#### RESEARCH ARTICLE



# An Optimizing Business Process: A Comprehensive Analysis of Amazon Inc.'s Information Architecture

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## *ABSTRACT*

This analysis studies Amazon Inc.'s information system design in detail using context, use cases, test cases, class, and sequence diagrams. Our research aims to improve business processes by better understanding the system's interactions, functionality, and data structure. The representation of data structure and entity relationships in class diagrams provides insights into the system's component organization. Sequence diagrams also provide a clear picture of the sequential interactions between system elements, showing potential bottlenecks and optimization opportunities. It provides unique insights into Amazon's approaches to keeping a competitive edge in the e-commerce industry, and it may be used as a resource for firms looking to improve their own information systems and procedures.

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#### 1. Introduction

We chose www.amazon.com, the most renown online shopping platform. Amazon.com is an online store that serves people all over the world by providing a variety of goods and services. It offers clients a simple and secure online shopping experience while acting as a platform for vendors to advertise and sell their goods. The project may therefore include a variety of components, including website development, infrastructure upkeep, user experience enhancements, and customer service enhancements [8].

#### 2. Project Definition

# 2.1. What Are We Building?

The website we are working for is Amazon.com, which is both the largest e-commerce company in the world and a well-known cloud service provider. Therefore, our goal is to evaluate, update, and improve the current website to improve user experience, relevance, and engagement.

## 2.2. Project Scope

The project's scope involves testing, analyzing, and documenting the entire website, from the user interface to the navigation and design, according to the website's established status. Other features include updating and

optimizing all sorts of mobile devices around the world (responsive design) and suggesting new features such as introducing shared user account (or family account) and contacting the seller to show the product live.

## 3. Project Deliverables

#### 3.1. What Are the Deliverables?

The project deliverables include the completed website review, as well as all documentation and code necessary to launch the website. Including introducing new features like introducing shared user account (or family account) and contacting the seller to show the product live:

- i) A fully functional and user-friendly online store: This is the main delivery, and it includes every feature, functionality, and element needed for customers to explore, search, buy, and engage with the Amazon.com platform.
- ii) User registration and account management system: This enables users to set up accounts, manage personal data, check order histories, preserve payment options, and personalize preferences.
- iii) Product listing and management system: A system that enables sellers to generate and maintain their product listings, including product descriptions,

- photos, pricing, inventory tracking, and shipping choices.
- iv) Search and suggestion engine: A powerful search engine that allows users to look for products using keywords, filters, and categories while producing precise and pertinent search results. A recommendation engine that makes product recommendations based on user preferences, browsing history, and purchasing behaviors is also available.
- v) Checkout process and shopping cart: A fully functional shopping cart that enables users to add products, change quantity settings, compute totals, and finish the checkout process. Secure payment methods, address confirmation, and order confirmation should all be available during the checkout process.
- vi) Order management and fulfillment system: An automated system for managing orders, tracking shipments, creating mailing labels, and processing returns or refunds. Customers and sellers should have immediate access to order status information.
- vii) Customer service and support system: A system for customer service and assistance that enables support tickets, live chat, email, and phone help, as well as client queries. It should allow for prompt answers and effective handling of consumer complaints.

# 3.2. Needs to be Specific Enough so that Everyone Has the Same Expectations of What Is Being Developed

The project deliverables need to be specific enough so that everyone has the same expectations of what is being developed. This includes a clear understanding of the scope of the project and what needs to be delivered.

Clearly defining the deliverables is essential to ensuring that everyone is on the same page. This entails detailing each deliverable's functionalities, user interfaces, and anticipated results in clear, short sentences. The deliverables should also be quantifiable, with distinct success or acceptability criteria established for each deliverable. This aids in creating clear goals for development and implementation, bringing stakeholders together, and setting expectations. To establish a common understanding of what is being developed and delivered, it is crucial to communicate the deliverables to all project team members, stakeholders, and relevant parties.

