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INTRODUCTION

Computers-related accessories can be purchased from a wide variety of e-commerce platforms, which is why consumers find it difficult to find the most affordable options in a world where products seldom stay the same and prices are constantly changing. PriceSpy stands out as a navigational aid in the rampant digital marketplace ecosystem, providing searchers with a hassle-free process of deciphering and selecting prices that fit their budget.

Beginning with this introduction, the layers of PriceSpy are peeled away one by one to reveal its goal, nature, and logical system-enabled life-cycle stages.

The Problem Statement:

In the wide world of e-commerce, one of the most commons problems users face is the task of comparing prices across different platforms to catch the best deals on computers accessories. This task is even more difficult because of the volatile nature of the market, and we are dealing with the ever-changing prices. Accordingly, PriceSpy acts as our solution aimed at helping users by providing them with the latest price comparisons in real time and giving them an opportunity to make all the right choices of digital market.

Purpose and the Scope of PriceSpy:

Purpose:

The primary function of price spy as a marketplace is to offer the users with a centralized pricing-comparison resource for all types of computer accessories from different online retailers. PriceSpy is able to do so by collecting and offering real-time pricing information, thus making the decision making process easier for users by comparing it like, and by meeting their needs and checking their budget.

Scope:

PriceSpy offers a multitude of products under consideration, which include graphic cards and peripherals. Aiming beyond just giving out prices, it hosts features including reviews of users, product specifications and real-time updates to create a complete universe for the consumers to explore, examine, and make purchases.

Software Development Life Cycle (SDLC) Process:

PriceSpy is reviewed from the idea stage up to a fully functional platform, which passes through the Software Development Life Cycle. Each stage strengthens the plateform resiliency, making sure it responds to user requirements, matches industry standards, and is compatible with technology.

1. Initiation: Recognizing The Need

The journey starts with pinpointing a challenge most shoppers in the online shopping experience are facing. Reviewing the fact that there was a need for such a platform that eliminates the burden of price comparison, the developmental phase lays the foundation for PriceSpy.

2. Planning: Chartering The Way

During the planning phase, the team specifies the scope of the project, issues, timing, and resources. The planning process entails the feature, functionality, and technical specifications that establishes PriceSpy.

3. Analysis: User Requirements.

Centered around in-depth studies to capture the various elements of the problem area. Interviews, observations, competitors' analyses and user surveys provide users' needs with a dept picture, which helps us design PriceSpy to solve the savvy users' actual problems.

4. Design: Wireframe of UX

The design stage that follows analysis is when the research findings are organized into a structural plan. Interface design, algorithm, database architecture, and security measures are elaborately created to construct a system that is easy to use and efficient.

5. Implementation: Bringing Ideas to Life.

An armed with the blueprint the development team realizes PriceSpy on the basis of coding and programming. The actual real-time price comparison, authentication of users and interactions with databases are implemented that build the functional core of the platform.

6. Testing: Ensuring Reliability

Thorough testing is implemented to discover and remove all bugs, to ensure the highest performance and the reliability of the platform. The User acceptance testing and quality assurance processes verify that PriceSpy succeeds in the mission of a seamless operations.

7. Deployment: Unleashing to the General Masses

After final tests, PriceSpy is ready to be launched. The framework is officially released to the public which signifies its competition with the existing online retail platforms.

8. Maintenance and Support: Supporting the Continual Improvement

Even after deployment it is a very continuous journey through maintenance and support User feedback, changing market dynamics, and emergence of new technologies leads to an iterative improvement in the PriceSpy solution, that makes it dynamic and relevant always.

ANALYSIS

The analysis is aimed at PriceSpy, a web platform featuring the comparison of prices of peripherals for computers over some retailers available on the internet. The goal of this paper is to investigate the features, objectives, target users, existing system (if any), technical research, and system features that we will propose. In addition, the analysis will contain a comparative research of analogous solutions and the objective-oriented system will be developed.

PriceSpy's Problem Domain and Specific Problem

In the domain of online retail and computer accessories, PriceSpy is crucial, the centerpiece that aspires to solve a particular problem that looms large over the vast business world. This section is focused on highlighting the underlying problem statement, which is the area that is to be addressed, the critical aspect of the problem that needs to find a solution or investigate.

1. Problem Area:

a. E-Commerce and Price Variability:

The problematic aspect is bound up with the complexities of e-commerce, which entails consumers in the game of distinguishing the best prices among the large number of online stores supplying computer accessories.

b. Market Complexity:

The market dynamics represent a complex factor seeing that prices vary depending on various factors that include promotions, discounts, and retailers' strategies.

c. Information Overload:

In the digital markets, consumers are flooded with vast amounts of information, making it hard for them to carry out the effective and thorough price comparison across various platforms.

d. User Dissonance:

The users suffer a sense of dissonance that comes with inability to identify the most affordable choices in their journey to make a purchase, and poor centralization makes this process even harder.

2. Specific Problem:

a. Lack of Centralized Price Comparison:

The key problem that the main mission of the company is trying to solve is the fact that there is no such centralized and full automated system that provides users with an ability to make real-time pricing comparison of computer accessories across the Internet.

b. Timeliness of Information:

Users are faced with the challenge of acquiring real-time updates on price changes, while the existing solutions may take long time to provide information hence the decision may be based on outdated data.

c. Algorithmic Complexity in Comparison:

The complexities of comparing prices go beyond the plain numerical, and they incorporate elements such as product specifications, shipping costs, and dynamic offers. Some current platforms could not be as sophisticated as the algorithms required for more intricate analyses.

d. Global Accessibility and Currency Conversion:

Inaccessibility and the inability to make informed choices by the digital users on a global scale are the factors that bring up the problem of the lack of smooth currency exchange and lack of local pricing information.

e. User Experience and Interface Design:

The users get overwhelmed by the fact that there is a huge number of data presented by different retailers and it becomes difficult for them to understand the content correctly. The difficulty of user experience and interface design that are not straightforward are yet another barrier to this matter.

f. Revenue Diversification for Sustainability:

Online platforms have challenges to continue as they have been through the traditional revenue streams. This means that revenue diversification and strategic partnerships become top priorities.

g. Adaptability to Market Trends:

The rapidly changing technology market demands continuous adaptation in trend formations. However existing solutions may become obsolete as the topography changes frequently, thus missing the point or irrelevant information can result.

h. User Feedback Integration and Continuous Improvement:

Users are generally dissatisfied with the development process of existing platforms, which results in the absence of features, that are constantly evolving together with their needs. An instrument for efficiently receiving and using user feedback for ongoing improvement becomes necessary.

i. Data Protection and User Trust:

More than anything, data protection and privacy are of great concern. There is a possibility that the users may not like if the platforms neglect some tough ways of protecting their personal data.

j. Scalability for Growing User Base:

With the increase of the user base the platforms face challenges in providing smooth performance and satisfying the traffic needs. Scalability reverts to the main issue for long-term impact.

PriceSpy's Contextual Background

To have a well-informed grasp of the issue PriceSpy tries to solve, we need to unfold the layers of complexity of the online retailing arena, the difficulties of the consumers, and the role of PriceSpy in this dynamic system. This sub- chapter takes a close look at the issue and provides enough details to a third party so that the intricacies of the matter at hand becomes comprehensible.

1. The Evolution of E-Commerce:

The twenty-first century has seen a formative change in the customers' behaviour, with the e-commerce platforms becoming the prevailing sources of purchasing goods. The rising trend is explained by the convenience, variety, and in some cases the price competitiveness of online shopping. Nevertheless, this transition has also generated challenges such as the excessive availability of choices and the need to find ways to get around the huge and confusing marketplace.

2. The Challenge of Price Comparison:

a. Abundance of Choices:

Online retailers' expansion has resulted in a range of options for customers unmatched in history Although the variety might be enjoyed by the customers, it is significantly hard for the users to compare prices in details as they have many options available.

b. Dynamic Pricing Strategies:

Online sellers often use dynamic pricing that depends on the prognosis of such factors as demand, supply, and buyer's behavior. This adds a whole new level of complexity for the consumers, who still try to find the cheapest deals.

c. Real-time Price Fluctuations:

Prices of products in the Internet interactions are variable at any given time. Sometime exsiting solutions cannot provide user with real-time information about price changes thus may introduce some discrepancies among user's decision making.

3. The Genesis of PriceSpy:

a. Identification of User Pain Points:

The birth of PriceSpy is a process that started by finding those major issues that online customers usually face. Users encountered the shortage of centralized medium with quick, correct, and algorithmically superior price comparisons for thousands of online retailers.

b. Algorithmic Sophistication Requirement:

A lack of price comparison is a view that PriceSpy recognized as inadequate in the modern e-commerce industry. Examples such as product specifications, shipping costs, and a dynamic discount are the components that require algorithmic complexity to enable contraposition.

c. Global Accessibility and Currency Considerations:

To implement the price differential strategy, PriceSpy considered the global nature of online shopping and solved the conversion and localized pricing problems. Serving the diverse user base required prices to be presented in different currencies to ensure affordability as well as user accessibility and experience.

d. User-Centric Design Philosophy:

PriceSpy's mission, however, did not stop at just being a price comparison website. The philosophy of the design that user-oriented was critical to its aims at all times; this was implemented through simplification of user experience, enhancement of navigation, as well as presenting the information in a manner that speaks to the varied consumers.

4. The User Experience Conundrum:

a. Information Overload:

Existing platforms, to impose full information upon, sometimes bombard users with data. PriceSpy strived to find the best chosen method for presentation of the users, which consisted of giving them as much information as possible, without becoming overwhelmed with information.

b. Interface Design as a Catalyst:

The interface design became for many a key element for customer involvement. Realizing that an uncomplicated and visually pleasing interface is the element that procedures the user adhesions and daily user interactions, PriceSpy concentrated on it.

c. Continuous Improvement Through User Feedback:

The changing needs of the customer being realized, the firm developed mechanisms which will seek feedback from the users. This approach was not concentrated solely on solving the emerging problems but also to develop a feeling of user's engagement in platform enhancement.

