



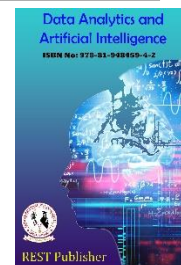
## Data Analytics and Artificial Intelligence

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# A Multi-Objective Approach Optimizing Pharmacy Industry Decisions through MOORA Method

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**Abstract:** *The pharmacy industry, a crucial pillar of the healthcare sector, encompasses the discovery, development, production, distribution, and sale of pharmaceutical drugs and medications. With an intricate interplay of scientific innovation, medical expertise, and commercial activities, this industry plays an indispensable role in safeguarding and improving human health. From the inception of groundbreaking drugs to their widespread distribution, the pharmacy industry integrates various stakeholders, including pharmaceutical companies, researchers, healthcare professionals, regulators, and consumers. It strives to address a wide spectrum of health conditions, from acute ailments to chronic diseases, by developing innovative treatments, generic medicines, and over-the-counter drugs. The pharmacy industry's evolution has been marked by technological advancements, research breakthroughs, and regulatory frameworks to ensure drug safety and efficacy. As the global population continues to grow and age, the industry faces the challenges of maintaining affordability, accessibility, and quality of medications. Furthermore, the pharmacy industry is a catalyst for economic growth, creating jobs, fostering research collaborations, and contributing to national and international healthcare systems. Its multifaceted nature, ranging from drug research to patient care, underscores its significance in the broader landscape of healthcare and public well-being. Research within the pharmacy industry holds immense significance due to its pivotal role in advancing medical knowledge and improving patient outcomes. Pharmaceutical research drives the development of new medications, innovative therapies, and treatment protocols, enhancing the efficacy and safety of drugs. It also uncovers insights into disease mechanisms, fostering a deeper understanding of health conditions. Furthermore, research guides regulatory decisions, ensuring drugs' quality, and promotes evidence-based medical practices. Through ongoing investigation, the pharmacy industry continually evolves, addressing emerging health challenges, optimizing drug utilization, and ultimately contributing to the overall enhancement of global healthcare standards. MOORA (Multi-Objective Optimization by Ratio Analysis) is a decision-making method used to evaluate and prioritize alternatives based on multiple conflicting criteria. It involves comparing alternatives' performance ratios against reference alternatives, considering both benefits and drawbacks. By assigning weights to criteria, MOORA quantifies their importance and ranks alternatives accordingly. This technique assists in complex decision scenarios where various factors must be balanced. MOORA's systematic approach aids in reaching well-informed decisions by quantifying trade-offs and providing a structured framework for considering multiple objectives simultaneously. Product Innovation, Market Share (%), Research Investment (\$ billion), Patient Satisfaction, Drug Efficacy (%), Global Reach (countries). Pfizer, Johnson & Johnson, Roche, Novartis, GlaxoSmithKline, CVS Health, Walgreens Boots Alliance, Rite Aid. From the result it is seen that Novartis got the first rank where as is the Rite Aidis having the lowest rank.*

**Keywords:** MCDM, Novartis, Rite Aid, Market Share.

## 1. INTRODUCTION

Retail pharmacy, a sector that was at the forefront, was examined within the realm of pharmacy. The study focused on various clusters that emerged in this field. These clusters pertained to the environment, organizational aspects, and the outcomes in terms of performance associated with the said concept [1] In the realm of the digital economy, the retail pharmacy industry is compelled to devise novel business approaches in order to attain high levels of operational efficiency. Through social media, users have generated substantial amounts of content, which can be harnessed by

