Penpal- An Online Stationery Shop Management

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Abstract:
Empowered by a versatile platform, the stationery shop is expanding its services, allowing customers to conveniently browse through an extensive array of books and school-related products from the comfort of their mobile devices. Enhancing the overall shopping experience, this mobile iteration of the store also offers exclusive monthly deals on select items. Customers can also request new items, ensuring a customer-centric approach. Meanwhile, Most Stationery is transitioning from its outdated manual inventory management methods to a web-based system. This system aims to streamline inventory management, categorize office supplies, and automate daily sales reporting, ultimately boosting profitability month after month. On the other hand, the online bookstore initiative aims to provide students with a user-friendly platform to browse and purchase books based on title, author, and subject. Customers can swiftly place orders, make payments with credit or debit cards, and set up accounts for a convenient shopping experience, while administrators gain new features to efficiently handle data
Keywords: Penpal, Online Stationery Shop Management (OSSM), Systems Development Life Cycle (SDLC), Rapid Application Development (RAD), Model View Controller (MVC).

I. Introduction

The stationery business management system encompasses several key features. Firstly, it seeks to provide an efficient system for tracking stationery inventory, replacing manual monitoring methods with a more structured approach. Secondly, the project aims to develop a system for generating comprehensive sales statistics to enable data-driven decision-making and operational optimization. These reports will offer valuable insights into sales performance, consumer preferences, and revenue trends. Finally, to ensure usability and reliability, the alpha/beta testing phases will involve real users. Stationery, comprising various writing instruments and office supplies, is indispensable in academic and professional settings. Online stationery purchasing behavior is influenced by intricate social dynamics, including brand and product preferences, as well as distribution channel choices. Thus, marketers must possess a deep understanding of customer behaviors and interests. Studies often focus on established or relatively stable markets, providing insights into market peculiarities and the challenges of effective marketing interventions, revealing the specific dynamics governing the stationery shop system.

The system has been purposefully designed to efficiently manage all stationery items within an organization's inventory, irrespective of their age or condition. It also facilitates communication with stationery vendors. Offering numerous functionalities, it covers a broad spectrum of products, including pens, pencils, erasers, notebooks, and A4 paper. These functionalities encompass sales tracking, inventory management, reporting damaged goods, registration, and vendor supervision. Moreover, the system extends its services online, granting users 24/7 access to stationery stores from various locations such as homes, offices, and internet cafes. Online price comparison tools and search engines enhance the shopping experience by providing quick access to a plethora of merchant offers, thereby simplifying the process. While certain regions may waive sales tax, delivery costs may vary, potentially offsetting any price advantages.

This model addresses a number of critical difficulties that stationery businesses and organizations encounter on a daily basis. To begin, relying on antiquated manual techniques for inventory management frequently results in inefficiencies, errors, and challenges in maintaining ideal stock levels. Second, a lack of detailed sales insights limits the capacity to comprehend client preferences, discover top-selling goods, and

make sound business decisions. Third, contact with suppliers can be time-consuming and error-prone in the absence of simplified processes, possibly leading to supply chain interruptions. Furthermore, with the growing popularity of online shopping, stationery stores must adapt to satisfy consumer expectations for ease and accessibility while also competing successfully with online competitors and price comparison websites. Furthermore, a user-friendly platform for both consumers and administrators is critical for increasing engagement and satisfaction. Finally, maintaining data security and dependability is critical for safeguarding sensitive consumer information and ensuring compliance with data protection laws. Addressing these issues via the creation and deployment of an integrated stationery business management system would not only streamline operations but also promote growth and success in a competitive market environment.

II.   Literature Review

The E-Stationary system is intended to improve the overall administration and distribution of stationery inventories. The primary goal of developing this system is to help Stationery operators at "Notebook Junction" manage their business more methodically and efficiently. Following thorough investigation, the issue of stationery stores still employing manual techniques to record stationery goods from stored record files has been recognized, resulting in congestion and discomfort.

