, necessitate that furniture firms implement marketing information systems capable of more efficiently addressing consumer needs. One of the quickly advancing breakthroughs is the incorporation of Augmented Reality (AR) technology into web-based marketing information platforms. This technology enables users to picture items with greater realism, offering an experience akin to direct involvement with the product. This study investigates the implementation of a popularity-based ranking algorithm within a web-based furniture marketing information system enhanced by AR technology, centering on a case study at D FURNITURE.

D FURNITURE, as a participant in the furniture sector, encounters difficulties in capturing consumer interest within a fiercely competitive market. A primary difficulty is delivering pertinent product information and facilitating consumer purchasing decisions. This furniture marketing information system employs AR technology and a popularity-based ranking model to deliver novel solutions. Popularity-based ranking facilitates the conspicuous display of products consumers seek, enhancing the ease with which consumers can locate items that align with their preferences. Simultaneously, AR technology enhances value by enabling product viewing within the user's environment, diminishing confusion over dimensions, colors, and product compatibility with existing places. (Mutmainah, Rahayu, Faujan, Budiman & Ibrahim, 2025; Duhari, Wahyudi & Nugroho, 2022; Wu & Chi, 2023)

This research employs the Rapid Application Development (RAD) methodology as the primary system design and development approach. The RAD technique was selected for its ability to expedite the system development process while allowing for enhancements depending on user feedback. This methodology enables developers at D FURNITURE to create solutions tailored to the distinct requirements of businesses and customers by engaging several stakeholders, including firm management and prospective users. The phases of the RAD methodology, encompassing needs analysis, prototype design, testing, and implementation, offer a systematic and efficient framework for developing high-quality information systems. (Yeni, Komara, Suzanto & Rusjiana, 2023; Mahadi, Tiara, Abdurrohman, Rohpandi & Alpiyasin, 2025; Xue, Sun, Liu, Li & Yuan, 2024)

During the needs analysis phase, this study gathered data via questionnaires and interviews with D FURNITURE management and prospective users. This study seeks to ascertain the primary requirements of consumers and the anticipated features of a web-based furniture marketing information system. The analysis indicates that most consumers need user-friendly navigation, precise product descriptions, and visualization tools to envision the product in their environment. Furthermore, D FURNITURE management underscored the necessity of a system capable of enhancing the efficiency of the ordering process and diminishing the incidence of product returns attributable to non-compliance with consumer expectations.

The system design phase incorporated a popularity-based ranking mechanism into a web platform that facilitates augmented reality

technologies. Popularity-based ranking is intended to showcase products with the most excellent popularity scores derived from user engagement metrics, including click counts, ratings, and order frequency. This feature offers a competitive edge by emphasizing the products most sought after by consumers, enhancing the likelihood of transactions. Simultaneously, AR technology lets users perceive products directly via their camera, facilitating an immersive and authentic experience. This visualization function aids buyers in comprehending the goods' dimensions and form while offering a more distinct representation of how the product will seem inside their environment. (Wang, Wang, Zhang, Zhan, Guo, Zheng & Wang, 2022; Shafiee, 2024)

The system prototype underwent iterative testing during the development period, with the participation of end users. The feedback acquired from the testing process was utilized to enhance the design and functionality of the system. Several users encountered challenges in utilizing the AR feature in the initial versions because of the unintuitive UI. In response to this criticism, the system interface was enhanced by incorporating more explicit usage instructions and augmenting the system's responsiveness across diverse devices. This approach guarantees that the resulting system fulfills technical specifications while delivering an ideal user experience. (Huang & Liu, 2022; Ballouk, Ben Jabeur, Boubaker & Mefteh-Wali, 2024; Liu, Chen, Pei, Maharjan & Zhang, 2021)

The solution incorporated essential elements within the D FURNITUR online platform. The solution includes AR visualization, popularity-based ranking, and an integrated ordering mechanism accessible via WhatsApp. This feature aims to streamline communication between consumers and the company, expediting the ordering process and minimizing the likelihood

of miscommunication. This method enables users to effortlessly select products, visualize them, and promptly place orders without navigating a convoluted process. (Sidharta & Rahmahwati, 2023; Huang, Li, Wu, Qiao, Guo, He & Li, 2023; Solano-Barliza, Arregocés-Julio, Aarón-Gonzalvez, Zamora-Musa, De-La-Hoz-Franco, Escorcia-Gutierrez & Acosta-Coll, 2024)