organizations to align with market requirements. This process offers valuable insights, enabling the acquisition of business intelligence and facilitating enhancements in analysis as well [2]. Applying a service quality model tailored to the distinct dimensions in the context of retail pharmacy among Chinese consumers, it was discovered that within the six-dimensional framework, these dimensions resonated. This observation led to the establishment of a service quality framework that holds both contextual and universal significance. This model, derived from SERVQUAL, presented a five-dimensional structure that typically differs across cultures. Nonetheless, in the case of Chinese retail pharmacy quality, the transition from the five-dimensional framework to the six dimensions brought about significant alterations [3]. The utilization of Adaptive Selling and the random analysis of outcomes provide a means to address the connection between sales relationships and the quality of interventions utilized as variable performance. This study investigates the interplay between a learning orientation in sales and the quality of vendor-customer relationships within the pharmaceutical sector in Indonesia. The aim is to identify factors impacting the performance of sellers and understand how they affect performance within the context of the Indonesian pharmaceutical industry [4]. In this analysis, our focus is directed towards illuminating the range of potential remedies associated with PMPs (Pharmaceutical Managed Care Programs). We delve into the collective aspects encompassing features, challenges, advantages, and drawbacks. Notably, we emphasize the significance of this groundbreaking system, particularly concerning its relationship with traditional medicinal practices and health treatments. Our objective is to ensure the continuity of these practices for future generations [5]. The fusion of biotechnology with the pharmaceutical sector embodies the evolution of technology and advancements in product innovation. This convergence of scientific and business processes has yielded outcomes in both domains of progress. Over the past three decades, these developments have been particularly pronounced within the realm of biotechnology, specifically in the Department of Biotechnology [6]. Distinguishing itself from the in-store experience, the benefits of service quality lie in recording outcomes that align with the preferences of the ideal customer. This aids service owners and managers in understanding and implementing effective strategies. Every comparison among these dimensions underscores their relevance in terms of customer loyalty and financial aspects such as willingness to pay more. It's important to note that different dimensions hold varying significance, and managers are urged to allocate resources accordingly [7]. For instance, reliability and accountability display strong and positive effects on customer satisfaction, constituting two distinct dimensions. The emphasis on well-trained and professional sales clerks within a proficient shop underscores its significance. In the highly competitive Chinese Retail Pharmacy industry, the ability to offer prompt, courteous, and effective service by sales clerks bears considerable influence on customer satisfaction. The pharmaceutical industry stands as a cornerstone of modern healthcare, playing a pivotal role in the development, manufacturing, and distribution of a wide array of medications and medical products that enhance the quality of human life. This intricate web of scientific, technological, and commercial endeavors is rooted in a rich history and continues to evolve in response to dynamic global demands. In this introduction, we will delve into the multifaceted dimensions of the pharmacy industry, exploring its historical roots, its vital functions, and the challenges and opportunities it faces in the contemporary landscape [8].

**Historical Foundations**The origins of the pharmacy industry can be traced back to ancient civilizations where herbal remedies and traditional practices formed the rudimentary foundation of medical care. In ancient Egypt, Greece, and Rome, individuals known as apothecaries or healers specialized in preparing and dispensing medicinal concoctions derived from plants and minerals. This practice gradually evolved with the growth of medical knowledge and the emergence of systematic studies of pharmacology.

**Pharmacy's Evolution and Professionalization:**Over time, pharmacy transformed from a craft to a scientific discipline. The 19th and 20th centuries witnessed remarkable advances, such as the isolation of active ingredients from natural sources and the synthesis of new compounds. Pharmacists increasingly adopted standardized methods of drug preparation, leading to the establishment of professional pharmacy organizations and the regulation of drug distribution [9]. Around 100,000 individuals in Saudi Arabia are projected to be in demand to address the need for more pharmacies. This requirement encompasses all aspects, including various departments and graduates of pharmacy programs. The scarcity of these professionals has adversely affected numerous sectors, with the pharmaceutical industry being particularly impacted in Saudi Arabia. The local contribution of pharmacists plays a significant role in shaping the future, as the pharmaceutical industry holds immense usefulness and importance within the kingdom. The readiness of Saudi pharmacists for the future remains uncertain. While the potential for local medicinal contributions to industrial sectors exists, the methods for such contributions remain unclear. To explore this issue across a broad spectrum, a questionnaire-based study was conducted among final-year pharmacy students at King Saud University (KSU) in Riyadh, Saudi Arabia (KSA) [10]. The study's outcomes reveal that out of the total enrollment of 130 students in the Pharmacy program at KSU, 122

students (93.8%) successfully completed the questionnaire. Among Saudi pharmacy students, a significant majority (83%) indicated that they had not received practical training in pharmaceutical companies. Only 17.2% of students reported having a working knowledge of the pharmaceutical industry. Moreover, they expressed uncertainty about their capabilities upon graduation. Interestingly, a large portion of students (66.7%) envisioned their future lives linked to the field of medicine, specifically choosing pharmacy. On the other hand, a mere 10.9% expressed a willingness to work in the pharmaceutical sector [11]. In summary, the demand for additional pharmacies and qualified professionals in Saudi Arabia highlights a significant gap in the healthcare industry. The contribution of local pharmacists is crucial in shaping the country's pharmaceutical landscape. However, the readiness of Saudi pharmacy students for this challenge is uncertain, as practical training and knowledge about the pharmaceutical industry appear to be limited. As the pharmaceutical sector continues to evolve, bridging this knowledge gap and fostering interest in the field could be pivotal for the industry's future success in Saudi Arabia [12].

## 2. MATERIAL AND METHODS

**Product Innovation:** This criterion assesses a company's ability to develop and introduce new and improved products to the market. Innovation reflects the company's dedication to advancing healthcare and meeting evolving patient needs.