5. Market Trends and Revenue Diversification:

a. Dynamic Technology Landscape:

The technology market develops with a pace that cannot be called slow, new products, trends, and consumer preferences emerge. With PriceSpy's commitment to be the cutting-edge that remains relevant and valuable to users, it is apparent that they are aware of the increasing demand for market trends.

b. Strategic Partnerships for Sustainability:

To achieve sustainable growth and relevance, PriceSpy started venturing into diversified revenue by forging alliances with the leading online stores. This strategy was a way of record to generate revenues and self-sufficiency by creating stakeholders that would benefit from it Such an approach was designed to create the mutually beneficial relations with other parties that would eventually ensure financial sustainability of the platform.

6. Data Protection and User Trust:

a. Privacy Concerns in the Digital Age:

In the period of the booming data privacy concerns, PriceSpy understood that if it wanted to register and stay onto the market, the ctrl should be taken in the data protection sphere. The objective for this approach was to build user trust and consequently ensure their compliance with the latest data protection policies.

Beneficiaries of PriceSpy's Solution

To guide offering a solution in the fast-changing arena of the online shop where users have lots of options and rival prices, it is crucial to determine who is the buyer. Herein, the section precisely illustrates the audience and the stakeholders that PriceSpy aims to transfer the labyrinth of online retail into an easily understandable problem-solving terrain.

1. Primary Beneficiaries: College Students and Tech Enthusiasts

a. User Profile:

College Students: The company which specializes in college students' electronic devices is the main target.

Tech Enthusiasts: People who are enthusiastic about technology and have a desire to know the latest products.

b. Navigating Budget Constraints:

College Students: Deal with the budget constraints and look for economical solutions as guiding principle of their computer accessories purchase.

Tech Enthusiasts: Aiming at competitive prices is a way to survive in a market to be innovative, but also frugal.

c. The College Community Focus:

Networking and Socializing: Beyond price comparison, the platform of PriceSpy fits into the customized mode that the college community need for a solution and builds friendships among students with similar hobbies.

2. Secondary Beneficiaries: College Staff and Administrators

a. Staff and Student Services:

Objective: Improve students' wellness by promoting positive relationships and building unity.

Reduction in Concerns: As a result of having more positive social integration, the staff and student services departments have a decreased number of issues concerning the students' social well-being.

b. Accessibility Considerations:

Accessible Features: Purposes of design is through ge illustrated is the need of staff members who have different characteristics with their ability to see.

3. Key Stakeholders: PriceSpy, Retailers, and Educational Institutions

a. PriceSpy:

Mission Alignment: The objectives of PriceSpy are exactly fitting to the purpose of solving the unique difficulties faced by college students, whose product accessories' prices are constantly updated, providing for consumers individual real-time online price comparison.

User Engagement: Success is demonstrated by uptake and the satisfaction of users, to validate that the platform is relevant and fits the identified target.

b. Retailers:

Increased Visibility: Maximize on the high-tech exposure among the college students who often flock on this platform.

Competitive Advantage: Establish a competitive advantage by offering the most competitive prices and promotional deals in addition to attracting very profitable college student demographic.

4. Global User Base and Inclusive Design Considerations

a. Global Audience:

Diversity in User Base: It should be emphasized that arriving to college from different geographical areas, PriceSpy addresses a global audience.

Currency and Language Support: Upfront inclusive design plugs translation and cross currency functionalities so as the system is accessible for the international users.

b. User-Centric Design:

Interface Intuitiveness: The design first concentrates on the user interface that is native and familiar to people from a variety of language and cultural perspectives.

Continuous Improvement: The platform needs to be created with an understanding that it should be ever changing to emit a tone that reaches its users. It is essential for us to get feedback from the users.

5. Client and Platform Alignment:

a. Client's Perspective:

Key Deliverables: Client satisfaction is directly related to the completion of critical, i.e. personal and exclusive social networking site for college students, which will serve as the main product.

b. Business and Competitive Edge:

Return on Investment: The client, particularly the educational institution, expects the project to deliver positive investment returns, tangibly expressed not only in economic terms but also in terms of social benefits for the students.

Competitive Edge: A successful strategy offers the institution a competitive advantage in operation of attracting prospective students.

Methodical Exploration in Researching PriceSpy's Problem

In this world of system development, an in-depth knowledge of the problem itself is the compass that directs the progress of development. The beginning of the trip of PriceSpy platform was its thorough investigation of problem domain.

1. Interviews:

Engaging Stakeholders: Interviewing different stakeholders, the online retail area users and the rivals platform agents.

User Insights: Investigated the expectations, difficulties, and choices of the idea users in the digital world of purchasing computer accessories.

Insights Gained:

- Pinpointed the user pain points in price comparison and a product selection process.
- Disclosed user preferences regarding interface design, feature, and the entire shopping experience in online.

Stakeholder	Key Insights
Users	Technology often finds it hard to address these challenges since a price comparison platform requires a streamlined interface.
Competitors	Market features that work for and make users happy as well as the room for improvement.

2. Observation:

User Behavior Studies: Undertook a subjective studies on how users engage with currently an online retail sites available.

Market Dynamics: The pricing observed as well as the metrics of user engagement and the effects of promotions or discounts.

Insights Gained:

- Identified common clues and general patterns to online buying habits.
- Explained the impact of price marketing on user selection.

Observation Focus	Key Finding
User Interaction	The most prominent use of filters and speed scrolling of product reviews.
Market Dynamics	Prices Sensitivity, the engagement increases during a special offer or sale.

3. Existing System Analysis:

Competitor Platform Analysis: I have evaluated and assessed the aspects of strength, weaknesses and importance of the existing platforms that play similar roles.

User Reviews Examination: Performed the analysis of user reviews and feedback by different means.

Insights Gained:

- Accurate features that users amalgamate with, and give a positive user experience.
- The issues and areas of concern arising from the opinions of referred users were gathered.

Competitor Platform	Strengths	Weakness
Platform A	Robust filtering options, clear pricing display	Limited user reviews, slow page loading times
Platform B	Comprehensive product information, intuitive navigation	Complex checkout process, lack of real-time updates

4. Document Inspection:

Analyzing Market Reports: Analyzed the market documents and studies pertaining to the sales sector of computer accessories.

Reviewing Industry Trends: Investigated the literature namely published magazines and articles discussing the current trends and challenges of online retail.

Insights Gained:

- From a general market perspective, I now understand the PC accessories retail business.
- Identified emerging technologies and consumer behaviors which are changing the sector.

Market Report	Key Findings
Tech Market Insights 2023	Growing demand for personalized shopping experiences, increased focus on customer reviews.
Online Retail Trends	Rise of mobile commerce, emphasis on user-generated content for decision-making.

5. User Surveys and Questionnaires:

Direct User Feedback: Set up and distributed surveys to get feedback of users directly.

Quantitative Data: Gathered quantitative data on users' individual preferences, pain points and expectations.

Insights Gained:

- Identified the usage frequency of particular obstacles by consumers.
- The gathered data about the user opinion on fundamental functionalities and value of separate functionalities

Survey Question	Response Distribution
Biggest Challenge in Online Shopping	35% Price Comparison, 25% Product Information Clarity, 20% Payment Security Concerns, 20% Other
Desired Features in a Price Comparison Platform	40% Real-Time Price Updates, 30% User Reviews Integration, 15% Intuitive Interface, 15% Other

6. Forums and Social Media Discussions:

Community Insights: Watched discussions on forums and social media conducted related to the field of computer accessories and online shopping.

Identifying Pain Points: Examined the complaints and queries of the users, in order to know the frequent displeasure.

Insights Gained:

- Opinions dispersed without censorship and with mind that they are unfiltered and organic by users who were already on the current platforms.
- Users’ most frequent pain points were listed.

Forum Topic	Common User Grievances
Platform Experiences	Slow customer support response, discrepancies in listed prices, lack of real-time updates.
Product Recommendations	Desire for personalized recommendations based on individual preferences.

Requirements Aligned with User Needs in the PriceSpy Ecosystem

Herein lies the secret of software creation which is the balance of user requirements and system functions. This part of the paper is an in-depth analysis of the systematic steps of transforming the voiced user needs into specific requirements that the PriceSpy platform must meet. Through the ability to match and emulate interface and functionality of the system with user expectations, the system strives to not only satisfy, but even surpass, ever growing demands.

1. User-Centric Elicitation:

a. Stakeholder Collaboration:

Inclusive Approach: Collaborated extensively with college students, tech fanatics and prospective users in sculpting the platform.

Workshops and Focus Groups: Lead sessions that were interactive and able to get candid responses from participants on what features and functionality they want.

b. User Stories:

Narrative Approach: User needs were analyzed from the standpoint of storytelling with the creation of user stories that showcased real-life situations.

Scenario Mapping: I force-mapped different user scenarios to see the key points of interactions and the main pain points.

2. Functional Requirements:

a. Feature Prioritization:

User Voting Mechanism: Let users decide on recommendations list through voting process based on concerned functionality.

Weighted Scoring: Scored the features based on the user-feedback and in-place, marking development focus.

b. Real-Time Price Comparison:

Central Functionality: Highlighted as the essential factor due to the importance of quick and correct pricing stated during the interview.

Algorithmic Framework: Integrated advanced algorithms to let for updating prices information in real-time and its precision.

c. User Profile and Preferences:

Tailored Experience: Understood the significance of personalization in the on-line experience.

Customizable Profiles: Users may create profiles adjusting their profiles to their personal preferences and favorite interests for a smooth shopping and socializing experience.

3. Security and Privacy:

a. User Authentication:

Data Protection: Security of user data raised as a top concern and expressed during the user interviews and survey.

Multi-Factor Authentication: Have implemented strong authentication techniques to shield users' credentials.

b. Privacy Controls:

Granular Settings: Responding to this need for privacy they have controlled how to view the data by adding granular controls.

Opt-In Features: Users are allowed to only share the particular information they wish to expose within the community.

4. Multilingual and Multi-Currency Support:

a. Global User Base:

Diverse Demographics: Incorporated the global user community consisting of diverse linguistic and currency choices .

Localization Features: Including languages and currency converters for ease of use and an inclusive experience.

b. Continuous Feedback Loop:

Community Forums: Ongoing user feedback and suggestions were incorporated in an existing channel.

Agile Development: Continuously improved system specifications, acquiring user feedback to develop the platform together with the developments in the needs of the users.

Measurable Objectives Charting PriceSpy's

A robust and successful system is undoubtedly supported by a strong objective as a basis plus a clear and measurable goal. This part of the plan focuses on the exercise of giving the goals

of the PriceSpy platform concrete, actionable, and time-sensitive objectives. Such objectives are the guiding lights of the development process as they are serving to steer the development and at the same time they provide a quantifiable basis for the success.