Indonesia possesses significant potential in the global furniture development and production sector, particularly regarding technology and customer engagement with items. In the digital age, people typically seek information online prior to making a purchase; nonetheless, items like furniture necessitate actual interaction to evaluate their quality. D FURNITURE, an Indonesian furniture manufacturer, encounters challenges in marketing due to its website's inability to effectively present product information, relying solely on product images that fail to convey a clear understanding to clients. This condition complicates customers' ability to locate best-selling products, resulting in heightened unhappiness and elevated product return rates. The primary issues in Indonesian e-commerce are inappropriate products, refund complications, and abrupt cancellations, highlighting a disparity between consumer expectations and the products delivered. An augmented reality (AR) website marketing system implements a popularity-based ranking algorithm, enabling consumers to obtain a more precise three-dimensional representation of the product and facilitating the identification of best-selling items. Consequently, this method will enhance user experience, diminish unhappiness, and stimulate revenue growth. This study aims to develop an AR feature exclusively accessible on Android handsets with particular specs, directing consumers to a purchase link using WhatsApp. Applying

the RAD methodology, encompassing observation, interviews, literature reviews, and documentation, alongside prototype development and iterative processes leading to final implementation at D FURNITURE, is anticipated to enhance the company's competitiveness and deliver novel consumer experiences.

Research Method

Rapid Application Development (RAD) is a software development methodology prioritizes speed and flexibility. This study uses this approach to design and develop a web-based augmented reality furniture marketing information system by integrating a popularity-based ranking model in D FURNITURE. The RAD method was chosen because it can accelerate the software development process through an iterative cycle that involves users in every stage of development. This development cycle includes four phases: needs analysis, design, development, and implementation.

The first stage is needs analysis, which collects data through interviews and surveys with D FURNITURE management and potential system users. This process aims to identify users' primary needs and preferences, including augmented reality visualization features and popularity-based ranking mechanisms. The data obtained becomes the basis for compiling the specifications of the system to be developed.

The second stage is design, where an initial prototype of the system is developed based on the needs analysis results. This prototype includes the design of the user interface, integration of augmented reality technology, and a popularity-based ranking algorithm. Users then test this prototype to obtain feedback on functionality and user experience.

The third stage is development, where the designed system is developed into a fully functional version. At this stage, the development team refines the prototype based on the feedback provided during the design stage. Testing is carried out periodically to ensure that each system component works according to specifications and user needs.

The final stage is implementation, which integrates the system into the D-FURNITURE operational environment. At this stage, end users receive training to ensure that they can utilize all system features optimally. In addition, the integrated ordering system via WhatsApp media is also tested to ensure smooth communication between customers and the company.

By using the RAD method, this study succeeded in developing a marketing information system that is responsive, adaptive, and to user needs. The iterative development cycle ensures that the resulting system is technically efficient and provides an optimal user experience.

Results and Discussion

This research examines the implementation of a popularity-driven ranking algorithm within a web-based furniture marketing information system integrated with Augmented Reality (AR). This method, exemplified by a case study on D FURNITURE, aims to enhance consumer engagement and relevance during the purchasing decision-making process. The utilization of the Rapid Application Development (RAD) methodology serves as the primary strategy in the system's development, facilitating a swift and adaptable design and implementation process to address users' changing requirements.

SWOT analysis is a technique for identifying a system's strengths, weaknesses, opportunities, and threats.

Table 1. SWOT Analysis

(Strengths)	(Weaknesses)	(Opportunities)	(Threats)
Superior quality products, technological advancement, and satisfactory offline client service.	The ordering procedure remains manual and lacks augmented reality elements—the lack of the best-selling product recommendation option.	Increasing demand for online shopping and adoption of new technologies.	Rivalry from alternative furniture enterprises and evolving market dynamics.