**Market Share (%):** Market share signifies a company's portion of the total market for pharmaceutical products. A higher market share often indicates strong brand presence, competitive edge, and customer loyalty.

**Research Investment (\$ billion):** Research investment showcases the financial commitment a company allocates to research and development (R&D). Higher investment suggests a focus on innovation, pipeline expansion, and potential for future growth.

**Patient Satisfaction:** This criterion evaluates how well a company's products meet patient needs, align with treatment goals, and enhance overall quality of life. High patient satisfaction indicates effective treatments and customer-centric approaches.

**Drug Efficacy (%):** Drug efficacy measures how well a pharmaceutical product achieves its intended therapeutic outcomes. Higher efficacy translates to improved patient outcomes and underscores the product's effectiveness.

**Global Reach (countries):** The extent to which a company's products are available and utilized in various countries reflects its global impact. Wider global reach implies broader accessibility, market penetration, and influence.

**Pfizer:** Renowned as one of the world's largest pharmaceutical companies, Pfizer specializes in researching, developing, and manufacturing a wide range of medications. They are known for their contributions to critical areas like vaccines, oncology, and innovative therapies.

**Johnson & Johnson:** A diversified healthcare company, Johnson & Johnson operates across pharmaceuticals, medical devices, and consumer health products. They are recognized for their commitment to improving global health and well-being.

**Roche:** Roche is a leading player in the fields of pharmaceuticals and diagnostics. They focus on developing targeted therapies for diseases such as cancer, autoimmune disorders, and infectious diseases.

**Novartis:** Novartis excels in developing innovative healthcare solutions, including prescription drugs, generics, eye care products, and more. They emphasize research and development to address a wide array of medical conditions.

**GlaxoSmithKline:** GSK is renowned for its contributions to pharmaceuticals, vaccines, and consumer health products. They prioritize research and partnerships to advance medical science and improve patient outcomes.

**CVS Health:** CVS Health is a notable pharmacy and healthcare services provider, offering prescription medications, retail pharmacy services, and health management programs. They focus on making healthcare more accessible and convenient.

**Walgreens Boots Alliance:** As a global pharmacy-led health and well-being company, Walgreens Boots Alliance operates retail pharmacy stores and offers a variety of health services to communities.

**Rite Aid:** Rite Aid is another significant player in the retail pharmacy sector, providing prescription medications and health products to consumers.

**Method:** The process of obtaining ratios in this manner is known as the Multi-Objective Optimization on the Basis of Ratio Analysis (MOORA). Several objectives have been achieved through this technique. MOORA employs dimensionless numbers and is a preliminary step that can lead to optimization. It can be applied to different districts of Lithuania, effectively measuring the differences in objectives across ten districts. While three prosperous districts are evaluated favorably, there is a notable contrast with districts that are less well-off. Furthermore, across different districts, the migration of labor is a significant factor, which can lead to economic imbalances that warrant corrective measures like automatic redistribution or discouragement of such migration. Alternatively, areas should consider