This method seeks to modernise the stationary industry by allowing clients to order items/products from anywhere. In this system, developers used several approaches to create alternative algorithms, such as accepting orders based on timestamps and sorting orders based on amount into two separate databases labelled Low order and Bulk order. Overall, the created stationary management system can speed up the procedure.[1]

The methodology employed for all research and system development frameworks in this project involves the Systems Development Life Cycle (SDLC). This process is entailed by understanding how an information system can support business needs, designing the system, building it, and delivering it to users. The steps involved include Planning, Analysis, Design, and Implementation. An advantage of SDLC is that activities to be carried out are defined, providing a framework to comprehend the systems development process. However, it is also noted that a disadvantage of SDLC is that a long time is taken between analysis and implementation, rendering it time-consuming. While SDLC is not the actual design process implemented for this project, the project cannot proceed if SDLC[7] is ongoing. Instead, different approaches are required for different parts of the development process, with design and implementation necessitating revision to accommodate changed requirements. Consequently, the author's own methodology has been deemed the most suitable procedure for this project.[2]

Fig 1: The three primary stages of SDLC process[2]

The waterfall methodology has been chosen for the development of Most Stationery Inventory Management System[8], where each phase in the development process is carried out only after the completion of the previous phase. In the Analysis and Requirement phase, information is gathered and analyzed to determine system requirements. The Design and Software phase involves designing the system's operation and structure using tools like Entity Relationship Diagrams (ERD) and Data Flow Diagrams (DFD). The database, MySQL, is utilized, and the user interface is created using Adobe Dreamweaver CS6 software.

The Implementation and Unit Testing phase includes actual system development using PHP, along with attentive database development and unit testing to ensure compliance with specifications. The Integration and Testing phase focuses on comprehensive software testing and system integration to ensure adherence to requirements and functionality as discussed. Finally, in the Operation and Maintenance phase, the system is released to users for initial use, with any necessary corrections made to fulfill user needs, or else the system operates fully if no changes are required.[3]

The Stationery system, which includes of software and hardware components, is intended to provide services related to the sale and purchase of items, with all information stored in a database and accessible as needed. The Stationery Management System for Qaaf Stationery Company will be an online application built with Microsoft Visual Studio VB.NET and ASP.NET 2012 as the front end and Microsoft SQL Server 2012 as

the back end, both of which were chosen for their compatibility and alignment with Microsoft products. Microsoft SQL Server is required for backend database administration, while Visual Studio provides the frontend development environment for application design.[4]

The system will be built utilizing Rapid Application Development (RAD) methodology and a prototype development process, which is beneficial for creating web systems with Web programming tools. System prototypes are swiftly built and displayed to people, and their feedback is used to improve them. The main advantage is that systems may be quickly delivered to users, even if they aren't yet ready for institutional use. This allows for user input and adjustments before the next prototype is ready. Further investigation may be necessary. The planning phase begins with the selection of a project title and the production of a proposal that defines the project scope, objectives, and problem statements. Preliminary research, progress reports, and final dissertation reports are generated. Hardware and software requirements are listed, with a focus on web technology such as ASP and JavaScript. To comprehend project and system flow, including server, database, and user interface analysis, literature studies, research, and the creation of UML diagrams are all required. Implementation comes after design, and it results in a well-structured server, client, and user interface design with finalized requirements. A thorough mastery of the ASP language is required, yet time restrictions mandate simplicity while satisfying project goals. Macromedia Dreamweaver 2004 for ASP and JavaScript, as well as Microsoft SQL Server 2000 Developer Edition, are available as software.[5]

Issues and Challenges

The system's goal of modernizing the stationary sector faced hurdles due to manual methods prevalent in some shops, leading to crowding and inconvenience. Developing algorithms for efficient order processing posed a significant challenge, necessitating seamless integration of online ordering and inventory management systems using advanced technologies like artificial intelligence and cloud-based platforms.[1]

The sequential nature of SDLC[2] resulted in a prolonged duration between analysis and implementation, highlighting the need to balance structured approaches with agile development methodologies. Present technology emphasizes agile methodologies like Scrum or Kanban, offering faster development cycles and continuous delivery, alongside automation tools for testing and deployment to enhance responsiveness to user feedback.

