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Web-based ordering system for Start-UP business with forecasting

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Abstract

The rapid advancement of technology has paved the way for small and start-up businesses to leverage digital solutions to enhance their operations and competitive edge. This research focuses on the development and implementation of a web-based ordering system integrated with forecasting capabilities tailored for start-up businesses. The system is designed to streamline the ordering process, improve inventory management, and provide actionable insights through demand forecasting.

The web-based ordering system offers an intuitive user interface that allows customers to place orders seamlessly. On the backend, the system provides business owners with tools to manage orders, track inventory levels, and generate reports. A key feature of the system is its forecasting module, which utilizes historical sales data to predict future demand. This capability enables businesses to optimize stock levels, reduce waste, and ensure product availability.

The forecasting module employs various statistical and machine learning algorithms to analyze sales trends and patterns. Techniques such as moving averages, exponential smoothing, and regression analysis are integrated to enhance the accuracy of predictions. The system also includes a feedback mechanism where actual sales data is continually fed into the forecasting model to improve its precision over time.

This research involves a comprehensive analysis of the system's impact on operational efficiency and customer satisfaction. Case studies of several start-up businesses implementing the system are presented, demonstrating significant improvements in order fulfillment times, inventory turnover rates, and overall business performance.

In conclusion, the integration of a web-based ordering system with forecasting capabilities offers start-up businesses a robust tool to streamline operations and make data-driven decisions. By adopting this technology, start-ups can achieve greater efficiency, reduce operational costs, and enhance their ability to meet customer demand, thus positioning themselves for sustained growth and success in the competitive market landscape.

Keywords: Integrated Web-based Ordering; Forecasting System; Start-Up Businesses

1. Introduction

Since the pandemic started, it has become difficult for business owners to sustain their small businesses, because of COVID people are reluctant to go out and make purchases. As a result, finding customers for the new business is challenging. Consumers are extremely cautious about their safety when visiting a physical store to look around and make purchases, as is the case with E-Catuni, a small business in Caloocan that sells electronic appliances.

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The owner of this business is Mr. Rhoduff Jed, but his enterprise is one of the ones most adversely affected by the epidemic, which has an inconsistent impact on sales because of this problem the researchers come up with a solution to develop an online ordering system that forecast the stocks of a business for E-Catuni business.

The researchers intend to develop a system that will ameliorate the company to oversee and somehow predict its sales through a digitized system, part of the system that we want to put on is a web-based system where the consumer can easily see what the company is selling. In addition, the owner/admin can view the sales forecast for them to determine the expected sales easily.

1.1. Statement of the Problem

- They try to sell their items using social media platforms, but it is tough to convince people to engage with them and buy from them.
- Our client's trouble estimating the amount of stocks is due to manual verification; as a result, they may experience future stock-related issues.
- The owner is also experiencing inaccurate sales, which may lead to future sales concerns.

1.2. Objectives

1.2.1. General Objectives

The objective of this research is to create and develop a program that supports business owners. Specifically, in the matter of selling products to consumers that will not compromise protocols that the pandemic started and also specifically on the part of business owners helping them in the matter of recording through the digitized system, helping them to oversee and plan over, this study will benefit both business owners and consumers.

1.2.2. Specific Objectives

- The proponents believe that developing an online web ordering system for the company will increase consumer engagement.
- To create a system that automatically generates the real-time number of stocks of the products to determine the availability.
- The objective of the study is to develop a system that will generate reports that show the monthly sales and implement sales forecasting to determine future sales.

1.3. Scope and Delimitation

1.3.1. Project Scope

Web-based ordering system for start-up business with forecasting will support E-CATUNI Trading & Wholesaling. The study will incorporate the ordering and foretelling stocks method; the study will include the ordered item's status and generate the reports of monthly sales.

1.3.2. Project Delimitation

The study will not insert the delivery tracking telling the movement of ordered items

2. Methodology of the study

The waterfall approach and the SDLC (Software Development Life Cycle) are employed in this study's architecture plan for an Online Ordering System with Forecasting. The SDLC is a project management model that describes the processes involved in bringing a project from conception to completion, whereas the waterfall technique is a sequential model that splits software creation into numerous parts. Each phase must be completed thoroughly before moving on to the next. Each phase of the SDLC process is designed to accomplish a certain purpose. Winston Royce introduced it in 1970.