#### 4. IDENTIFICATION OF STAKEHOLDERS

#### 4.1. Who is the Client?

The business that owns the website and runs the ecommerce platform, Amazon.com Inc., is the client of Amazon.com.

## 4.2. Who are the External Stakeholders?

Those who are not directly involved in the creation or use of the website but who could be impacted by its debut are considered external stakeholders. This might apply to Walmart customers, Walmart shareholders, or the broader public [7]:

- i) Suppliers: Organizations or people who provide goods for products to be advertised and sold on Amazon.com.
- ii) Sellers: Individuals, companies, or retailers who use Amazon.com as a platform for their product sales.
- iii) Delivery and Shipping Partners: Organizations in charge of delivering shipments and packages purchased from Amazon.com.
- iv) Payment Processors: Companies that offer payment services and financial institutions that enable safe payment transactions on a platform.
- v) Partners in advertising are businesses or organizations that place adverts on the Amazon.com platform.
- vi) Online marketplaces and other e-commerce businesses that compete with Amazon.com for market share are competitors in the industry.
- vii) Owners of Amazon.com Inc. shares who are financially interested in the company's success are known as shareholders.

#### 5. Functional Requirements

Functional requirements define what a product or system is supposed to do.

## 5.1. List Major Functionality with a Short Description of How It Works

Numerous features that Amazon.com provides support its e-commerce platform. Following are some key functional criteria and a brief explanation of how they operate:

- i) Product Search: Users can do a product search on Amazon.com by inputting specific information, product names, or keywords. On the basis of variables including relevancy, popularity, and user ratings, the platform employs a search algorithm to locate pertinent products and display them in search results.
- ii) Product Listings: Vendors can build product listings for their wares, including titles, descriptions, pictures, prices, and shipping details. These listings are available for viewing on Amazon.com, where shoppers may explore and decide what to buy.
- Shopping Cart: Users can add products to their shopping cart while browsing, and the cart records the items they have chosen. When ready to purchase something, users can evaluate the products, change the quantity, delete products, and then go to the checkout.
- iv) Order Entry: When customers are prepared to finish their purchase, they can head to the checkout process. This includes choosing shipping options, providing shipment addresses and payment information, and evaluating the order summary before completing the transaction.
- v) User Accounts: On Amazon.com, customers can set up individual accounts that save their payment choices, order history, and profile data. Recommendations, remembered addresses, and payment

- options for quicker checkout are all possible with user accounts, allowing for personalized experiences.
- vi) Reviews and Ratings: Customers can offer feedback by leaving reviews and giving their purchases stars. These reviews are visible on product pages, assisting other consumers in making defensible choices regarding the value and suitability of the products.
- vii) Wishlist: Users can make a Wishlist to save and keep track of things they might be interested in buying in the future. They can categorize things into various lists, share their Wishlist with others, and sign up for notifications whenever prices or stock levels change.
- viii) Order tracking: Through their Amazon.com accounts, customers can monitor the status and development of their orders. They get updates on the shipment's status and anticipated delivery dates, and they have access to tracking data made available by the shipping company.
- ix) One-Click Ordering: Customers who have enabled it on Amazon.com can use the handy one-click ordering function. Users can finish their purchase with just one click by using previously saved payment and delivery details.
- x) Seller Tools and Dashboards: Amazon.com offers sellers tools and dashboards to manage their inventory, pricing, order fulfillment, and customer relations. Through these technologies, sellers may keep tabs on sales activity, keep track of inventory levels, and answer consumer questions.
- xi) Customer care: Amazon.com provides customer service through a variety of channels, including live chat, email, and phone assistance. Customers can get help with orders, returns, refunds, and other questions by getting in touch with customer care.