1. User Registration and Engagement:

Objective 1: Ensure a 20% rise of user registration in three months' time.

Objective 2: Guaranteed monthly user engagement rate of 70% and more.

Objective	Target Metric	Timeframe	Success Criteria
1	User Registrations	First 3 months	20% Increase
2	User Engagement Rate	Monthly Average	70% or higher

2. Real-Time Price Comparison:

Objective 3: Make sure the maximal price changes are shown in real time with delay no longer than 10 seconds.

Objective 4: Manage a pricing accuracy rate of 95% and above.

Objective	Target Metric	Timeframe	Success Criteria
3	Price Update Delay	Real-time	Maximum 10 seconds
4	Pricing Accuracy	Ongoing	95% or higher

3. User Authentication and Security:

Objective 5: Install Multifactor Authentication for all user accounts within six months.

Objective 6: Attain 100% block rate of malicious access.

Objective	Target Metric	Timeframe	Success Criteria
5	Multi-Factor Authentication	Within 6 months	Implemented for all users
6	Unauthorized Access	Ongoing	0 unauthorized access incidents

4. User Interface and Experience:

Objective 7: Achieve a user satisfaction score of 80% or better in every quarter of user surveys.

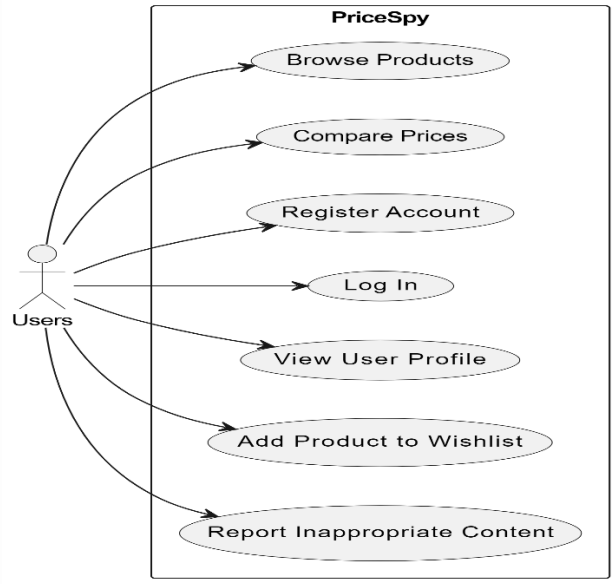
Objective 8: Optimize the average page load time of three seconds.

Objective	Target Metric	Timeframe	Success Criteria
7	User Satisfaction	Quarterly	80% or higher
8	Page Load Time	Ongoing	Below 3 seconds on average

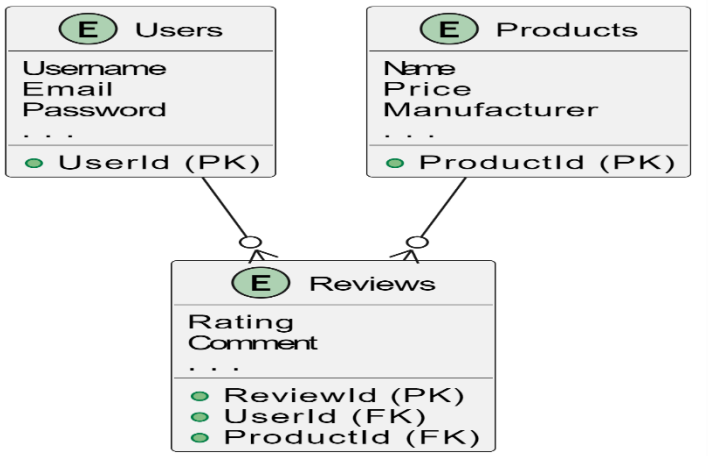
Problem Modeling in PriceSpy's Design Journey

As a very important phase in the development of software, the move from analysis to design is a key one. This part of the study deals with modeling strategies used for the PriceSpy, providing a detailed description of the part, when the identified problem has been converted into a specific structured plan. Using a range of modeling techniques, we intend to reduce the gap between the analysis and, the design stage. This will lay a positive foundation for the further development of the new PriceSpy platform.

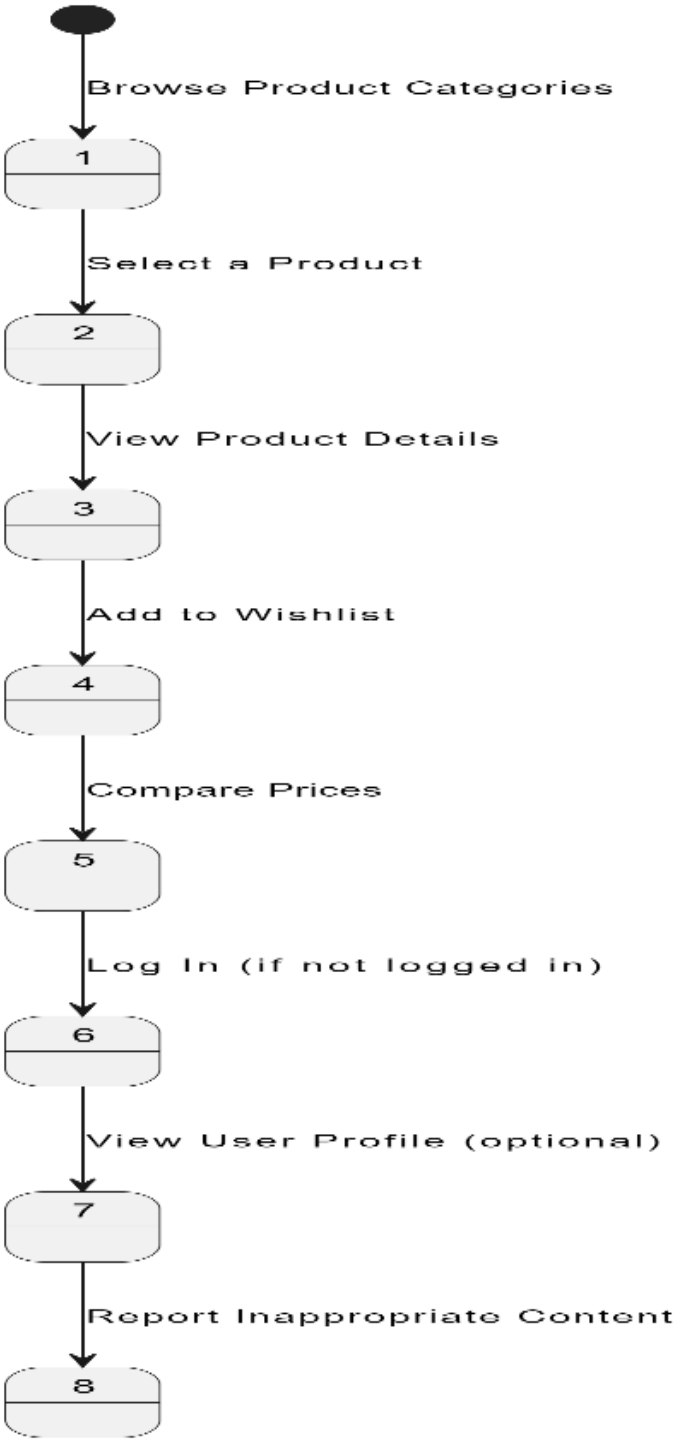
1. User Case Diagram:



2. Entity-Relation Diagram:



3. Activity Diagram:



Features that Enable Problem Solving

The PriceSpy website, focused on the comparison of prices for computer accessories from multiple retailers, stands a complex task that can be tackled by computational methods.The

purpose of this part is to focus on the aspects that qualify the issue as solvable through the application of computational methods, shedding light on why this type of methods should be adopted in the case of the company referred to as "PriceSpy".

1. Data Scraping and Aggregation:

One of the key features that place computational treatments at the core of PriceSpy is the need for web crawling and data aggregation. The website accumulates data from a number of online retailers, sorts the products into categories, and then displays the products on one centralized page. Manual methods will be inapplicable, tedious and prone to mistakes when dealing with vast numbers of products, as well as rapidly changing pricing structures. Computation algorithms are capable of effectively collecting data from various sources thereby making the product information reliable, accurate and timely.

2. Real-time Updates:

The rapid changes in prices across various product types in the online market require instant updates to give the users accurate and current information. Computational methods make it possible to PriceSpy to perform the process of price updates frequently in an automated manner. Algorithms can be configured to track price or other changes, so that customers get updated market conditions. This functionality is critical for the website as it enhances credibility as well as providing value to users who are in need of accurate current information, for their purchasing decisions.

3. User-Friendly Interface and Search Functionalities:

The user interface and the search functions are the most important key of success in PriceSpy. Computational methods make possible to design an interface that is easy to use and which is friendly with the user. Algorithms can be used in the designing of the layout, navigation and the search process to make them more effective. Such characteristics are very important for users, as they help them quickly compare prices in different online stores and enjoy the shopping process.

4. Algorithmic Price Comparison:

The main components of the price comparison service offered by PriceSpy are the possibility to compare prices on different on-line retailers. This complex function can be done effectively when it is carried out with the aid of price comparison algorithm. Through computational methods various factors like product specifications, shipping charges, and discounts get considered to develop algorithms so that users are presented with accurate and complete price comparisons. However, manual processing would eventually fail in the case of high complexity and rate, whereas computational strategies would remain of significance.

5. Scalability:

In order to meet the demands of a diverse user base that could be quite numerous, scalability becomes a fundamental consideration. Computational technologies on the other hand, support scaling operations in a cost effective way. Codes can process more data, users, and transactions without the deterioration of performance. This scalability is, in fact, of utmost importance given the aim for PriceSpy to support expansion and to ensure consistent and reliable service provision to an increasing user community.

Stakeholder Analysis for PriceSpy

The rule of thumb followed by PriceSpy, the website meant for comparing prices of computer peripherals from several online merchants, depends on its capacity to deal with the matters of relevance to the various interest groups. This section will conclude on the identification and illustration of the principal stakeholders who will be interested in our solutions and give out the specifics of how we will correspond to the disparate needs of each stakeholder.

1. Consumers:

a. Needs:

Cost-Efficient Purchasing: Consumers will be searching for the best bargains in computer accessories to maximize their wealth management.