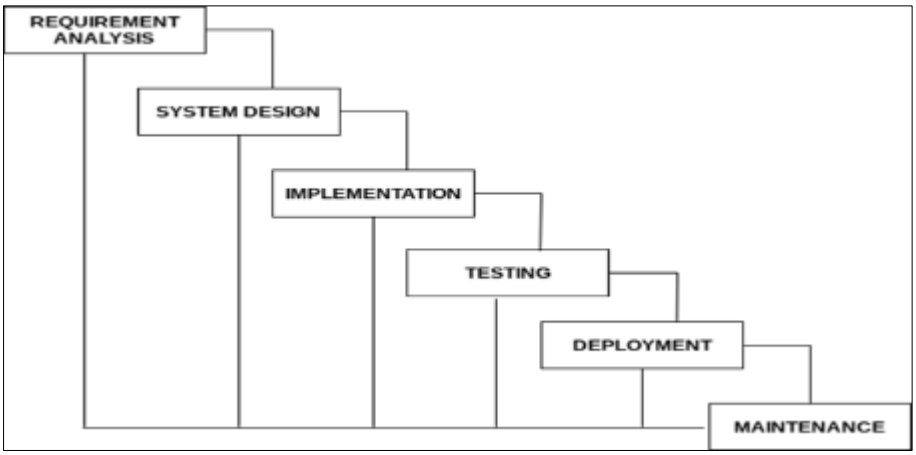


Figure 1 System Development Life Cycle Waterfall approach

The proponents chose the SDLC and waterfall approaches because they are straightforward, simple to understand, and simple to manage because each phase has distinct outputs and a review process, has clearly defined stages, and works well for smaller projects with very clear requirements. Finally, the study precisely explains each phase's procedure and output.

This research will be carried out in six stages. The SDLC diagram illustrated in figure 1 can be used to model the phases of this study.

2.1. Requirement Analysis

Using a requirement analysis, the waterfall paradigm was applied in this investigation. In terms of software programs, requirements analysis, according to Catanio (2006), is the process of analyzing, evaluating, and documenting user needs and expectations for the software system that will be created in order to address a certain issue.

This can be used for new business because they have just started to be in the process of ordering their items and so that it will not be difficult for them to order and they will be able to track what they will sell because they will be popular if they sell out immediately. that item can also be increased and it won't run out immediately and they will earn how much they have already ordered from the main where that item was taken because of the website that they will make, their business will be a ware and d immediately they will lose money and the small business won't start immediately.

2.2. System Design

The waterfall model's system design phase is the following stage. According to Pierce (2017), system design describes a system's components as well as the security level, modules, design, and numerous interfaces and data kinds that the system can handle.

The project's specifications are converted into a detailed design in this section. To connect the entire system to its specifications, the advocates created a Data Flow Diagram (DFD). The information flow between the information and the system as a whole was described in full by DFD, as is common knowledge. Additionally, it helps to clarify the type of system that is required. This phase also involves the execution of the interface design.

2.3. Implementation

The implementation and coding phase of the software development life cycle is the third stage of the SDLC procedure. In this step, the proponents produce the final product, claims Ransom (2017). The process of system implementation is where the business's project strategy is put into action. Project developers are creating and coding the platform.

To produce the desired results a graphical user design that the organization required, the proponents employ HTML and CSS. SQL and PHP were also utilized by supporters for the database. The created system's intended implementation is the main focus of the system implementation process.

2.4. Testing

The testing stage comes next. The majority of research activities are concentrated on this stage since, according to Ijeacs (2017), software testing is a technical way to guarantee the accuracy of software.

Based on the functional and non-functional requirements, the entire piece of software will be tested. To ensure component integration and prevent faults, each component of the software will be evaluated separately. Both the proponents and the intended users must take part in the research endeavor. During this stage, the test results must be meticulously recorded.