## 5.2. List Major Functionality that the System Should Not Do

The website should not allow users to purchase products without an account, view confidential information, or access restricted areas:

- i) Customer accounts won't be subject to unlawful access by the system. Without adequate authentication, the system shouldn't permit unauthorized users to access or edit client accounts. To safeguard client information, robust security measures should be put in place.
- ii) Fraudulent transactions will not be processed by the system. To recognize and stop fraudulent transactions, the system should contain fraud detection features. Payments that are regarded as unauthorized or suspicious shouldn't be processed
- iii) Intellectual property rights won't be violated by the system. The system shouldn't permit the distribution or sale of things that are illegal or that are counterfeit and violate intellectual property rights. It must carry out laws protecting

- intellectual property and respond to accusations of violation.
- iv) Customer data security will not be jeopardized by the technology. To safeguard consumer data from illegal access, breaches, or cyberattacks, the system should maintain strict security procedures. Information about customers should remain secure and secret
- v) The system won't rig user evaluations or ratings. In order to mislead or fool users, the system shouldn't manipulate or inflate customer reviews or ratings intentionally. It should guarantee the veracity and integrity of client reviews.
- vi) No false or deceptive advertising shall be used by the system. The system shouldn't use dishonest or deceptive advertising techniques. About products, prices, special offers, and delivery information, it must be accurate and transparent.

## 6. Non-Functional Requirements

Non-functional requirements (NFRs) define how the product or system should do it [4].

### 6.1. Product Requirements

Non-functional product requirements ensure that Amazon.com operates efficiently, reliably, and securely, and performs at a level that meets or exceeds user expectations:

- i) Response Time: The website should response instantly to ensure user interactions are nearinstantaneous. For example, Amazon should load, and any tab or search results should be displayed within a specified timeframe (e.g., less than 1 sec-
- ii) Reliability and Availability: It would be very difficult to experience outages or service interruptions when using Amazon.com. It should be equipped with high availability safeguards such redundant servers, failover systems, and proactive monitoring to detect problems early.
- iii) Error Handling: When failures occur, the product should treat them politely and give users concise, helpful error messages. Users should be assisted in comprehending what went wrong and given advice on how to go forward or fix the issue.
- iv) Scalability and Performance: Amazon.com platform should be able to handle rising user loads and grow its resources appropriately. It needs to function well under peak loads, guaranteeing that performance keeps up even during times of strong demand.
- v) Concurrent User Support: Amazon.com should be capable of supporting a large number of users at a time without significant degradation in performance. So, handling high traffic volumes and allowing multiple users to interact with the system simultaneously should be smooth.
- vi) Performance Tracking and Reporting: The solution must include built-in monitoring features that can track system performance and produce reports

- on important performance metrics. This enables proactive bottleneck detection, performance deterioration, and capacity planning.
- vii) Data Integrity and Security: The product should ensure the integrity and security of user data, including personal information and financial transactions. It should employ encryption and secure authentication mechanisms and protect against data breaches and unauthorized access.
- viii) Compatibility: In order to deliver a consistent user experience across platforms, Amazon.com should be compatible with a range of web browsers, operating systems, and devices. It should be compatible with widely used operating systems including Windows, macOS, iOS, and Android as well as browsers like Chrome, Firefox, and Safari.
- ix) Compliance: The item should adhere to all applicable legal, regulatory, and industry standards. This covers security norms like PCI DSS (Payment Card Industry Data Security Standard), accessibility criteria, and regulations governing data protection and privacy.

#### 6.2. Organizational Requirements

The website must adhere to Walmart's branding guidelines and meet all legal and compliance requirements:

- i) Process Standards: To maintain consistency, effectiveness, and quality in its operations, Amazon.com should abide by clearly established process standards. Standards for order fulfilment, inventory management, customer service, and other crucial procedures may be included in this.
- ii) Change management: In order to efficiently handle changes to the website, systems, and processes, Amazon.com should have established change management procedures. This entails determining how changes will affect stakeholders, securing the required approvals, and communicating changes to them.
- iii) Risk management: To detect, evaluate, and reduce risks related to its operations, the business should have strong risk management processes. Regular risk assessments, emergency preparation, and the monitoring of important risk indicators may all be necessary for this.
- iv) Compliance and Regulatory Policies: To ensure compliance with relevant laws, regulations, and industry standards, Amazon.com should have definite policies and processes in place. Data protection, consumer rights, financial rules, and other pertinent legal and regulatory requirements are included
- v) Security Policies: To safeguard customer information, thwart illegal access, and guarantee the integrity of its systems, the company should have thorough security policies and procedures. This includes steps like data encryption, access limits, incident response procedures, and routine security audits.