Comprehensive Information: The users want to see a centralized platform that offers specific info on products and prices from multiple online sellers.

Real-time Updates: Up-to-date price fluctuation informs users of transaction competitiveness.

b. How PriceSpy Meets Their Needs:

• PriceSpy aggregates product data to enable consumers to compare prices, and therefore, ensure customers buy most cost-effectively.

• The feature of real-time updating provides up-to-date details for users who can, in turn, use it as a basis for decision-making.

• The dedicated platform makes it much easier to get the needed information in a multipurpose manner, and the buyer's journey is simplified.

2. Online Retailers:

a. Needs:

Increased Visibility: The target market of online sellers is to make their products more visible in a competitive market.

Market Insights: Knowing how their prices differ from competitors' prices gives a big picture what the market is all about.

User Traffic: Technically, retailers look to customers visiting their portals.

b. How PriceSpy Meets Their Needs:

• Boosting the offerings" visibility is what PriceSpy does by selecting products from different online stores.

• The website provides insights into the markets by displaying the meanings of each retailer's prices on comparison, the tool being useful to the pricing departments.

• Attending the affiliated online retailers by the customer as a result of user traffic on PriceSpy is potential.

3. Tech Enthusiasts:

a. Needs:

Product Research: Tech fans usually take time to do a detailed investigation prior to computer-related parts purchasing.

Latest Trends: Staying on par with the newest products and trends is a must for this target market.

Cost Savings: Brand loyalists are also eager to learn everything they can and still have cheaper options for their tech buys.

b. How PriceSpy Meets Their Needs:

• PriceSpy acts as a handy tool for research, considering numerous product comparisons carried out in its database.

• The website is used to display the trending andrecent products that are offered in the computer accessories world.

• Through PriceSpy, tech enthusiasts are able to make an educated and economic choice for their purchases, which is possible by price comparisons.

Research and Solution Approaches for PriceSpy

Complexities such as those encountered when comparing prices for computer accessories from online retailers call for a well thought-out and effective solution, and that is what the website PriceSpy has in mind in its mission to address those issues. In this section of the research, the problem in contention is studied and necessary approaches are identified and justified to accordingly help PriceSpy come up with a sustainable solution.

1. Understanding the Problem:

a. Market Dynamics:

Extensive Product Varieties: The online market for computer accessories is gigantic with it carrying an impeccable variety of items.

Dynamic Pricing: Prices are always susceptible to frequent changes attributed to promotions, discounts and peculiar demands of the market.

User Expectations: Users demand live updates and explain-able information for the purpose of intelligent decision-making.

b. Competitive Landscape:

Numerous Online Retailers: Competition among an overwhelming number of online retailers is fighting for the attention of consumers, between them, who have different prices and promotions.

User Loyalty: Users may favour certain retailers creating a situation when their buying choices are affected.

Market Trends: Providing awareness of the market trends is vital to keep businesses relevant and competitive.

c. User Needs:

Ease of Comparison: Customers are ready to use somewhere user-friendly that makes it simple to compare prices from many stores.

Comprehensive Information: The requirement for exact product data among which are specifications, reviews and seller ratings.

Currency Conversion: Proper solutions for the global audience should have the ability to perform currency conversion.

2. Solution Approaches:

a. Data Scraping and Aggregation:

Approach: Classify web scraping methods to obtain data from different e-commerce websites.

Justification: Automation is indispensable for data collection and aggregation procedures requiring speed and precision, as well as for the latter to be current and updated.

b. Real-time Price Updates:

Approach: Develop systems that can tweet the probative market conditions and register changes in prices automatically on the database.

Justification: In an emerging market presenting the users with the latest price information is of a great significance to protect the website's reputation and to make the website appealing for the users.

c. Algorithmic Price Comparison:

Approach: Design algorithms that take into account numerous factors including item specifications, shipping costs, and discounts for accurate comparisons of prices.

Justification: The manual approaches would not be able to cope up with the complexity and scope. Algorithms give us the efficiency and accuracy that we need.

d. User-Friendly Interface:

Approach: Reinvest in the design that focuses on the users, improving the layout, increasing navigation, and simplifying the search.

Justification: A user-friendly and easy-to-navigate interface should be the focus to ensure both user engagement and satisfaction, thus attaining a suitable user experience.

e. Currency Conversion:

Approach: Develop currency conversion algorithms based on live exchange rates which are dynamic in nature.

Justification: Enables accessibility to customers of various regions helping them in comparing prices conveniently in their local currency.

f. Inclusive Design and Accessibility:

Approach: Adhere to accessibility standards, thus, providing a platform that is inclusive of users with different abilities.

Justification: An emphasis on inclusivity also is ethically sound and increases the user volume by taking into account people with various needs.

3. Integration of User Feedback:

Approach: Introduce ways for receiving and integrating users' feedback.

Justification: User feedback is paramount for continuous improvement, hence it is essential that the platform keeps on growing according to user expectations and preferences.

4. Compliance with Data Protection Policies:

Approach: Adherence to data protection policies, especially when dealing with the users' sensitive information.

Justification: Preserving data protection norms is the key to building user trust and compliance with the laws.

Designing the Computational Solution

For dealing with a computational approach for PriceSpy website where it allows for comparing prices of computer accessories on several online retailers, identification and creation of fundamental features are of critical importance. This section dives into the core elements that constitute the foundation of a vital computerized solution for PriceSpy, expounded with logic behind each decision.

1. Web Scraping for Data Aggregation:

a. Essential Feature:

Automated Data Collection: The use of the web scraping algorithms that automatically gathers data from more than one online stores.

b. Explanation:

Web scraping is the root of rapidly amassing huge masses of information from different sources. An automated system will ensure real-time updates and accuracy, which is essential to giving people the most updated and genuine information on computer accessory prices.

2. Real-time Price Updates:

a. Essential Feature:

Dynamic Price Monitoring: Using algorithms to track price changes and adjusting the database in real time in case of a price fluctuation.

b. Explanation:

Real-time data is very important in a volatile market where the prices of commodities change very quickly. Consumers are dependent on data that is truthful and current for their decision-making. Real-time price monitoring guarantees that PriceSpy can boast its reputation by offering customers the most current prices.

3. Algorithmic Price Comparison:

a. Essential Feature:

Advanced Comparison Algorithms: Creating algorithms that take different types of factors like product specifications, shipping cost, and discount into consideration for precised price comparisons.

b. Explanation:

Manual comparisons become unpractical from the viewpoint of the number of products and retailers which are very high. While in the majority of cases state-of-the-art algorithms become irreplaceable sources of information to find accurate and informative result. Taking into consideration several variables allows for a more comprehensive assessment, which makes it easier for users to choose the best products corresponding to their needs.

DESIGN

In the world of online shopping, how the price comparison website is designed is central to achieving success. Designing Phase covers a wide range of activities that include system architecture research, user interface development as well as functionalities. This part of the discussion concentrates on the design aspects of the project, which are intended to construct a system that is simple and user friendly, as well as capacity building.

Designing PriceSpy: A Comprehensive Breakdown

E-commerce design is complex; thus, the development of a platform such as PriceSpy needs strategic planning and smart thinking. This section addresses the design phase, it is discussed how managing a complex problem of cost comparison into smaller ones to find a computational solution. Theory of the motive of critical choices is presented, revealing the composition of structure of the solution. In order to help with understanding, an IPSO chart (in/process/storage/output) is offered, this is a visual representation of the main components of the system.

Input Process Storage:

An IPSO chart gives a structured illustration of the leading elements of PriceSpy and brings into view the way from the inputs of the user to the required outputs. Next, the journey through the project's nitty-gritty details begins.

Input	Process	Storage	Output
User's Search Parameters	Real-time Price Matching	Product and Price Database	Ranked List of Products with Prices
User Reviews	Algorithmic Evaluation	User Preferences	Aggregated Product Ratings
User Authentication Data	Security Validation	User Authentication Database	Authenticated User Access
Historical Price Data	Comparative Analysis	Historical Price Database	Price Trends and Fluctuations Over Time

Breakdown of the Problem:

1. User's Search Parameters:

Input: User enters information such as product name brand or category.

Process: Instantaneously, the bot is searching the product and price database.

Storage: Temporary memory to store the search parameters while the search is on progressing.

Output: The ranking of the products in their order of price resulting from the user's query.

Justification: This break-down allows the data-centric processing of the user's search, prompting real-time comparisons and presenting instantaneous results.

2. User Reviews

Input: Customers leave feedback and make evaluations for products.

Process: An Algorithmic assessment includes sentiment and relevance scoring.

Storage: Users' preferences are preserved for future customization.

Output: Aggregated product evaluations, giving users critical information to make their own buying decisions.

Justification: User reviews have the ability to give an informal, yet valid, view to the product comparison, as a result, improve the decision making process.

3. User Authentication Data

Input: Security of user credentials for authentication.

Process: Authentication, in particular, assures the legitimacy of access to users.

Storage: User authentication details are therefore, kept safely.

Output: Users can authenticate to access personalized features.

Justification: Security is also significant, and this makes possible the control of user data and the provision of personalized experiences.

4. Historical Price Data

Input: Historic price information regarding the item in question.

Process: The emphasis of comparative analysis to track fluctuations and trends.

Storage: Database for retaining historical price data.

Output: Knowledge of the prices of the past.

Justification: Realizing historical price data helps the user to make predications and to make sensible choices in his decision, based on the past of the product' price.

Design Rationale:

1. A Real-time Price Matching Algorithm in this approach.

Justification: For the purpose of delivering quick and reliable data to users, it is essential to develop a real-time algorithm. This idea makes the website worth is to use while trusting it to give the latest market prices.

2. The Computer Algorithm Assessment of Reviews

Justification: Through the use of algorithms to rate user reviews, PriceSpy keeps itself objective and channelizes the insights in such a way that users get summarized, and meaningful review, simplifying the choice-making process.