Dependence on sequential phases in the waterfall methodology[3] posed challenges, potentially causing delays if issues arose during each phase's completion. Ensuring comprehensive testing and validation at each stage was critical to prevent downstream errors. Modern methodologies like DevOps and CI/CD streamline development, enabling parallel activities and rapid feedback loops through automated testing and deployment pipelines.

Dependency on specific software tools and technologies limited flexibility in the development process, while integrating legacy systems with modern technologies posed challenges for enhanced functionality and scalability. Present technology focuses on interoperability and compatibility, facilitating seamless integration between diverse systems through APIs and microservices architecture, along with embracing open-source technologies and cloud-native solutions for enhanced flexibility and scalability.[4]

Balancing rapid development with thorough analysis and planning was essential to ensure prototypes accurately reflected user requirements and could be scaled for production. Modern development frameworks offer low-code or no-code solutions, accelerating development while maintaining scalability and reliability. User-centric design approaches and iterative development cycles facilitate rapid feedback and refinement, aligning closely with user needs and expectations.[5] Despite facing challenges inherent to their respective methodologies and technological constraints, present technology offers more agile, flexible, and scalable solutions to address similar issues effectively. Embracing modern development practices and leveraging advanced technologies can enhance project outcomes and deliver greater value to stakeholders in the rapidly evolving digital landscape.

Core Methodologies

The core methodology adopted in the development of the E-Stationary system[1] revolves around modernizing stationery management by leveraging technology. It focuses on addressing the challenges faced by stationery operators, particularly in managing inventory and facilitating smooth customer transactions. Through extensive research, the methodology emphasizes the utilization of algorithms to streamline processes, such as order management based on timestamps and quantity sorting. This approach aims to expedite the entire process, ensuring efficiency and convenience for both operators and customers. Overall, the core methodology of the E-Stationary system development centers on integrating technology to enhance the stationery management experience.

This approach involves a systematic process of understanding business needs, designing the system, and implementing it to meet user requirements. It provides a structured framework for project planning,

analysis, design, and implementation. Despite its advantage of defining clear activities, SDLC[2] is noted for its time-consuming nature, particularly between analysis and implementation phases. However, for this project, a tailored methodology is deemed necessary, considering the project's unique requirements and constraints.

The waterfall methodology is used for developing the Stationery Inventory Management System[3]. This approach entails sequential phases, where each phase is completed before moving on to the next one. The Analysis and Requirement phase focuses on gathering and analyzing information to determine system requirements. The Design and Software phase involve designing the system's operation and structure, utilizing tools like Entity Relationship Diagrams (ERD) and Data Flow Diagrams (DFD). The Implementation and Unit Testing phase include actual system development using PHP, with a focus on attentive database development and unit testing. The Integration and Testing phase ensure comprehensive software testing and system integration before final release to users.

Iterative development approach is chosen for compatibility and alignment, ensuring smooth system development. The methodology focuses on defining hardware and software requirements, with a clear emphasis on web technology using ASP and JavaScript. Analysis involves literature reviews, research, and UML diagram development to understand project and system flow. Implementation follows design, producing a well-structured server, client, and user interface design, with requirements finalized to meet project objectives.

Rapid Application Development[5], approach emphasizes quick development through prototyping, allowing for rapid system provision and feedback incorporation. The planning phase involves selecting a project title, defining project scope, objectives, and problem statements. Preliminary research, progress reports, and final dissertation reports are produced to guide the project. Hardware and software requirements are identified, focusing on web technology using ASP and JavaScript. Implementation follows design, resulting in a well-structured server, client, and user interface design that focuses on simplicity while satisfying project goals. Macromedia Dreamweaver 2004 for ASP and JavaScript, as well as Microsoft SQL Server 2000 Developer Edition, are among the software options.