Creating a Use Case Diagram is a crucial phase in developing an information system, as it delineates the interactions between the system and external players. This diagram functions as a visual instrument to comprehend the requirements and primary functionalities of the system from the user's viewpoint. Designing use case diagrams by defining diverse players and usage scenarios offers explicit direction for creating and implementing an efficient system aligned with user requirements. This web-based furniture marketing information system utilizing augmented reality (AR) comprises three participants: Administrator, Consumer (User), and Owner. Each actor possesses distinct access privileges, as seen in the subsequent image:

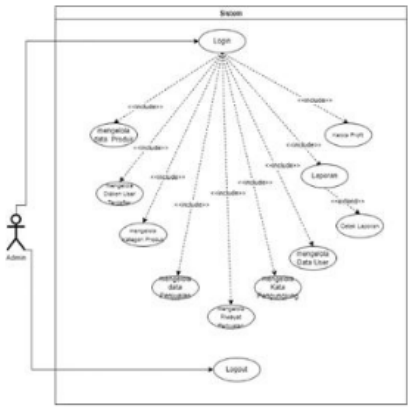


Figure 1. Administrator Use Case Diagram

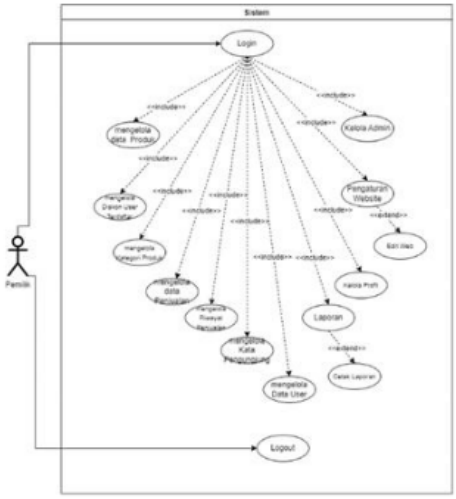


Figure 2. Owner Utilization Case Diagram

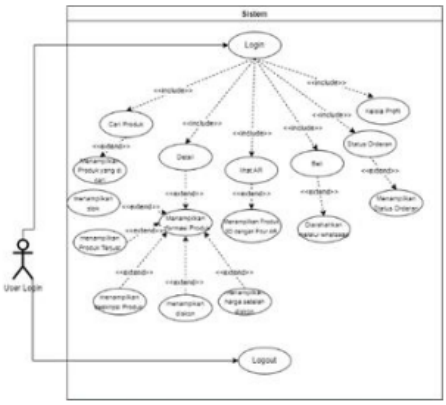


Figure 3. Use Case Diagram for User Login

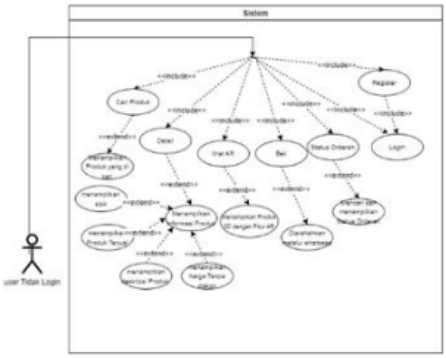


Figure 4. Use Case Diagram for User Not Logged In

Actors and Descriptions:

1. Owner: Complete authority to oversee the dashboard, sales statistics, products, settings, reports, and user information. Exhibit product graphs, top-selling items, total sales, and oversee product categories, discounts, and inventory input.

2. Administrator: This position oversees daily operations and has access to the dashboard, sales statistics, product information, settings, reports, visitor analytics, and landing pages. The

administrator also exhibits product graphs, top-selling items, and total sales and oversees product categories, discounts, and inventory input.

3. User Login: Authenticated users can see product listings, update their profiles, monitor order status, execute transactions, and obtain discounts.

4. Unauthenticated Users: Individuals who have not logged in may browse products and register or login but cannot modify profiles or receive discounts.

The study's results indicate that the built AR-based furniture marketing information system offers numerous benefits. This method enables buyers to visualize furniture products in their surroundings using augmented reality technology. Consequently, users may visualize the appearance and fit of the furniture within the designated space before making a purchase. This result enhances the product visualization experience and reduces the likelihood of client discontent stemming from product discrepancies with expectations.

A primary characteristic of this system is the application of a popularity-driven ranking model. Furniture items are categorized by popularity and determined by many metrics, including click count, interaction level, and prior purchases. This function assists consumers by presenting recommendations for the most sought-after products, expediting the process of finding and purchasing items. This technology also integrates

with WhatsApp as an ordering method, enhancing consumer communication and D FURNITURE.

The assessment outcomes indicate that this method has effectively enhanced marketing efficiency and product attractiveness. Users reported increased satisfaction with the interaction experience with the system, particularly with the accessibility of product information and realistic visualization via augmented reality. Incorporating sophisticated technology, such as augmented reality and popularity-based ranking models, offers substantial value to the marketing system.