3. User Authentication for the Purpose of Personalization.

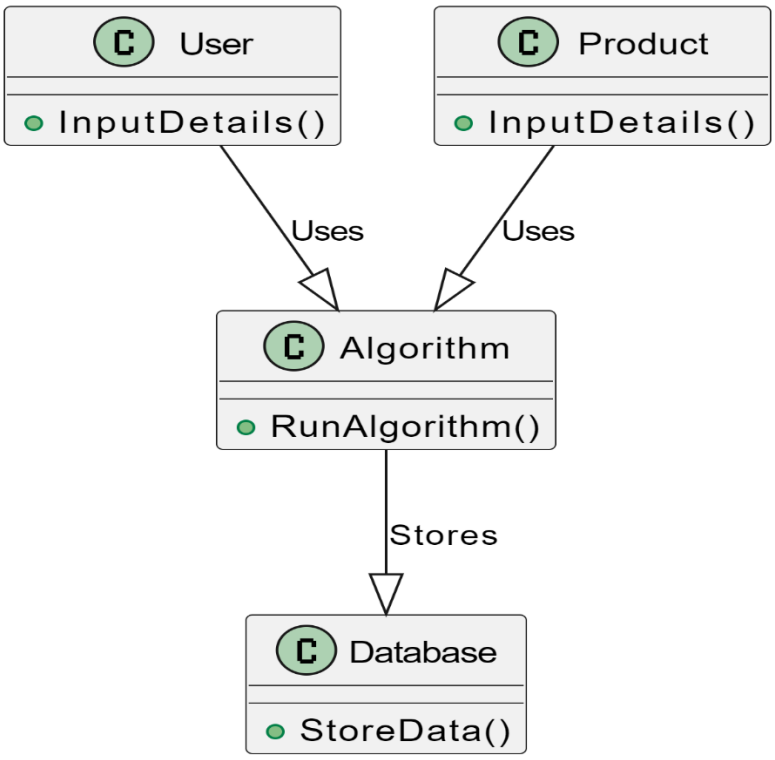
Justification: User authentication is the only way to get a good personalization, for example , it could be saving preferences, tracking search history and giving custom recommendations.

4. Historical Price Database

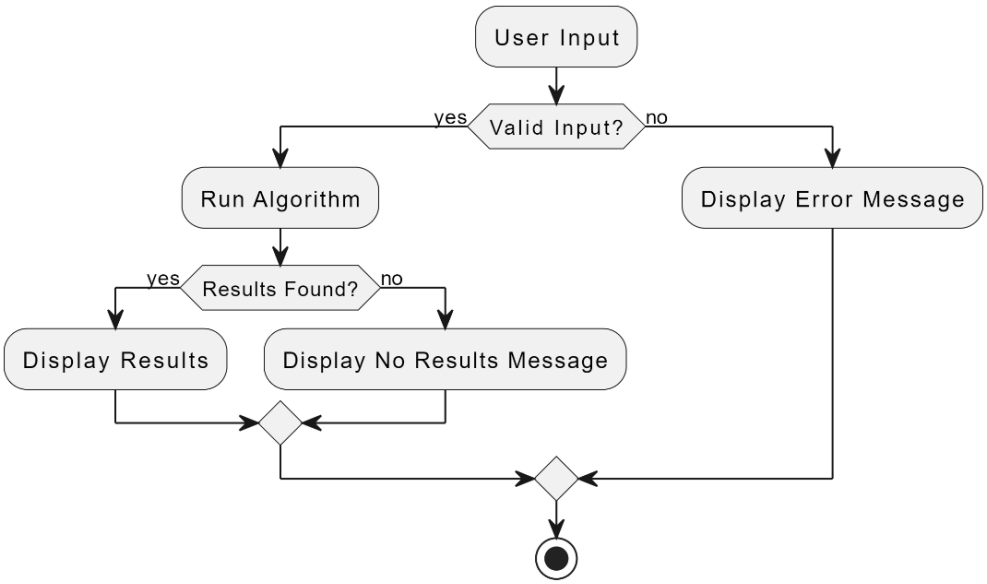
Justification: A historical price database having a comprehensive detail enables the users to give predictions about the trend with the possibilities that they can make well founded decision based on a product's pricing history.

Visualization Tools: Hierarchy Chart and System Flowchart

1. Hierarchy Chart:



2. System Flowchart:

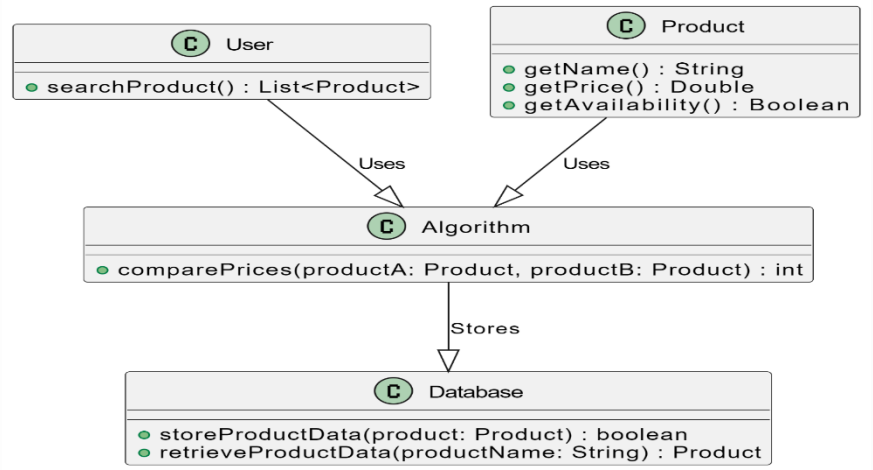


Comprehensive Modelling Approach

The design phase of price spy implies the topic of understanding the problem is already over and the crafting of a structured and effecient solution is the subject of discussion. Modeling the problem here has the building of the simulations or diagrams that will give the laboratory a chance to visualize and understand the concepts deeply. The section yields a presentation of different modelling approaches, where you'll have Annotated Class Diagrams, Entity - Relationship Diagrams (ERD), Data Flow Diagrams (DFD), and Graphs all PlantUML applied.

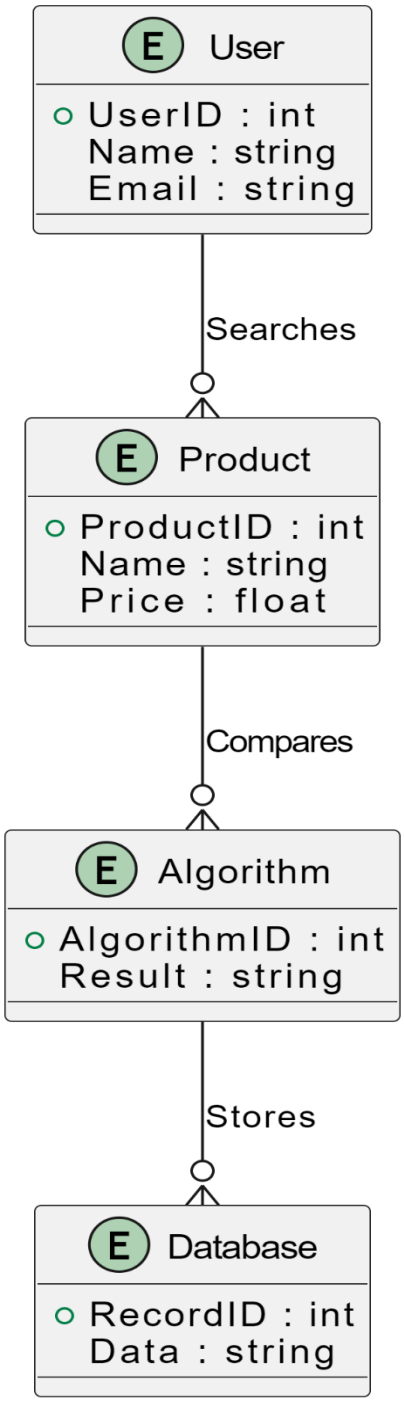
1. Class Diagram:

A class diagram is the fundamental tool for showing the system structure in the terms of classes, their attributes, and relations between them. For PriceSpy, the Class Diagram is the component that contains the main entities and how they interact.



2. Entity-Relationship Diagram (ERD):

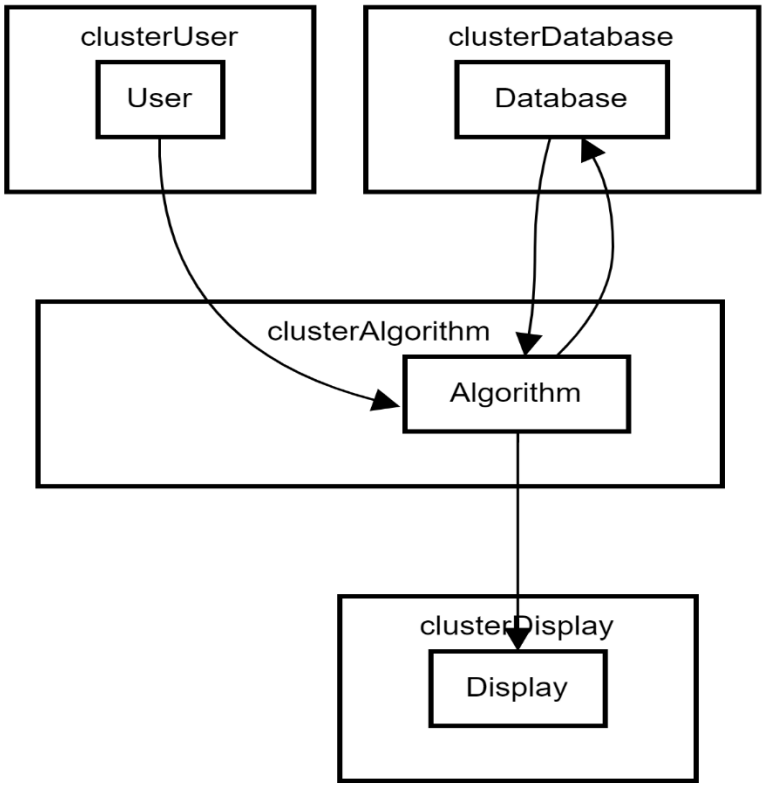
Entity-Relationship Diagram (ERD) is a pivotal mechanism to depict the linkage of entities in a database. It brings relationships of organizations and connections of the whole system into focus.