Strengths and Drawbacks

E-Stationary System[1] presents a comprehensive solution for managing stationery stock efficiently. Its strength lies in modernizing the stationary sector by enabling convenient online ordering for customers, addressing the inconvenience caused by manual stock recording methods. However, its drawback may be the limited exploration of alternative methodologies beyond timestamp-based order sorting.

The use of SDLC[2] provides a structured approach to system development, ensuring clarity in project activities. Its strength lies in defining clear steps from planning to implementation. Nonetheless, the time-consuming nature of SDLC could pose a drawback, especially concerning the long duration between analysis and implementation phases.

The waterfall methodology[3] offers a systematic approach to software development, ensuring each phase's completion before moving to the next. This structured process aids in gathering requirements effectively. However, its drawback may be the limited flexibility to accommodate changes once a phase is completed.

The specific hardware and software requirements for the proposed system, ensuring compatibility and alignment with Microsoft products[4]. Its strength lies in its detailed specification of technology choices and their rationale. However, its drawback may be the dependency on Microsoft products, limiting flexibility and adaptability to alternative solutions.

Rapid Application Development [4] methodology offers quick system provision through prototyping, facilitating user feedback and refinement. Its strength lies in its agility and responsiveness to user needs. However, the potential drawback may be incomplete requirements due to the rapid development pace, requiring further analysis and refinement.

III.   Methodology

A technique that can adjust to shifting needs and take into account the dynamic nature of e-commerce is necessary for this strategy. This flexibility is provided by agile, more especially by scrum, which permits iterative development cycles known as sprints. A potentially shippable product increment is delivered throughout each sprint, allowing for continuous delivery and early stakeholder input. This iterative process makes sure that the system can quickly adjust to changing priorities and demands, which is in line with the goal of handling different product, customer, payment, and order-related variables.

Close engagement with stakeholders is required for building user-friendly features and functionalities in this architecture. Agile approaches encourage cooperation by incorporating regular feedback loops into sprint review sessions. Agile guarantees that the system satisfies user requirements and expectations by stressing cooperation with the client. This model's focus on delivering value to consumers through incremental releases

allows it to begin offering value to users sooner rather than later. Agile's iterative approach also reduces the risks associated with large-scale, upfront development initiatives, boosting the likelihood of success.

Continuous improvement is a key component of Agile techniques, making Scrum an excellent fit for this paradigm. At the end of each sprint, the development team may reflect on their methods and make changes to make them more productive. This dedication to continual improvement is consistent with the objective of improving efficiency in product, customer, and order management. Overall, implementing Agile, particularly Scrum, would allow the development team to efficiently handle the intricacies of this paradigm while maintaining flexibility, customer collaboration, and continuous improvement throughout the development lifecycle.

Model View Controller(MVC)

MVC which stands for Model View Controller is a software architecture paradigm for designing online applications. A MVC pattern consists of the following three parts:
•Model-It is the lowest level of the pattern and is responsible for keeping data.
•Views-It present all or a subset of the data to users.
• Controller - It is the software code that manages interactions between the Model and View.

MVC is popular because it separates application functionality from the user interface layer, allowing for the separation of concerns. The Controller accepts all requests for the application and then collaborates with the Model to prepare any data required for the view. The View then utilizes the data generated by the Controller to create a final presentable response.
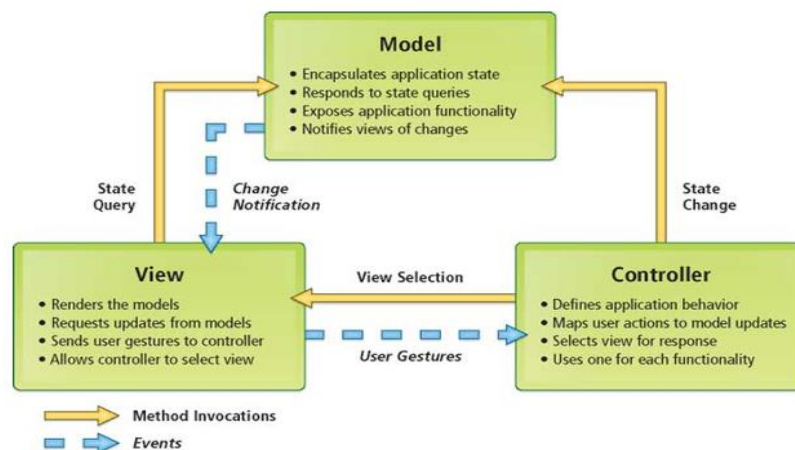