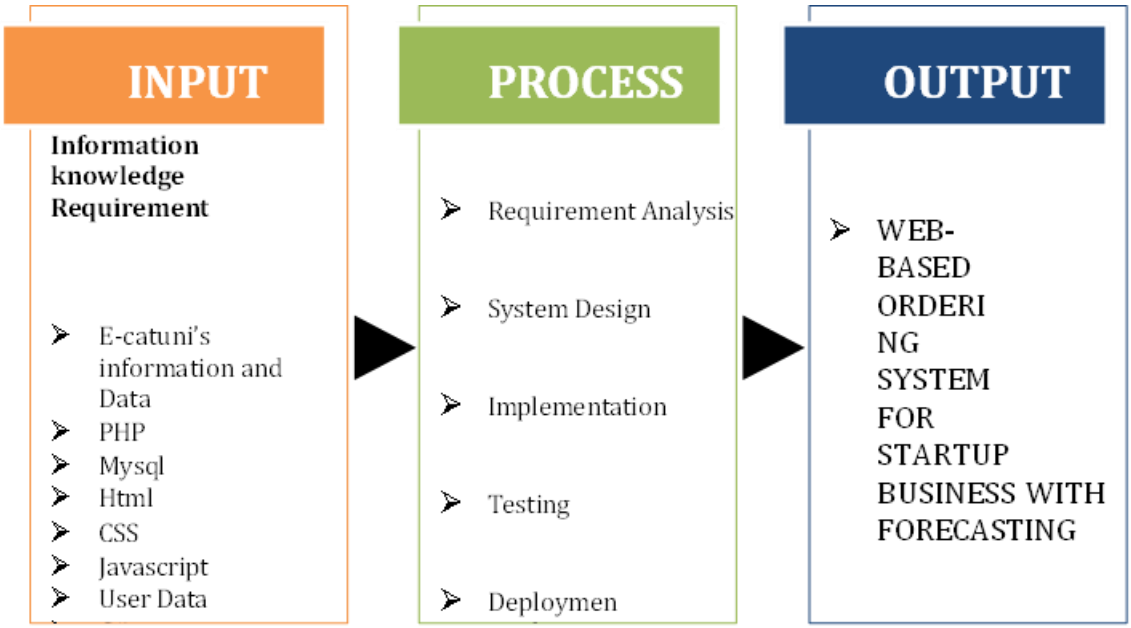
2.5. Deployment and Maintenance

System deployment makes sure that the designed system is operationally suitable and that the user is in charge of the system's dependability, efficacy, and safe operation. Operation and usage factors must be considered at all stages of the system's life cycle (Jackson, 2021). Once finished, the system will either be made available to users or put on the market.

After deployment, the next step is maintenance. The SDLC maintenance phase begins once the product is operational. If the program fails, upgrades, fixes, and patches may be required (Ransom, 2020). If everything goes as planned, the proponents will test it before installing it on the system user's system, which is necessary because the system is designed to require modifications due to errors or advancements in the field of information technology.

3. Conceptual Framework

Conceptual Framework of the System



The conceptual framework is all about the input, process, and output of the Web-based Ordering System with Forecasting process.

3.1. Hardware and Software Requirements

Table 1 Hardware Requirements

Hardware Components	Minimum Requirements	Hardware Recommended
Processor	Intel core i3 or in equivalent	Intel i5 2300 or in equivalent
RAM	2GB	4GB and up
HDD	500 GB	1TB and up

A processor, RAM, and hard disk drive are needed components for constructing an online hiring process. With an Intel core i3 or comparable as the minimal requirement, an Intel i5 200 or equivalent processor is recommended. Hardware with 4GB or more of RAM is recommended, with 2GB being the bare minimum. Finally, HDD hardware suggests 1TB and more, with 500GB being the minimum needed.

Table 2 Software Requirements

Software Components	Used Software	Other Software
Database designer	MySQL	Any database designer in equivalent of MySQL
Software language	PHP, C#/Python and Javascript	PHP or any scripting language
User interface designer	HTML and CSS	HTML and CSS or in equivalent

The system's proponents will design the user interface of the system using HTML and CSS, as well as the PHP and Javascript programming language, MySQL for the system's database, and the other software components that were listed above the table.