3. Data Flow Diagram:

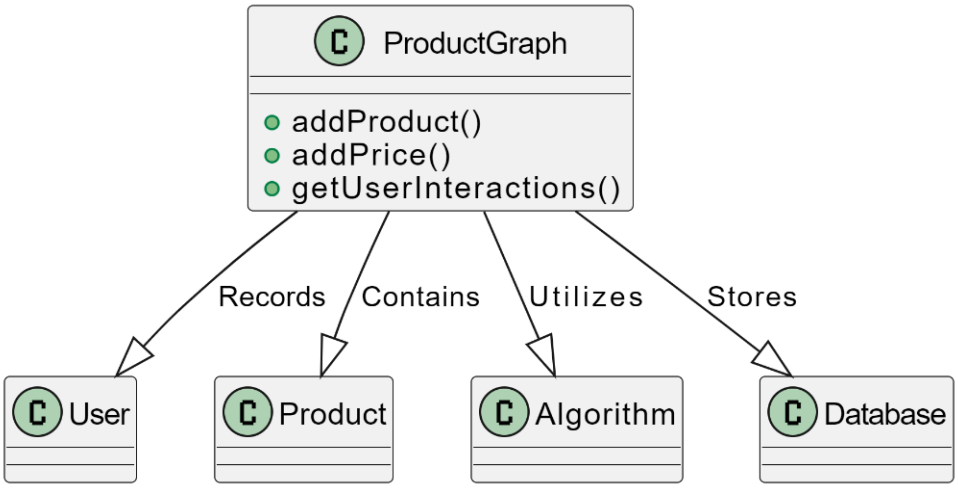
A DFD (Data Flow Diagram) gives an intuitive picture of the way in which data moves

through a system. It represents processes, data stores, data sources, and data destinations.



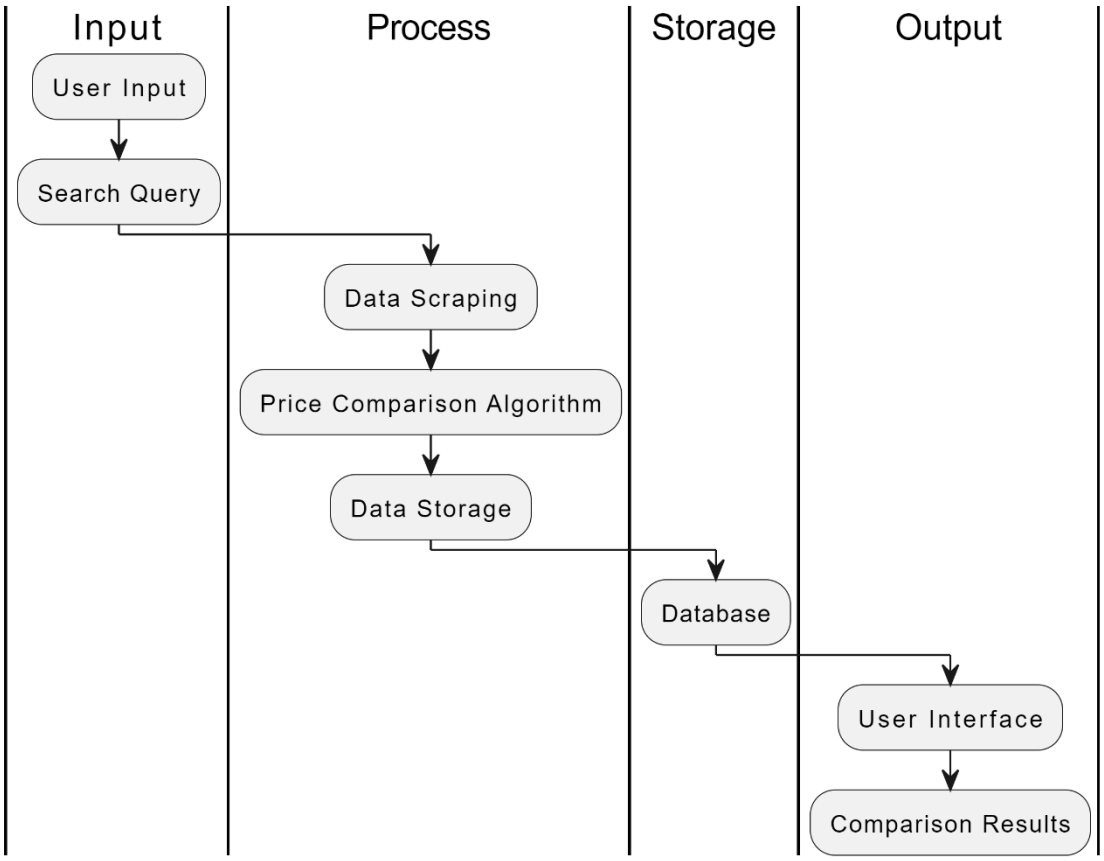
4. Graphs:

Graphs play an important role in factoring in relationships and dependencies of variables/properties. Graph in this context of PriceSpy shows that there are relationships underlying the products, prices and the interactions of the users.



5. IPSO Chart:

An IPSO (Input-Process-Storage-Output) chart serves as a visual representation of the problem model, outlining the flow of information and processes within PriceSpy.



Algorithmic Framework for Comprehensive Price Comparison

In the intricate fabric of algorithms PriceSpy weaves it forms the core of a fully and effectively adapted solution to challenges arising from online price comparison. Every algorithm is exactly built to tackle specific parts of the system, making contribution to the working and stable performance of the platform. This part of the solution deals with the main processes by presenting the algorithms for each component and showing that they are required to meet the addressing of the problem requirements.

1. Signup Registration Algorithm:

Objective: Enable the user profile registration, offering the easiest onboarding process.

Algorithm:

```
def signup(request):
    if request.method == 'POST':
        # Get form data
        first_name = request.POST.get('first_name')
        last_name = request.POST.get('last_name')
        email = request.POST.get('email')
        password = request.POST.get('password')
        age = request.POST.get('age')
        contact_number = request.POST.get('contact_number')

        # Check if email is already taken
        if CustomUser.objects.filter(email=email).exists():
            # email is taken, render signup page with error message
            return render(request, 'computer_parts/signup.html', {'error': 'email is already t
        else:
            # Username is unique, create user
            user = CustomUser.objects.create_user(email=email, first_name=first_name, last_nam
            login(request, user)
            print("user logged in successfully")
            # Redirect to home page or a confirmation page
            return redirect('/')
    else:
        # Render signup page
        return render(request, 'computer_parts/signup.html')

def send_verification_email(email):...


def signin(request):
    if request.method == 'POST':
        email = request.POST.get('email')
        password = request.POST.get('password')

        user = authenticate(email=email, password=password)
        if user is not None:
            login(request, user)
            print("user logged in successfully")
            return redirect('/')
        else:
            print("user login failed")
            return render(request, 'computer_parts/signin.html', {'error': 'Invalid email or p
    else:
        return render(request, "computer_parts/signin.html")


def signout(request):
    logout(request)
    return redirect("computer_parts:home")
```

Justification:

The sing up registration algorithm is the pathway to PriceSpy which enables users to create accounts and experience the options that are personally targeted for them. The algorithm guarantees validity of user input and hence data integrity creates a secure base for user registration. The hashed password thus acts as a security protection, which consequently moves the user toward trust in the platform.

2. Home Page Implementation in Django Algorithm:

Objective: In Django, implement screen design and rendering the homepage view.

Algorithm:

```
def home(request):

    is_verified = False  # Default value if user is not logged in or not verified
    if request.user.is_authenticated:
        is_verified = request.user.is_verified

    excel_path = os.path.join('computer_parts','static', 'computer_parts', 'cateloge
    df = pd.read_excel(excel_path)

    items = df.to_dict(orient='records')
    categories = set(item['Category'] for item in items)
    category_items = {category: [] for category in categories}

    for item in items:
        category_items[item['Category']].append(item)

    return render(request, "computer_parts/home.html", {
        'is_verified':is_verified,
        'items': category_items,

    })
```

Justification:

The home screen view algorithm relevant to Django is of fundamental value for the creation of a positive and client-oriented interface. With Django's efficient template architecture, this algorithm is designed to get the job done and this is achieved by promptly getting the user to the relevant content by rendering the content as soon as the user logs in. By providing personalized experience, the user becomes more engaged, making the platform more usable and appealing to them.

3. Search capability Algorithm in Home page:

Objective: Make it possible for users to navigate the site effortlessly from the first page.

Algorithm:

```
def search_page(request):
    if request.method == 'POST':
        search_query = request.POST.get('search_query', '')
        sort_by = request.POST.get('sort', 'price_low_high')
        filter_by = request.POST.get('filter', '')

        excel_path = os.path.join('computer_parts', 'static', 'computer_parts', 'cateloge.xlsx
        df = pd.read_excel(excel_path)
        filtered_items = df[df.apply(lambda row: any(search_query.lower() in str(row[col]).lowe

        if filter_by:
            filtered_items = filtered_items[filtered_items['Category'] == filter_by]

         # Apply sorting
        if sort_by == 'price_low_high':
            filtered_items = filtered_items.sort_values(by='Price')
        elif sort_by == 'price_high_low':
            filtered_items = filtered_items.sort_values(by='Price', ascending=False)


        items_searched = filtered_items.to_dict(orient='records')
        return render(request, "computer_parts/search_page.html", {
            'items': items_searched,
            'search_query': search_query,
            'request':request,

            })
    else:
        return render(request, "computer_parts/search_page.html", {
                        'request':request,
                    })
```

Justification:

The product of the price search functionality algorithm is PriceSpy's something with which it is beginning a new business- comparing prices. Through its query system, this algorithm helps to widen the user journey and make it shorter at the same time. The significant algorithm effectively searches for the information meaning users may get the information they need in a short time, therefore, the whole system is more usable and satisfactory.

4. SQLite 3 Database Tables Algorithm:

Objective: Give the database structure using SQLite 3 to save all the product information.