Fig 2: MVC (Model View Controller Flow)Diagram

The Model-View-Controller (MVC) architectural pattern, which is ideal for online applications, may be used to construct the Online Stationery Shop. In this approach:

- Model: The Online Stationery Shop's Model component of the MVC design will be in charge of keeping track of information about its orders, clients, merchandise, and payments. Data storage, retrieval, updating, and deletion are all included in this.
- The View component will handle the Online Stationery Shop's presentation layer, which is responsible for showing data to users in an easy-to-use and straightforward manner. It will create the final HTML pages for consumers to interact with, including product listings, order summaries, payment information, and so on.
- Controller: The Controller part will act as a bridge between the View and the Model. When users make requests (such browsing items or placing orders), it will receive them and handle them appropriately. When necessary, the Controller will work with the Model to get or modify data, which it will then provide to the View for display.

IV.   Implementation

The implementation is centered on overcoming the issues created by manual processes and simplifying activities for greater efficiency. Implementing error-free software and generating error messages for incorrect data entry guarantees user-friendliness and dependability. This strategy seeks to minimize manual record-keeping responsibilities, allowing users to focus on other activities and make better use of organizational resources.

This seeks to successfully handle a variety of features, including product details, client information, payments, and orders. The system improves product data and customer transaction management by providing search capabilities, online payment administration, and information tracking. It also enhances resource management by allowing users to modify, add, and update records, resulting in more efficient processes.

The scope includes business process automation, which aims to computerize numerous activities inside the Online Stationery Shop. By digitizing forms, creating numerous copies at the same time, and automating operations like manifest preparation, the system boosts productivity while lowering the cost and time associated with manual management procedures. With an emphasis on customer pleasure, convenience of use, and timely delivery within budget, the implementation guarantees that the Online Stationery Shop satisfies user needs while also improving operational efficiency.

Fig 3: Dashboard

Fig 4: About the project page

In Fig 3 and 4 that is, the Customer Module which is responsible for managing customer information, including profiles, contact details, and purchase history. It enables personalized services and efficient customer relationship management.
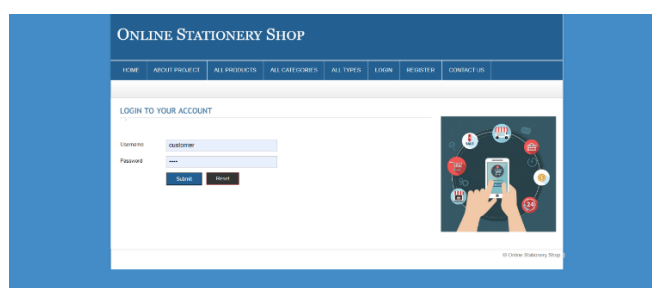

Fig 5: Login Page

In Fig 5 that is, the Login Module handles user authentication and authorization processes. It ensures secure access to the system by requiring valid login credentials and permissions for different user roles.
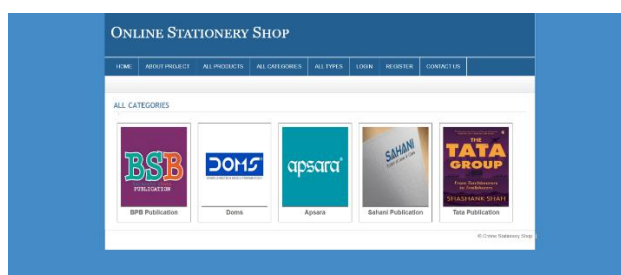
Fig 6: All available Products page