- vi) Supplier and Vendor Management: Amazon.com should have policies and procedures in place for choosing, assessing, and managing its suppliers and vendors. This entails creating standards for choosing suppliers, carrying out frequent evaluations, and keeping open lines of communication.
- vii) Quality Control: Amazon.com should have quality control procedures to meet or exceed the expectations of the client, this may involve quality control checks, testing methods, and performance monitoring.

## 6.3. External Requirements

The website must be accessible to users worldwide and work with common web browsers and devices.

- i) Accessibility: According to established accessibility standards like WCAG 2.1 (Web Content Accessibility Guidelines), Amazon.com should be created and intended to be accessible to users with disabilities. For users who are visually challenged, this entails making sure that there is adequate color contrast, offering alternative language for images, and making the keyboard accessible.
- ii) Compatibility: Compatible web browsers include Microsoft Edge, Google Chrome, Mozilla Firefox, and Safari. The website should operate without a hitch on all of them. Additionally, it ought to work with a range of hardware, including desktop, laptop, tablet, and smartphone PCs as well as numerous operating systems (such as Windows, macOS, iOS, and Android).
- iii) Internationalization: In order to serve users from all around the world, Amazon.com needs support for multiple languages. It ought to offer alternatives for choosing a language and make sure that the information, navigation, and functions are appropriately customized and localized according to the user's desired language and location.
- iv) Payment Methods and Currencies: To accommodate visitors from various nations, the website should offer a variety of currencies. It should include payment choices that are often used abroad, such as credit cards, PayPal, or local payment methods, as well as appropriate currency conversion rates.
- v) Geographical Accessibility: Amazon.com should be usable and accessible across the various nations and regions where the business conducts business. It should take into consideration any unique legal, logistical, or other constraints imposed by each region, including tax rates, shipping alternatives, and customs policies.
- vi) Performance across Networks: The website needs to function well even in areas with different network setups, such as those with slower or less dependable internet connections. Data transfer should be kept to a minimum, page loading times

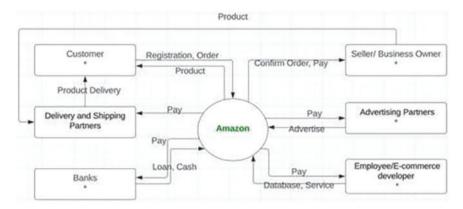


Fig. 1. Context diagram for Amazon.

should be optimized, and network interruptions should be handled politely.

- vii) Social Media Integration: Amazon.com should be integrated with well-known social media sites to enable consumers to share products, reviews, and recommendations on social media. Simple sharing options should be available, and social media integration should be seamless across all platforms.
- viii) Integration with Third-Party Services and APIs: The website should easily work with APIs from third parties, including shipping companies, payment gateways, and analytics programs. The user experience is improved overall, and smooth interoperability is ensured.

## 7. Context DFD

Context diagrams concentrate on the interactions of a system with external elements. It is the most basic type of

data flow diagram, depicting the comprehensive perspective of the system. Here, we are trying to figure out the Context diagram for our Project Amazon (Fig. 1).

#### 8. Level 0 DFD

Data Flow Diagrams (DFD) are graphical depictions of a system that show how data moves throughout the system. Level 0 DFD is the highest-level DFD, which offers a system overview, is this one. It does not provide any information into the internal operations of the primary processes, data flows, or data stores in the system [6] (Fig. 2).