Algorithm:

```python
class CustomUserManager(BaseUserManager):
    def create_user(self, email, first_name, last_name, age, contact_number, password=None):
        if not email:
            raise ValueError('Users must have an email address')
        if not first_name or not last_name:
            raise ValueError('Users must provide their first name and last name')
        if not age:
            raise ValueError('Users must provide their age')
        if not contact_number:
            raise ValueError('Users must provide their contact number')
        user = self.model(
            email=self.normalize_email(email),
            first_name=first_name,
            last_name=last_name,
            age=age,
            contact_number=contact_number,
        )
        user.set_password(password)
        user.save(using=self._db)
        return user
    def create_superuser(self, email, first_name, last_name, age, contact_number, password=None
        user = self.create_user(
            email=email,
            first_name=first_name,
            last_name=last_name,
            age=age,
            contact_number=contact_number,
            password=password,
        )
        user.is_admin = True
        user.is_staff = True
        user.save(using=self._db)
        return user
```

```python
class CustomUser(AbstractBaseUser):
    email = models.EmailField(verbose_name='email address', max_length=255, unique=True)
    first_name = models.CharField(max_length=50)
    last_name = models.CharField(max_length=50)
    age = models.PositiveIntegerField()
    contact_number = models.CharField(max_length=14)  # Assuming the format is XXX-XXXXXXX
    password = models.CharField(max_length=128)  # Storing hashed password
    is_active = models.BooleanField(default=True)
    is_admin = models.BooleanField(default=False)
    is_staff = models.BooleanField(default=False)
    is_verified = models.BooleanField(default=False)  # New field for verification
    objects = CustomUserManager()
    USERNAME_FIELD = 'email'
    REQUIRED_FIELDS = ['first_name', 'last_name', 'age', 'contact_number']
    def __str__(self):
        return self.email
    def has_perm(self, perm, obj=None):
        return self.is_admin
    def has_module_perms(self, app_label):
        return True
```

Justification:

SQLite 3 database algorithm includes tables for inhabitants that forms the main data structure. Through creating tables of products, users, and search history, the algorithm is designed to help with automatic data. More importantly, the relational model provides the data consistency ensuring that PriceSpy can smoothly conduct and retrieve information for accurate price comparison and user interactions.

Usability Features in PriceSpy

Besides, it is the quality, easy-to-extract, and valid information of a platform that gives it a competitive advantage in the online price comparison world. The usability of PriceSpy becomes the focus of the design in that phase when we base on the development of strong usability features. This portion maintains information about the most crucial usability element in the app, however each of usability element has been developed in the view of betterment of user experience, encouragement to users and effortless navigation through the application.

1. Intuitive User Interface:

Objective: Create a platform that is aesthetically pleasing, simple to navigate, and it does not cause people to hesitate before using it.

Features:

Clear Navigation Menus: Establish a step-by-step menu, making navigation easy for the users by having them browse different parts of the platform, such as product categories, price comparisons, and user details.

Visual Consistency: Consistency in the design language across the platform is essential. Therefore, in order to achieve unity in color schemes, typography, and iconography you have to pay attention to its design.

Intelligent Search Bar: Distinguish the search field with a large and prominently visible location at the home page, the search field must be equipped with auto-suggestions and real-time search results which will subsequently improve the product discovery process both speedily and accurately.

Justification:

The user-friendly navigation of PriceSpy forms a cornerstone of our usability strategy. Through emphasizing on simplicity in navigation and applying visual consistency from one section to another, users will have a chance to explore different sections without being confused. This will be of great help in building a sense of familiarity and confidence to the user. The smart search bar, in turn, is presented to the users as an easily accessible mechanism for starting the comparison of prices, and so the user will enjoy a seamless navigation.

2. Personalized User Profiles:

Objective: Offer users personalized profiles, indicating their search history, favorites and providing a setup procedure to customize their PriceSpy experience.

Features:

User Account Dashboard: Develop a user-friendly dashboard that is easily accessible by the registered users where they can check their profile details, preferences and saved stuff.

Search History Tracking: Add a function that records user's search statements, allowing users to refer back to them or to compare prices among repeatedly searched products.

Product Wishlist: Create a wishlist capability, allowing users to markdown the products for a latter reference and giving the notifications about price drops or promotions.

Justification:

User profile personalization adds a more individualized touch, thus improving the overall user experience. PriceSpy transforms to a user-oriented platform which is both aligned with individual preferences and at the same time fostering loyalty and engagement, because it provides the users with tools to monitor their search history and to create wishlists.

3. Making Websites Responsive for Cross-Device Accessibility:

Objective: Make PriceSpy available on different devices like desktops, tablets and mobile phones and make sure that it functions properly on any of them.

Features:

Responsive Layout: Create a responsive interface that adjusts easily to different screen sizes, meanwhile lets users have a consistent and visually appealing experience across any device.

Mobile Optimization: First of all, give mobile optimization a top priority to meet users' needs who mostly explore the platform via their mobile phones and provide their essential features on smaller screens.

Cross-Browser Compatibility: Ensure and optimize the compatibility with the most popular web browsers, granting a uniform user experience regardless of the browser environment.

Justification:

Nowadays different types of digital devices which is a major factor to consider for PriceSpy to succeed. An adaptitive design does not only widen the outreach, but also empowers the users to be able to take part in the service regardless of the device which they are using, thus increasing the service accessibility.

4. Transparent Pricing Comparison Metrics:

Objective: Offer your customers with visible and accurate pricing to make comparison easier and therefore, the process of making a purchase more informed.

Features:

Price Trends Graphs: Incorporate graphical presentations of the price direction for the targeted products so that consumers can track price movements.

Comprehensive Product Details: Represent detailed product information exactly, which covers specs, customer reviews, and seller rates, for a textured view of the products.

Real-Time Price Updates: Establish a system for automatic update of product prices that get information from many sources. It will enable consumers to make instant and informed decisions.

Justification:
Access to very objective price comparison metrics is vital for the success of user trust. Via the graphical representation of price trends and rival products, PriceSpy gives users the ability to choose wisely and upon this develops credibility as the platform.

5. High-performance Filters and Sorters that Provide Convenience:

Objective: Simplify the process of discovering the product through advanced filtering and sorting tools .

Features:
Customizable Filters: Supply users various filters according to product characteristics that encompass brand, price range and customer's ratings, hence personalized search outcomes are being materialized.

Sorting Options: Provide different ways of sorting the products like price range from low to high and high to low, as well as relevance, so that customers can make their choices based on their priorities.

Quick View and Comparison: Use a fast view mode that displays the most relevant product details in the search results page, which speeds up user's decision-making process.

Justification:
Efficient sorting and filtering tools are absolutely part of the solution to make the process of comparing prices more efficient. Through the features which let consumers narrow their search options and compare goods at once, PriceSpy accelerates customers' journey through product discovery to the decision of making a purchase.

Permanent Data Storage in PriceSpy

Establishing a reliable and secure global warehouse for authentic and permanent data storage should be the cornerstone in the ever-changing internet price comparison industry. The data storage systems design development of PriceSpy focuses on creativity and scalability issues at a time that the platform has not only thrived in the present but also future development. The given portion examines the design basics, the architectural choice, and gives indication of the permanent data storage strategy of PriceSpy.

1. Data Storage Architecture:

Objective: Design scalable and efficient data storage system that can support varied product information, user data, and historical data that PriceSpy will handle represents a big challenge.

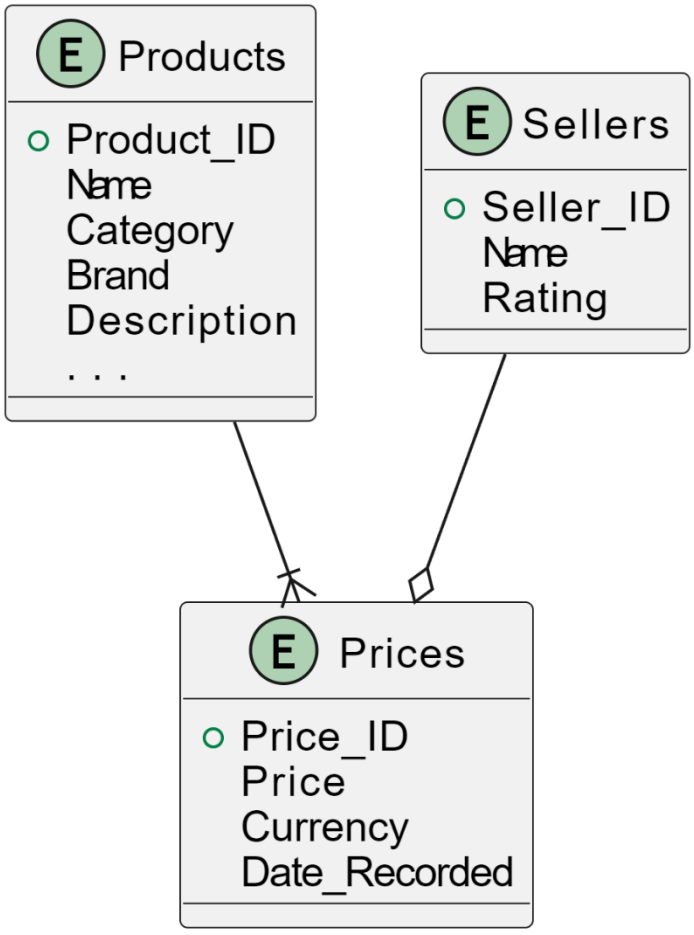
Approach:

Relational Database Management System (RDBMS): Having a relational database like SQLite that is designed to bring structure and order in storing good description, user databases and historical price data, is an approach that can ensure that no piece of data is lost.

Normalization: Using normalization techniques to eliminate wasted space arising from data duplication do have an immense role toward building a database with better data integrity strength thus data are well organized.

Indexes for Performance: Induce indexing on the crucial data fields, for instance, like IDs of Product, and IDs of the user, to efficiently retrieve data at times of price comparison, and at times of user-specific priority queries.

Diagram: ERD for Product Data



Justification:

The selection of an RDBMs and the application of normalization techniques are veritable tools towards rancher and more orderly data storage also. Total this leads to the fact that PriceSpy can administrate different data area, for example, for the product sellers and price history in an efficient way and at the same time keeps its data intact.

2. User Authentication and Authorization:

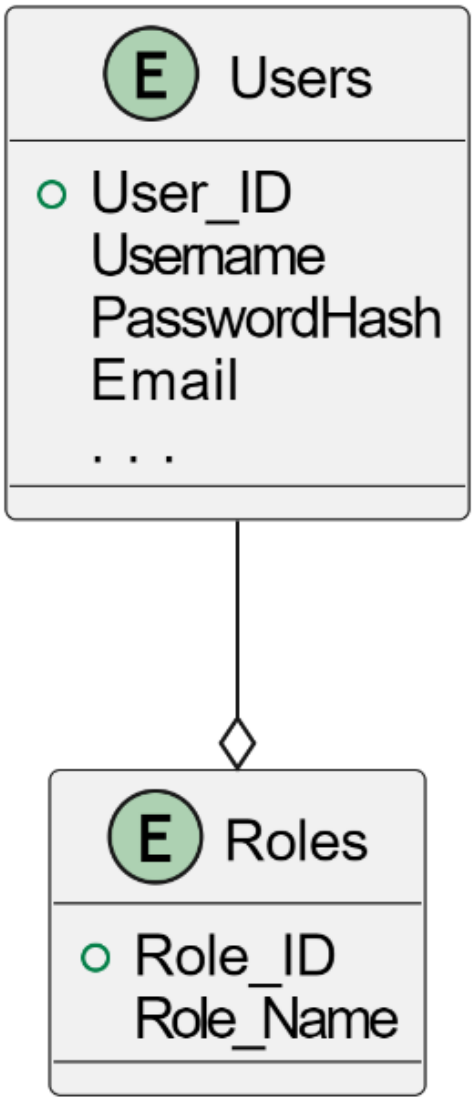
Objective: Set up a safe and fully secured account verification and access management system, which guarantee the data of users is secure at all times.