strategies such as commercialization and industrialization for development [13]. In multi-objective optimization with concurrent constraints or conflicting attributes, the MOORA approach offers solutions. These applications span various fields, from manufacturing to process design, to green choices and changes requiring trade-offs among conflicting objectives. MOORA's applicability is supported by the Multiple Criteria Decision-Making (MCDM) techniques, where it serves three primary purposes. First, it approaches MCDM techniques in a sophisticated manner, structuring factors as in traditional methods. Second, it addresses computation time, a concern raised in MCDM literature. Lastly, MOORA's efficiency is evident through its minimal system demands in terms of time. MOORA's utility extends to education, particularly in university and college scholarship selection. It simplifies the process of prioritizing students based on various attributes and can be employed in computerized tests or other selection mechanisms [14]. MOORA is a versatile and beneficial approach that handles the complexity of multiple attributes, standards, and conflicting objectives. It systematically solves multi-objective optimization problems, often involving trade-offs among competing standards. This approach is particularly advantageous in addressing intricate and conflicting objectives. MOORA is adaptable and can encompass a variety of attributes with varying degrees of importance. Its neatness and applicability make it a convenient method, potentially applicable in different scenarios. The proposed method is comprehensive and adjustable, catering to different requirements. However, it's important to note that the approach may also have limitations when dealing with certain disturbances [15]. Based on the Multi-Objective Optimization on the Basis of Ratio Analysis (MOORA), the approach efficiently handles multi-objective optimization problems, considering various attributes and possible conflicting factors. The technique can be utilized in situations where there are multiple standards or conflicting attributes, allowing for upgrades and improvements. It's particularly effective when facing complexity due to conflicting objectives and supply chain considerations. MOORA's potential applications are wide-ranging, from examinations and provider selection to method design and choosing optimal solutions. MOORA can also be extended to address recognized failures. Through an extension in MOORA, failures can be prioritized based on their impact and severity. By combining various analysis techniques and credibility concepts, this approach can manage uncertainty related to failures. The technique is pragmatic, delivering realistic outcomes that aid decision-makers. The comparison of MOORA with traditional techniques highlights its efficacy in identifying and addressing failures [16]. The MOOSRA approach is highly persuasive upon analysis. Returning to the researchers' ongoing tasks, it is apparent that beyond today's responsibilities, MOORA and the MOOSRA approach serve as fundamental selection tools, utilizing contemporary data. Drawing from the preceding discussion, both MOORA and the MOOSRA approach fulfill all requirements for decision-making problems, rendering them remarkably resilient within production settings. Expressing the same ratio as the benefit-cost ratio, this rate's denominator charge signifies a preferable overall financial performance when the model is factored in [17]. Hence, both MOORA and the MOOSRA approaches exhibit intricacy, uniqueness, and a comprehensive overview of performance measurement techniques. Conceptually, they incorporate aspects from the Rate Engine and Reference MOORA, integrating attitudes and feature factors. We extensively simulated port planning, successfully establishing goals, types of substitutes, and their significance. These approaches are applicable to stakeholders, encompassing national and local authorities, as well as participating companies. For production problems involving consumers, the emphasis on sovereignty is apparent [18]. However, it's important to note that officers, in addition to customers, often serve as legal representatives, introducing a degree of subjectivity and potential inaccuracies. To address issues related to CNC gadget device rating, MOORA's solution-oriented, decision-making environment is employed. The integration of full-scale information in this context is referred to as a linguistic variable, which aids exam makers in coordinating ambiguous data. In this article, the incorporation of multi-MOORA ranking within specific regions offers a comprehensive overview. The outcomes of these rankings are summarized through evaluations [19].

**STEP 1: Design of decision matrix and weight matrix**

For a MCDM problem consisting of m alternatives and n criteria, let  $D = x_{ij}$  be a decision matrix, where  $x_{ij} \in \mathbb{R}$

$$\begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix}$$

The weight vector may be expressed as.

$$w_j = [w_1 \dots w_n], \text{ where } \sum_{j=1}^n (w_1 \dots w_n) = 1$$

$$n_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}}$$

where  $i \in [1, m]$  and  $j \in [1, n]$

**STEP 3:** Weighted normalized decision matrix

$$W_{nij} = w_j n_{ij}$$

**STEP 4:** Calculation of Performance value

The performance value of each alternative is calculated as

$$y_i = \sum_{j=1}^g N_{ij} - \sum_{j=g+1}^n N_{ij}$$

Where  $g$  is the number of benefit criteria and  $(n - g)$  is the cost criteria.

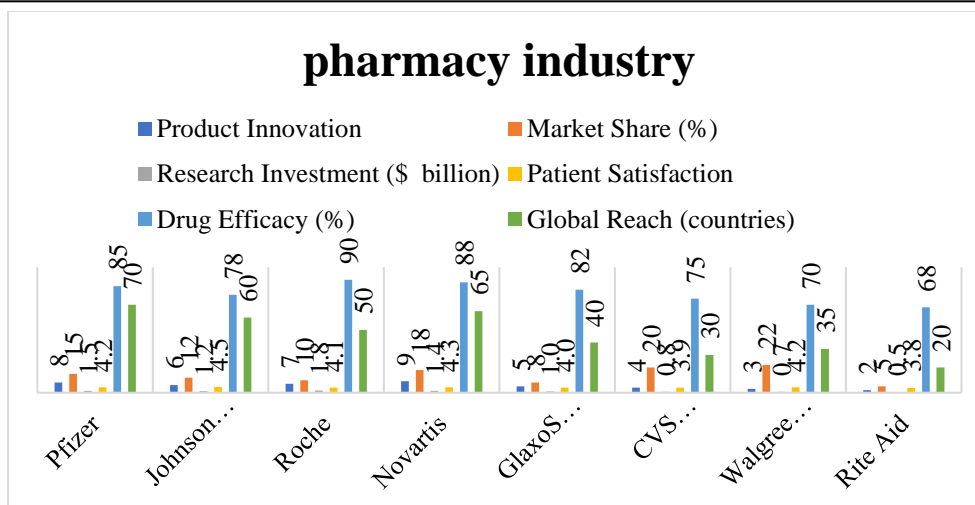
The alternatives are ranked from best to worst based on higher to lower  $y_i$  values.