#### 9. Level 1 DFD

Although they go into greater detail than a context diagram, Level 1 DFDs are still a general summary. The context diagram's single process node is divided into subprocesses in level 1 DFD. Additional data flows and data stores will be required in the diagram as these procedures

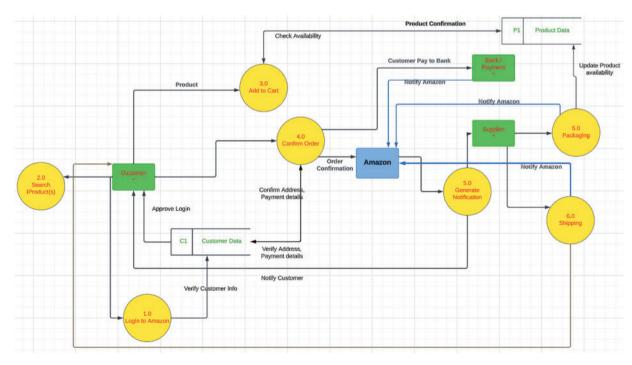


Fig. 2. Level 0 DFD.

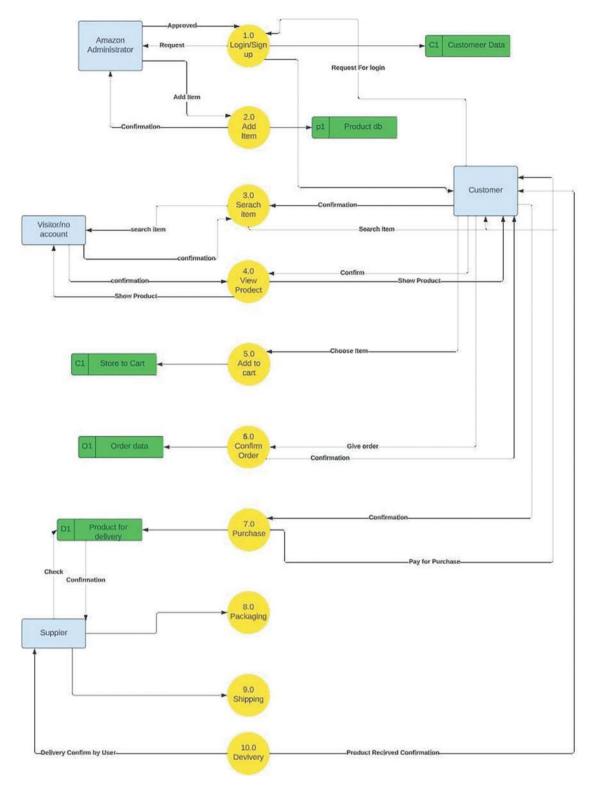


Fig. 3. Level 1 DFD for Amazon purchasing process.

are introduced to connect them. Here, for Amazon the Level 1 diagram can be as below [9]:

Level 1 DFD: Example 01, we try to depict the overall Amazon purchasing process (Fig. 3).

Level 1 DFD: Example 2, the Amazon Admin Side is depicted (Fig. 4).

Level 1 DFD: Example 3, the Amazon User Side is illustrated.

## 10. Use Case Models

Use-case diagrams illustrate a system's high-level operations and scope. These diagrams show how the system's actors interact with one another [5]. Use-case diagrams' use cases and actors show what the system does and how the actors utilize it, but they do not explain how the system functions internally [3].