AR technology plays a vital role in this system by allowing consumers to view furniture products directly in their real-world environment. The visualizations generated by AR provide a realistic depiction of the furniture's size, color, and style in the context of the user's space. This technology addresses the needs of modern consumers who tend to seek a personalized and interactive shopping experience. Compared to conventional methods such as catalogs or two-dimensional images, AR significantly enhances consumers' ability to make more informed purchasing decisions.

However, implementing AR requires supporting hardware, such as a high-quality mobile phone camera, and optimizing system performance so that it can run smoothly without lag. To overcome these challenges, the system was developed using an AR framework compatible with various devices and optimized to ensure a seamless user experience.

Implementing a popularity-based ranking model dramatically improves the system's efficiency in displaying relevant products to users. The system dynamically presents the most popular products by adopting an algorithm that calculates product popularity based on parameters such

as the number of views, user interaction rate, and purchase rate. This condition increases the likelihood of purchase and provides insight into D FURNITURE's market preferences.

An additional advantage of this model is its ability to increase user engagement. By displaying a list of popular products, the system creates a sense of urgency and interest in consumers, which can ultimately encourage them to make faster purchasing decisions. However, implementing this model requires effective data management to ensure that the ranking algorithm can work accurately and responsively to changes in user preferences.

The RAD methodology selected in this study proved appropriate because it accelerated the system development process while providing flexibility to make adjustments based on user feedback. This approach begins with the needs analysis phase, where data is collected through surveys and interviews with D FURNITURE management and potential users. The information obtained is used to design a system prototype, which is then tested and refined iteratively.

The main advantage of this methodology is its ability to integrate proposed changes during the development process without disrupting the workflow. In this case, user feedback, such as suggestions for improving search features and AR visualization, can be easily accommodated. This condition ensures that the resulting system meets current needs and is ready to evolve along with changing market trends.

The system developed in this study provides tangible benefits to D FURNITURE and consumers. From a company perspective, the system improves operational efficiency by automating marketing processes and

providing in-depth analytical data on consumer preferences. This data can be used to design more effective marketing strategies and increase the company's competitiveness in the market.

For consumers, the system provides easy access to product information, makes more informed decisions, and enjoys a modern and enjoyable shopping experience. With AR visualization features and popularity-based recommendations, consumers feel more confident choosing products that suit their needs.

However, several aspects need to be considered for further development. For example, system integration with various social media platforms can expand marketing reach and increase product visibility. In addition, developing additional features, such as customer reviews and real-time furniture measurements, can add value to the system.

Although the system has succeeded in providing an innovative solution, several limitations must be considered. One of the main challenges is the dependence on high-tech devices to enjoy AR features optimally. Users with less sophisticated hardware may experience limitations when using this feature, which can affect their experience.

In addition, implementing a popularity-based ranking model requires extensive and ongoing data management. If data is not updated regularly or there are errors in data collection, ranking results can be inaccurate and reduce consumer confidence in the system.

Conclusion

Research using a popularity-based ranking mechanism in the augmented reality website for furniture marketing information systems yields some notable conclusions. This research effectively addressed the challenges

encountered by D FURNITURE, including the deficiencies of the information system inappropriately presenting items, the absence of digital engagement with customers, and the elevated percentage of product returns attributable to discontent. Integrating the Augmented Reality (AR) function is a novel approach that enables users to visualize furniture products in three dimensions within their surroundings. This condition enhances the consumer purchasing experience and facilitates more informed decision-making, hence diminishing the likelihood of unhappiness and product returns.

Utilizing the popularity-based ranking model is a fundamental aspect of this system. The system effectively delivers more pertinent and appealing product information to consumers by categorizing products according to their popularity, which is determined by sales volume and user engagement. This methodology further substantiates the efficacy of the company's marketing strategy, as the most popular products receive enhanced visibility, hence boosting sales.

The study's results indicate that amalgamating augmented reality and the ranking model positively influences consumer experience and marketing efficacy. Consumers gain access to enhanced product information, a comprehensive visualization experience, and the convenience of locating popular items. This study identified many constraints, including restricted AR feature support on Android devices utilizing ARCore, the reliance of processing time on internet network quality, and the absence of AR capabilities for iOS devices. These constraints present obstacles in broadening user outreach and guaranteeing system inclusivity.

This study demonstrates that digital technologies, including augmented reality and popularity-based ranking models, can substantially enhance web-based furniture marketing systems. With further development, this technology possesses significant potential to enhance customer happiness and corporate competitiveness in the digital age.

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