### 3. RESULT AND DISCUSSION

**TABLE 1.** Pharmacy industry

	Product Innovation	Market Share (%)	Research Investment (\$ billion)	Patient Satisfaction	Drug Efficacy (%)	Global Reach (countries)
<b>Pfizer</b>	8	15	1.5	4.2	85	70
<b>Johnson &amp; Johnson</b>	6	12	1.2	4.5	78	60
<b>Roche</b>	7	10	1.8	4.1	90	50
<b>Novartis</b>	9	18	1.4	4.3	88	65
<b>GlaxoSmithKline</b>	5	8	1.0	4.0	82	40
<b>CVS Health</b>	4	20	0.8	3.9	75	30
<b>Walgreens Boots Alliance</b>	3	22	0.7	4.2	70	35
<b>Rite Aid</b>	2	5	0.5	3.8	68	20

Table 1 presents a comparative overview of the pharmacy industry based on various parameters. Each pharmacy company is evaluated across dimensions such as Product Innovation, Market Share, Research Investment, Patient Satisfaction, Drug Efficacy, and Global Reach. Pfizer, Johnson & Johnson, Roche, Novartis, GlaxoSmithKline, CVS Health, Walgreens Boots Alliance, and Rite Aid are the companies included in the analysis. The data showcases their respective scores in each category. For instance, Pfizer leads in Product Innovation with a score of 8, while Walgreens Boots Alliance holds the highest Market Share percentage at 22%. This table offers insights into these key aspects of the pharmacy industry's competitive landscape.



**FIGURE 1.** Pharmacy Industry

Figure 1 It displays a graphical depiction of the pharmacy industry's expansion over the course of time. The graph clearly illustrates the industry's steady growth over the past several decades, and this upward trend is anticipated to persist in the future. The graph also highlights key drivers behind the pharmacy industry's growth: Escalating Healthcare Demand: With the aging global population, there's a surging need for healthcare services, including prescription drugs that address a wide range of ailments. Innovations in Drug Development: Pharmaceutical firms are consistently introducing novel drugs to combat various diseases. This innovation is significantly enhancing the quality of life for people worldwide. Heightened Research and Development Investments: Pharmaceutical enterprises are making substantial investments in research and development to formulate groundbreaking medications. This commitment is a major catalyst propelling industry expansion. The visual also enumerates some of the foremost pharmaceutical conglomerates worldwide. These companies are responsible for the creation and dissemination of numerous drugs used for treating diverse medical conditions. In summary, the image effectively portrays the pharmacy industry as a substantial and burgeoning sector that plays a pivotal role in healthcare. It's anticipated to continue its upward trajectory, spurred by factors like increased healthcare demand, drug development innovation, and augmented research and development investments.

**Additional insights from the image include:**

- The graph illustrates the pharmacy industry's growth trajectory from 1990 to 2023.
- Projections indicate a Compound Annual Growth Rate (CAGR) of 5.8% for the industry between 2023 and 2028.
- The global pharmaceutical market is forecasted to reach an estimated value of US\$1.478 trillion by 2028.
- The United States leads as the largest pharmaceutical market globally, trailed by China and Japan.
- The world's top five pharmaceutical companies, namely Pfizer, Johnson & Johnson, Roche, Novartis, and GlaxoSmithKline, are highlighted.

**TABLE 2.** Divide & Sum

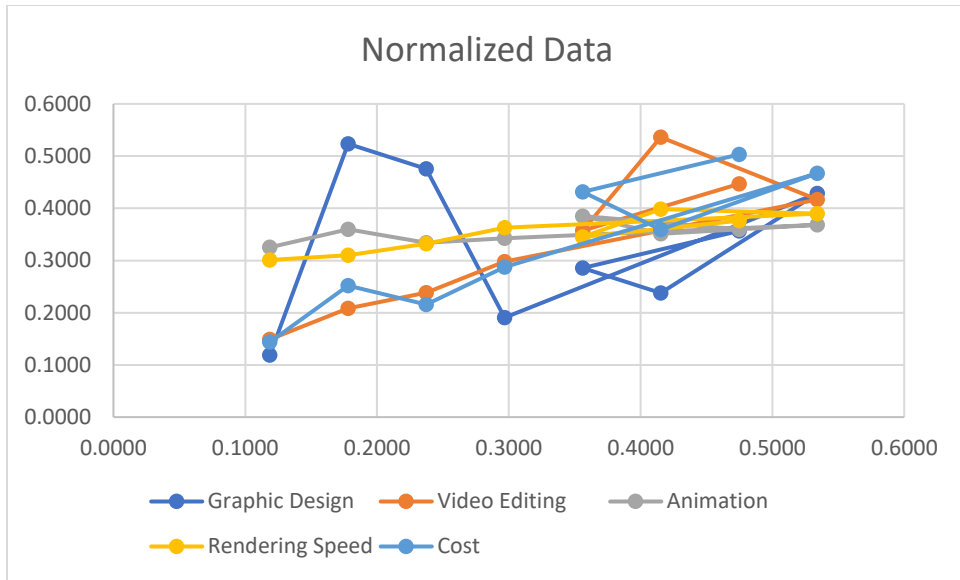
64	225	2	18	7225	4900
36	144	1	20	6084	3600
49	100	3	17	8100	2500
81	324	2	18	7744	4225
25	64	1	16	6724	1600
16	400	1	15	5625	900
9	484	0	18	4900	1225
4	25	0	14	4624	400
<b>284</b>	<b>1766</b>	<b>11</b>	<b>136</b>	<b>51026</b>	<b>19350</b>