Use Case 01: For Amazon, the Actor is Customer who can be a customer or Anonymous Searcher, who needs to

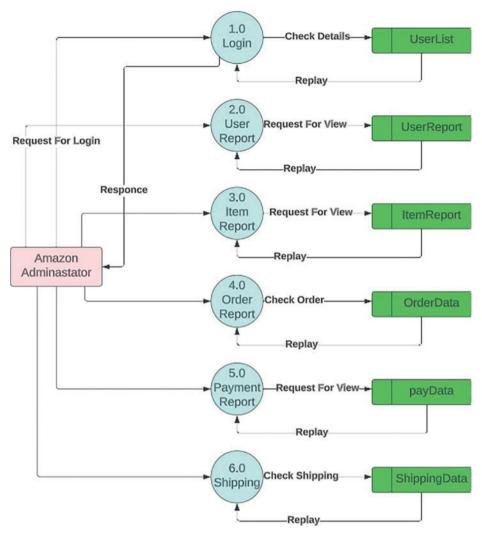


Fig. 4. Level 1 DFD for Amazon admin side.

be a customer before placing an Order. And the basic steps to purchase a product are registration, view product, add to card, checkout-these actions performed by a registered customer only. Whereas a non-customer and Supplier can view product(s). Also Add to card includes customer data verification and authentication. Similarly, sellers need to confirm their identity before performing any activity. The diagram is shown in Fig. 5.

Use Case 02: Here we try to cover the customer and the supplier, as well as the bank (credit card/redeem card/-PayPal/Google pay), who are involved in a full Amazon product's purchasing cycle. The relationship is shown in Fig. 6.

#### 11. SEQUENCE DIAGRAM

A sequence diagram is a Unified Modeling Language (UML) diagram that depicts the flow of messages between objects during an interaction. A series of objects are represented by lifelines in a sequence diagram, together with the messages they exchange during an interaction [2], [5].

Sequence Diagram 01: This sequence diagram illustrated customer's actions that can be done with Amazon. Like a customer/noncustomer can browse Amazon's products.

But only login/registered customers can perform the activities in the repeated box. Activities include Login, adding products in to cart and confirming the order, pay for the order, and after receiving the product review the seller or product.

Sequence Diagram 02 (Fig. 8): This sequence diagram describes supplies' activities and return responses. Only registered suppliers can perform activities like Login, add new product to their account, delete any product, check users review and give feedback. This diagram also describes the relationship between banks and sellers.

Sequence Diagram 03 (Fig. 7): Here, we depict the activities of a customer (do not consider a non-customer) and connected customers with Amazon, product, Product purchasing, payment, and delivery process.

#### 12. SIMPLE OBJECT CLASS DIAGRAM WITH ASSOCIATIONS

An association depicts the connection between two classes. An association denotes a connection between two classes of items.

Class diagram 01: Product Purchasing Cycle with Payment is shown in Fig. 9.

Class diagram 02: Product Purchasing cycle is shown in Fig. 10.

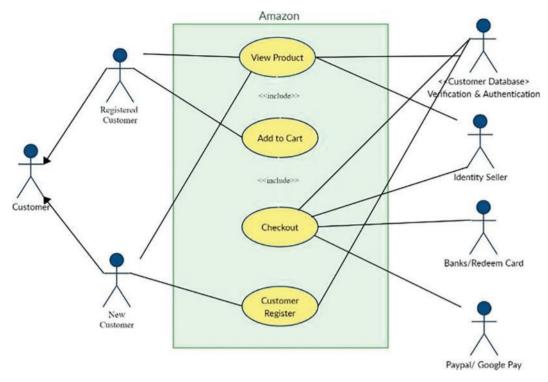


Fig. 5. Use case diagram for Amazon customer's action.

#### 13. Test Case

The steps necessary to validate a certain feature or capability in software testing are referred to as test cases. The test case describes the procedures, information, requirements, and postconditions required to validate a feature [1].

# 13.1. Process 1: Customer Login

Test 01 **ID:** TC-01 **Priority:** High

Title/Name: Customer Login-Successful login to Amazon home page

Goal: To ensure that a customer logs in to his Amazon account securely and successfully.

Description: This test case determines whether a customer can successfully log in to his account without experiencing any errors or problems.