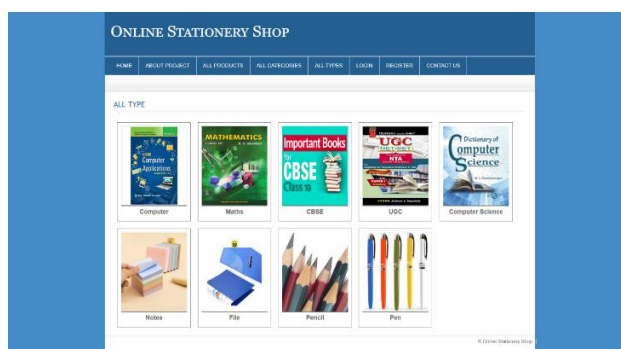**Fig 7: All Categories page**

Fig 8: All type pages

In Fig 6, 7 and 8 that is the Product Type Management Module which is used for managing information and details related to product categories or types. This module categorizes products based on their attributes, facilitating easier navigation and organization.
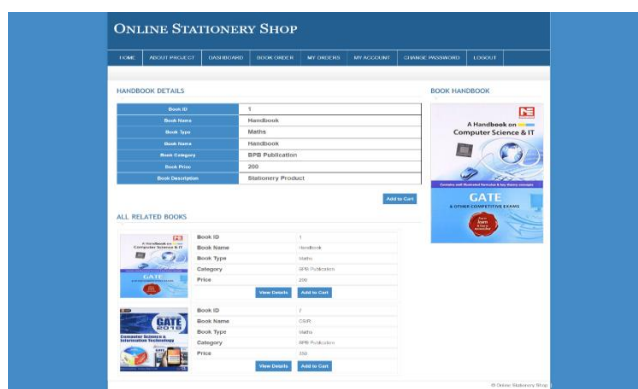

Fig 9: Details about the item purchase

In Fig 9 that is, the Product Management Module which is responsible for managing product details, such as descriptions, prices, and availability. It ensures that accurate and up-to-date information about each product is maintained within the system.
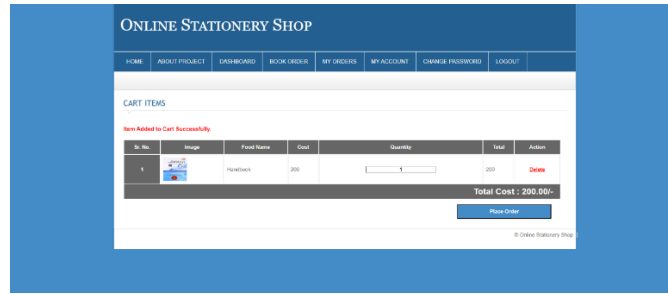
Fig 10: Item added to Cart Page

In Fig 10 and 12 that is, the Order Module which handles the details of customer orders, including order placement, tracking, and fulfillment. It allows users to create, modify, and track orders throughout the purchasing process.
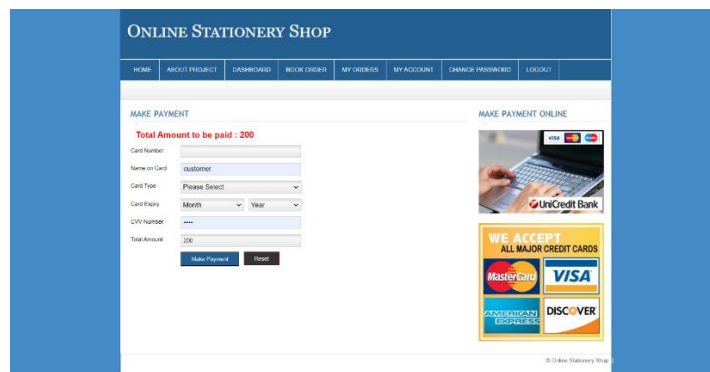