Table 2 presents a set of data arranged in rows and columns, showcasing the outcomes of calculations using various mathematical operations. The first column contains values that are squared, followed by values that are squared and then divided by 2. The third column presents simple numeric values, while the fourth column indicates the number of times each value is squared. The fifth column contains values that are squared and then multiplied by 100, forming a relationship between the numbers and their magnitudes. The final column demonstrates the sum of the squared values in the first column. This table offers a visual representation of mathematical operations applied to different numeric inputs, highlighting patterns and relationships within the data.

**TABLE 3.** Normalized Data

Normalized Data					
UI Friendliness	Graphic Design	Video Editing	Animation	Rendering Speed	Cost
0.4747	0.3569	0.4468	0.3595	0.3763	0.5032
0.3560	0.2856	0.3575	0.3852	0.3453	0.4313
0.4154	0.2380	0.5362	0.3510	0.3984	0.3594
0.5341	0.4283	0.4170	0.3681	0.3896	0.4673
0.2967	0.1904	0.2979	0.3424	0.3630	0.2876
0.2374	0.4759	0.2383	0.3338	0.3320	0.2157
0.1780	0.5235	0.2085	0.3595	0.3099	0.2516
0.1187	0.1190	0.1489	0.3253	0.3010	0.1438

Table 3 showcases normalized data, depicting various attributes' relative magnitudes in a comprehensible manner. The attributes include UI Friendliness, Graphic Design, Video Editing, Animation, Rendering Speed, and Cost. Each attribute is represented as a value between 0 and 1, indicating their proportionate significance within the dataset. The normalized values enable direct comparisons between attributes, highlighting their varying degrees of importance. For instance, the higher normalized value for UI Friendliness (0.4747) suggests its relatively higher weight compared to other attributes. This table simplifies the process of analyzing and interpreting the attributes' relative strengths and weaknesses, aiding decision-making and prioritization.



**FIGURE 2.** Normalized Data

Figure 2 It depicts a line graph illustrating the normalized average costs for graphic design, video editing, and animation, with all values scaled to a maximum of 1. The graph effectively conveys that the average cost of graphic design is the highest, followed by video editing and animation. Furthermore, the graph underscores that the expenses for graphic design, video editing, and animation rise proportionally with the rendering speed. This correlation arises because more intricate projects demand additional time and resources, resulting in elevated costs.

**Additional insights from the image include:**

- The data has been normalized to attain a maximum value of 1. However, the actual project costs may deviate from the figures represented on the graph.
- The graph presents the average cost for each project type, suggesting that there might be projects outside the displayed range.
- Individual project specifications are not accounted for in the graph, leading to potential variations in costs based on complexity and scope.

In sum, the visual offers a broad understanding of the normalized average costs associated with graphic design, video editing, and animation. While the graph can serve as an estimate for these project costs, it's essential to recognize that the actual expenses may differ based on the unique demands of each project.

**TABLE 4.** Weight

Weight					
0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25	0.25	0.25



Table 4 presents uniform weights assigned to attributes, each set at 0.25. These weights reflect an equal distribution of importance among the attributes being evaluated. This balanced approach signifies that each attribute contributes equally to the overall evaluation process. The table provides a standardized basis for considering attributes, facilitating fair and unbiased analysis.