Use Case Owner: QA Team

Primary Actor(s): Registered Customer

Secondary Actor(s): None

**Trigger Event(s):** When a user clicks on the "Log In" button. Or, when a register user Want to place an Order.

Pre-Condition: The customer needs to register/sign up to Amazon first.

**Post-Condition:** The Customer can view his home page along with cart if he already adds some product.

Constraints/Issues/Risks: Correct ID and password. Consecutive wrong passwords can be locking his account.

## 13.2. Process 2: Product Purchase

Test 02 **ID:** TC-02 Priority: High

Title/Name: Product purchase-customer should purchase a product successfully.

Goal: To ensure that a customer purchases a product from with his bank details successfully. He can also set his delivery address successfully and correctly.

**Description:** This test case determines whether a customer can add his delivery address correctly and add his bank details/or redeem card details/PayPal/Google Pay account details correctly.

Use Case Owner: QA Team

Primary Actor(s): Registered Customer

Secondary Actor(s): Bank, Seller, Delivery Person

Trigger Event(s): When a user clicks on the "Confirm Order" he should successfully place the order.

**Pre-Condition:** The customer needs to set his delivery address as well as payment details correctly.

Post-Condition: After placing an order the seller should notify the order. And customer should track his order status.

Constraints/Issues/Risks: Correct delivery address and accurate card/bank details need to place the order. Wrong address can send the order to different place.

# 13.3. Process 3: Checkout

Test 03

**ID:** TC-03

**Priority:** High

Title/Name: Checkout-customer should place an Amazon order successfully.

Goal: To ensure that a customer can place an order successfully.

Description: This test case determines whether a customer can add products and then place an order successfully.

Use Case Owner: QA Team

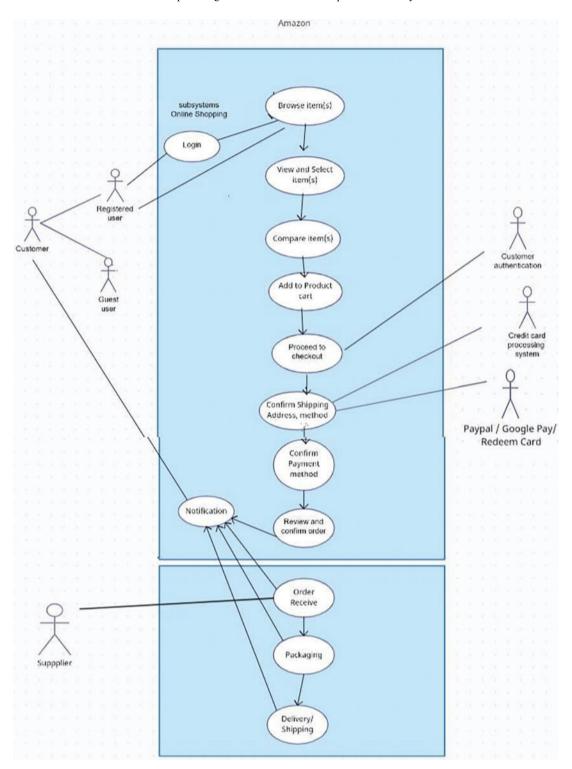


Fig. 6. Use case diagram for Amazon's purchasing process.

Primary Actor(s): Registered Customer Secondary Actor(s): Bank, Seller

**Trigger Event(s):** When a user clicks on the "Confirm Order" he should successfully place an order.

**Pre-Condition:** A registered customer should enter his address (Order Address) and his card details before placing the order.

Post-Condition: After placing the order the order amount should be deducted from his account and, the product/order should be moved from cart to tracking order. Also, the email account that relates to Amazon should get a mail notification. Also, the seller should get a notification about the order.

Constraints/Issues/Risks: Accurate card details, accurate Address is needed.