Fig 11: Payment Page

In Fig 11 that is, the Payment Module manages payment-related information, such as payment methods, transaction details, and order payments. It ensures secure and efficient processing of payments for customer orders.
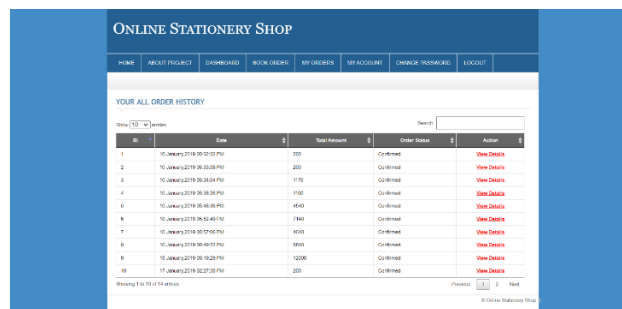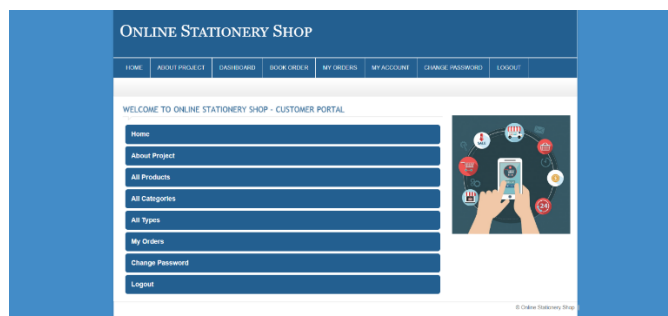

Fig 12: Order History Page

Fig 13: Customer Portal Page

In Fig 13 that is, the Users Module which manages user accounts and permissions within the system. It allows administrators to create, modify, and deactivate user accounts, as well as assign specific roles and access levels.

All things considered, these modules serve as the framework for the Online Stationery Shop system, offering extensive capabilities to efficiently manage goods, orders, payments, clients, and user access.

V. Results And Discussions

The Model-View-Controller design pattern is used in the Online Stationery Shop system to give an organized approach to data management, display, and user interactions. The Model component efficiently maintains data relating to orders, clients, products, and payments, assuring data quality and dependability. The MVC architecture improves the system's maintainability and scalability by isolating concerns, making future changes and alterations easier.

In terms of functionality, the various modules serve critical roles in aiding various facets of the online purchasing journey. The Product Management Module guarantees that product information is correctly kept and updated, allowing consumers to explore and buy with confidence. Similarly, the Order Module simplifies the order placement, tracking, and fulfillment processes, increasing customer happiness and operational efficiency.

The Payment Module securely stores payment-related information, accepts a variety of payment methods, and ensures that transactions go smoothly. This module is critical in providing seamless and safe online transactions, resulting in a great customer experience. Furthermore, the Product Type Management Module and Product Company Module are useful organizational tools for classifying items and maintaining supplier information, respectively.

VI. Conclusion

Finally, the creation of the Online Stationery Shop initiative represents a big step toward modernizing and optimizing the conventional manual procedures seen in the stationery sector. By integrating cutting-edge technology and adhering to software engineering best practices, the project has effectively tackled significant difficulties encountered by stationery firms, such as manual record-keeping, order administration, and customer support. The Model-View-Controller (MVC) design has made it easier to organize and handle data, while also assuring data integrity, scalability, and maintenance. The system's modular architecture, which includes features like product administration, order processing, payment handling, and customer relationship management, demonstrates its comprehensive approach to serving the different demands of stationery businesses and their consumers. Moving forward, further refining and optimization of the Online Stationery Shop project will be required to respond to changing market trends, technology improvements, and user preferences, eventually fostering innovation and competitiveness in the stationery business.

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