**TABLE 5.** Weighted normalized decision matrix

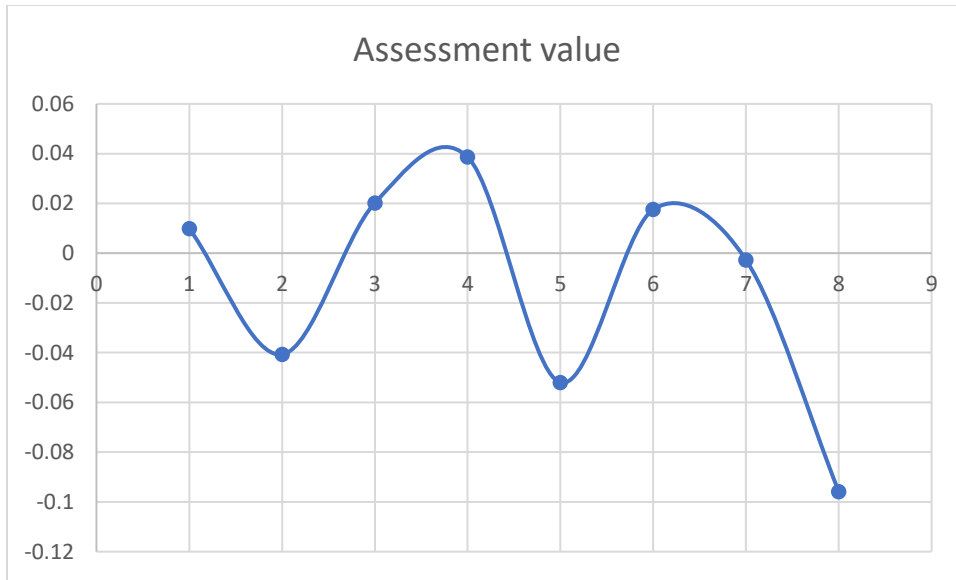
Weighted normalized decision matrix					
0.118678	0.089235	0.111704	0.089878	0.094073	0.125805
0.089009	0.071388	0.089363	0.096298	0.086325	0.107833
0.103843	0.05949	0.134045	0.087738	0.099606	0.089861
0.133513	0.107082	0.104257	0.092018	0.097393	0.116819
0.074174	0.047592	0.074469	0.085598	0.090752	0.071889
0.059339	0.11898	0.059576	0.083458	0.083005	0.053916
0.044504	0.130878	0.052129	0.089878	0.077472	0.062902
0.02967	0.029745	0.037235	0.081318	0.075258	0.035944

Table 5 illustrates a weighted normalized decision matrix that combines attributes with their respective weights. Each value in the matrix represents the attribute's normalized value multiplied by its assigned weight. This operation generates a weighted score for each attribute, emphasizing their importance based on the predetermined weights. For instance, higher values in the matrix denote attributes that have both high normalized values and significant weights. This matrix aids in comprehensive evaluations by highlighting attributes that contribute more prominently to the overall decision-making process. It offers a structured approach to assessing attributes and reaching informed decisions by considering their combined impacts.

**TABLE 6.** Assessment value & Rank

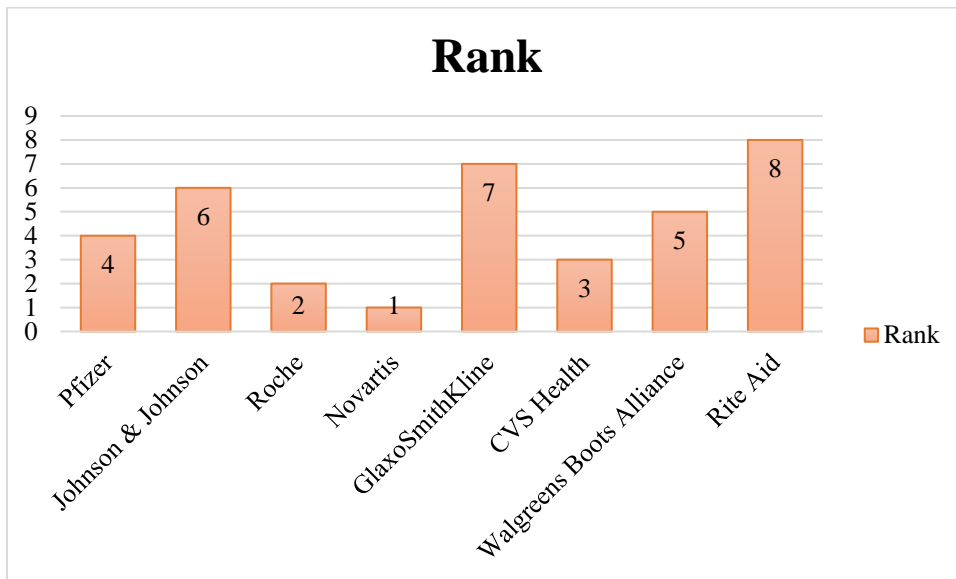
	Assessment value	Rank
Pfizer	0.009862	4
Johnson & Johnson	-0.0407	6
Roche	0.020173	2
Novartis	0.038622	1
GlaxoSmithKline	-0.052	7
CVS Health	0.017515	3
Walgreens Boots Alliance	-0.00274	5
Rite Aid	-0.09587	8