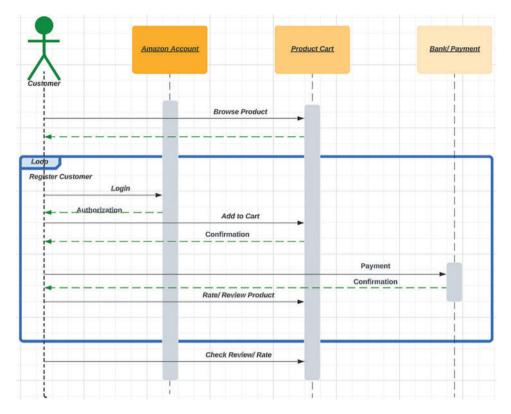


Fig. 7. Sequence diagram for customer's action.

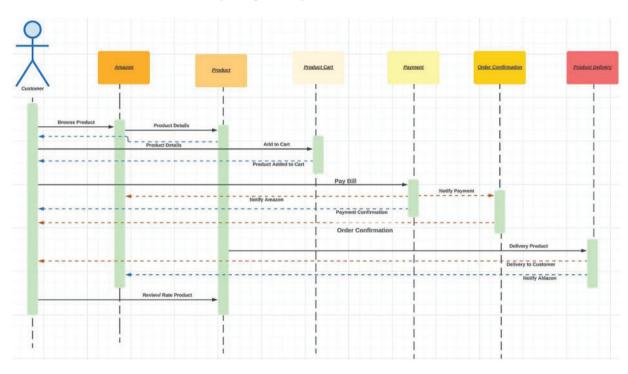


Fig. 8. Sequence diagram for supplier's activity.

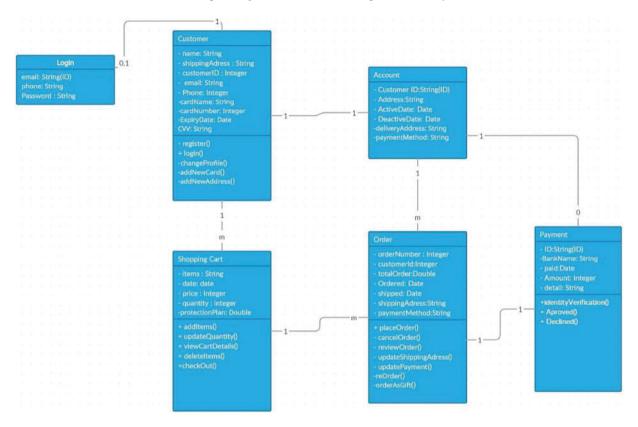


Fig. 9. Object diagram for product purchasing cycle.

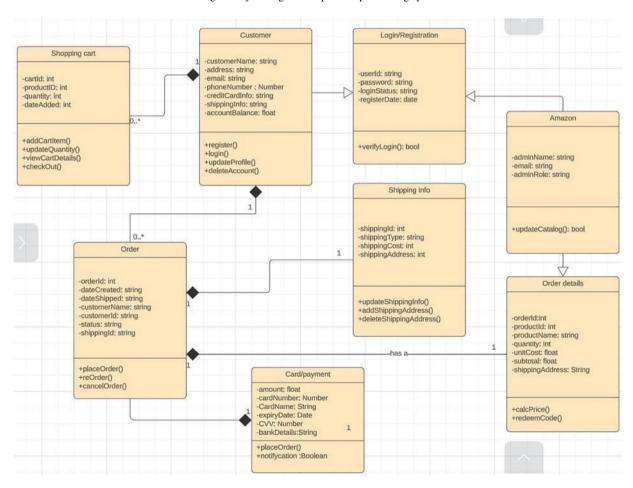


Fig. 10. Object diagram for product purchasing cycle from login to checkout.

#### 14. Conclusion

With well-defined deliverables and functional objectives, our aim is to create Amazon.com. Clients, project teams, sponsors, end users, and external stakeholders are all included in the stakeholders. Product behavior, organizational policies, and outside influences all fall under the category of non-functional requirements.

#### CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

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