Approach:

Hashing and Salting Passwords: Encrypt users' passwords using hashing and salting algorithms in order to prevent password cracking in case of a data breach and make unauthorized access impossible.

Role-Based Access Control (RBAC): RBAC system provides authority management which will be applied in managing users' roles and permissions accurately, and this will ensure that each user has only the appropriate access that fits within their role within the system.

Diagram: ERD for User Authentication



Justification:
It is so necessary to invest in ‘user authentication’ and ‘authorization’ as the next elements of the data safety. Hashing and salting-based password storage approach along with the assignment of granular access rights to approved personnel are the techniques used at PriceSpy to protect personal user data from unauthorized disclosure and makes it available to the authorized individuals only.

3. Fundamental Crypto Storage for Historical Price Data:

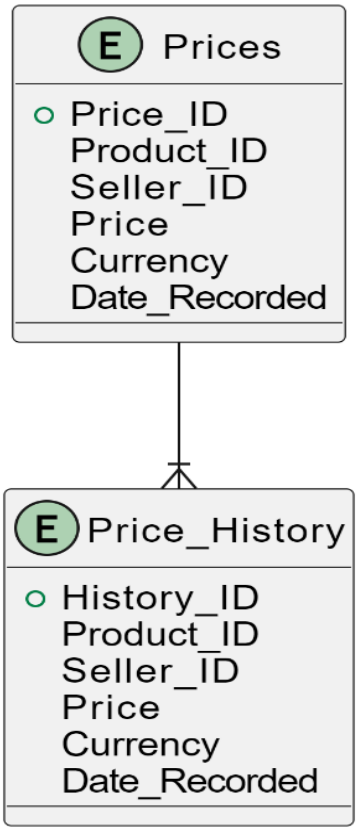
Objective: Collect historical price data for various products and finally save it in the system; thus, enabling users to follow the development of prices in time.

Approach:

Temporal Tables: Apply temporal (time series) tables as means to store price variations along with time and thereby giving the system a chance to show historical price trends for certain goods.

Archiving Mechanism: For archive old prices, implement an archiving mechanism to store older price data, this will prevent data storage in primary database table with new price records.

Diagram: ERD for Historical Price Data



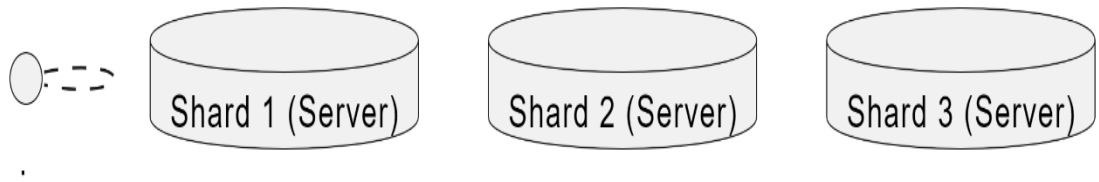
Justification:
Adding into historical data storage gives a deeper experience for the user in respect of showing price trends. Implementing temporal tables and an archiving mechanism allows PriceSpy to work fast and allocate resources to other vital tasks with no performance penalties during competition price comparisons.

4. Scalability and Future Expansion:
Objective: Develop the dataset storing system to be scalable. This will accommodate future data growth in terms of users base and variety in products.

Approach:
Sharding: Employ the sharding master and slave technique in order to horizontally split data across several databases sharing workload and contributing to scalable environment.

Regular Database Maintenance: Scheduleperiodic maintenance efforts, like database indexing and optimization, to make surethe platform continues to function seamlessly as it scales.

Diagram: Sharding for Scalability



Justification:
Scalability being a key issue in the design of the data storage as used by PriceSpy, should be part of the key tenets of the system's design. The platform makes the shrading and the regular maintenance inline which the platform could scale linear with the increased data volume, user interactions an as well as future update.

Key Elements and Justification
In the design phase of the website of PriceSpy, one has to distinguish certain variables, data structures and classes that will after become the vital work of the system. Such elements that include interfaces, application programming interfaces, and other compositions and arrangements are crucial in the making of a website that is functional, efficient, and can be maintained easily. Perfection, or the desire for faultless performance, can induce stress, making it difficult to take risks, assume responsibility, or accept failure. In this section, the details of the PriceSpy site will be discussed in-depth, explaining the factors, data structures and classes through the use of the various elements, followed by a justification of the choice of all factors.

Product Data Management:

One of the major management features on price.spy website is the product related information. The product data like the key variables, data structures and the classes is the most important aspect to the core system's function. undefined

Product Class:

The Product category lays down all attributes linked with each product offered via the website.

Product_ID: The product to have a unique identifier.

Name: The name of this product.

Category: Whether the product is under any of the categories.

Brand: The brand of the product.

Description: The complete product guidelines.

Justification: Defined class for product helps to establish a folded ordering of information. It reduces the effort of data creation, updating and also maintain consistency across the system.

Seller Class:

The Seller class handles the seller‘s data related to the product they offer.It includes:

Seller_ID: The sellers must have a unique ID which differentiates them.

Name: Sellers name.

Rating: The rating of seller from users' experience based on their feedback.

Justification: Distinct selling category aid in tracking seller-related metrics quickly and easily. Furthermore, identified sellers can be associated with their respective products.

Price Class:

The Price class collects the price information from a particular seller on a product.It includes:

Price_ID: An id characteristic for individual pricing entry.

Price: The nominal price of the product.

Currency: The currency in which the price is stated.

Date_Recorded: Date of value acquisition.

Justification: This strategy of storing pricing information in a separate Java class class enables the monitoring of price evolution across different time periods.

User Authentication:

Authentication of the user is the most vital attendant for guaranteed secure access to the website of PriceSpy.

User Class:

The User class represents the users who have posts on this website. Key variables include:

User_ID: A one-of-a-kind tag for each participant.

Username: The user name to use login with.

PasswordHash: The password could be hashed and stored as securely.

Email: The user's email address

Justification: Keeping user data secure becomes the highest priority. Hashing passwords provide security by doing encryption of valuable user data.

Roles Class:

The Roles class encodes the roles that users can have in the system, that of 'admin' or 'a regular user', among others. It includes:

Role_ID: Because each role should have its own unique identifier.

Role_Name: Presence or absence of job title.

Justification: In this way, the role assignment helps to control the access and permissions needed in different groups.

Permanent Data Storage:

The provision of permanent data store is the sure way for attaining system integrity. The choice of a robust database system is essential:

SQLite3 Database:

In particular, for small scale projects, SQLite3 is going to be selected as the database management system for its simplicity and ease of integration with Django. It offers a database structure if you need advanced project use, while being the most efficient for small to average-sized applications.

Justification: The choice of SQLite3 comforms to project requirements, being a compromise between speed and simplicity.

Test Data Identification and Justification

In the design phase of the PriceSpy website, choosing an appropriate test data set is a key consideration. It should be clear why these data tackles both the issues of iterative development and post-development phases. In the third section we cover choosing test data,

its importance and the process of selecting it well as the manner that this compilation helps to streamline the development and the testing of the website.

Test Data Selection:

Iterative Development Phase:

Through the iterative growth, when the site evolves every moment, the testing data selection should be very wide to make all the testing possible. This includes:

Product Variability: Pick a different computer's accessories that would have different performance, qualities, and prices in order to enable the system to support products based on different ranges and specifications.

User Scenarios: Use a test data that generates user tasks like searching for commodities, product pricing comparison, and then making the purchase. This will examine the product providing effectiveness and user interaction factoring different types of usage.

Pricing Dynamics: Include pricing fluctuations data from different sources in order to evaluate the performance of the system at the time of a price move in a real market conditions.

Post-Development Phase:

Following that, testing efforts progress to an intensive mode to solicit consumer feedback thus, resolving any issues. To cover this step validation test data is the most critical and its should be targeted to verify system reliability and robustness. This includes:

Edge Cases: Talk about the worst case scenarios, like excessively low or high prices, for instance, and determine how the software reacts to abnormal data, outliers.

User Interaction: Perform the load test involving the performance level under stress of simultaneous user actions, multiple search requests and price checks to see the current situation the platform will be able to cope with.

Security Testing: Include the data, which focuses on the theatrical security risks, like the boulevard manipulation of price or the leakage of user data. This will show whether the system is working or not as it will help to identify the vulnerabilities in the system.

Justification for Test Data Selection:

Realism and Relevance:

The given data is chosen so that the site can be tested in real life conditions same as how it will be utilized in future. This method raises the efficiency of the system so that it can interact with the real world and function without failure.

Comprehensive Coverage:
The selected test data set covers key variables and variants, such as varying product types, user behaviors, and pricing dynamics. This broad-ranging analysis is fundamental to the detection of glitches spanning multiple issues in the web product.

Scalability Considerations:
Taken together, a variety of cases involving varying user engagement and complexity implies scalability. It guarantees that the site can wither the crunch of high-traffic inputs and interactions without jeopardizing performance.

Test Data Tables:

Iterative Development Test Data

Product ID	Product Name	Brand	Price (Source 1)	Price (Source 2)	...
001	Wireless Mouse	Logitech	$29.99	$27.49	...
002	Mechanical Keyboard	Corsair	$99.99	$105.00	...
...	...	...	...	...	...

Post-Development Test Data

Product ID	Product Name	Brand	Price (Source 1)	Price (Source 2)	...
101	Gaming Headset	Razer	$79.99	$82.50	...
102	External Hard Drive	Seagate	$129.99	$135.00	...
...	...	...	...	...	...