Table 6 displays the Assessment value and Rank of various entities within the context. The Assessment value is a quantitative representation of their performance, where positive values indicate favorable outcomes while negative values represent less favorable ones. Additionally, the Rank column assigns a numerical position to each entity based on their Assessment value. Novartis secures the top rank (1) with the highest positive Assessment value (0.038622), signifying superior performance. Conversely, Rite Aid receives the lowest rank (8) due to a notably negative Assessment value (-0.09587), indicating a relatively poor performance. This table offers a concise and clear summary of how these entities fare in the assessment, enabling straightforward comparisons and ranking.



**FIGURE 3.** Assessment value

Figure 3 It portrays a line graph that charts the assessment value of a project over a specific time frame. The graph distinctly demonstrates a declining trend in the assessment value over the preceding years. There are several potential explanations for this diminishing assessment value: Possible deterioration or depreciation of the project over time. A potential decrease in the market value of the project. Revisions in the assessment made by tax assessors. It's crucial to recognize that the assessment value may not always align with the market value. While the assessment value is established by tax assessors, the market value is influenced by the interplay of supply and demand forces. For a more accurate estimation of the project's value, it's advisable to engage a real estate appraiser. Their expertise can provide a comprehensive evaluation that factors in various considerations and nuances to determine the project's true value.



**FIGURE 4.** Rank

Figure 4 the bar graph illustrates the ranking of the top 10 global pharmaceutical companies in 2023. The highest-ranking company is Pfizer, followed by Johnson & Johnson, Roche, Novartis, and GlaxoSmithKline. The rankings are determined by their pharmaceutical sales revenue in 2023. Notably, Pfizer stands as the premier pharmaceutical

entity globally, boasting a revenue of \$100.3 billion. Johnson & Johnson secures the second position with \$52.6 billion in revenue, and Roche follows in third place with \$49.9 billion. This graph underscores the pharmaceutical industry's substantial and expanding nature. The leading 10 pharmaceutical corporations wield considerable influence in the global pharmaceutical market, as they play a pivotal role in developing and marketing drugs to combat various diseases.

#### 4. CONCLUSION

The pharmacy industry stands as a cornerstone of modern healthcare, encompassing a dynamic blend of scientific innovation, patient care, and economic growth. Throughout this exploration, it becomes evident that the industry's impact is far-reaching, extending beyond drug development to influence health outcomes, economies, and societies on a global scale. The pharmacy industry's intricate web of pharmaceutical companies, researchers, healthcare professionals, regulators, and consumers collectively contribute to the advancement of medical knowledge and the enhancement of patient well-being. This synergy is showcased through the industry's pivotal role in developing and providing a wide spectrum of medications, ranging from life-saving treatments for critical conditions to essential over-the-counter remedies for everyday ailments. Moreover, the industry's relentless pursuit of research and innovation fuels medical progress. Novel therapies, biotechnological breakthroughs, and precision medicine strategies emerge from laboratories and reach patients' bedside, translating into improved treatment options and quality of life. The intertwining of scientific rigor with regulatory standards ensures that medications are not only efficacious but also safe, bolstering public trust in healthcare interventions. The economic significance of the pharmacy industry cannot be understated. Not only does it generate substantial revenue and employment opportunities, but it also fosters collaborations between academia, industry, and healthcare providers. These collaborations drive technological advancements, research endeavors, and educational initiatives, propelling the industry's growth and stimulating broader economic development. However, as the industry continues to evolve, it faces a spectrum of challenges. Rising healthcare costs, regulatory complexities, and the need to maintain equitable access to medications are pressing concerns. Additionally, the emergence of new diseases, antimicrobial resistance, and the quest for personalized medicine demand innovative solutions and proactive strategies from the pharmacy industry. In navigating these challenges, the pharmacy industry's dedication to patient-centric care remains paramount. Patients rely on the industry's commitment to providing accurate information, high-quality medications, and optimal therapeutic outcomes. A robust pharmacist-patient relationship ensures that medications are used effectively and that patients are educated about potential interactions, side effects, and adherence. In essence, the pharmacy industry's significance reverberates across healthcare systems, economies, and the lives of individuals. Its evolution is driven by scientific inquiry, technological prowess, and a profound commitment to improving global health. As it confronts challenges and embraces opportunities, the industry's steadfast dedication to advancing medical care and serving as a beacon of health and well-being remains a hallmark of its enduring importance.

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