3.2. Context Diagram

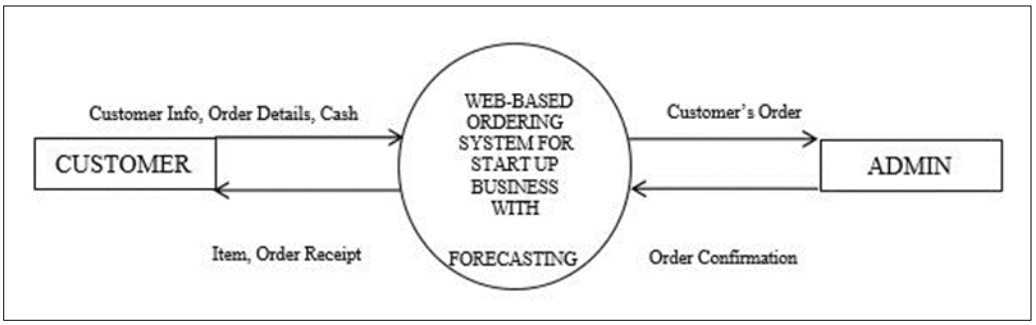


Figure 2 DFD Level 0 Web-based ordering system for startup business with Forecasting

The figure above shows the proposal of the proponents for the business company. The arrow denotes the direction in which the data input is flowing. The external entities that direct the system's actions are the customer and the administrator. The main operation is known as a "Web-based ordering system for startup business with forecasting." In other words, 0.0 start the conversation about the core function. For the sake of the following illustrations, the DFD level 0 meal ordering system often serves as the starting point.

3.3. Data Flow Diagram

The level 1 data flow diagram for the client side is shown in figure 3.0. It demonstrates that the customer must log in or register on the website before they can begin to search for the products they desire. Next, the customer goes through the order confirmation process to ensure that all of the desired products are correct. Finally, the customer goes through the payment process, which is the system's final step and generates a receipt for the customer at the conclusion of the process.

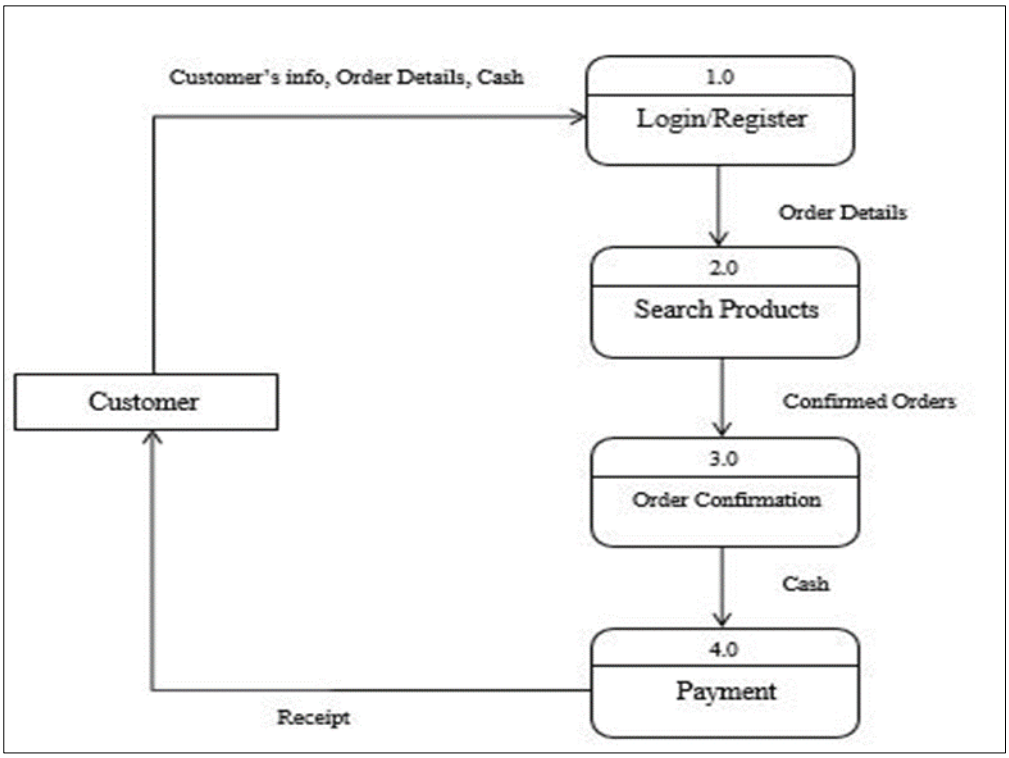


Figure 3 Level 1 Data Flow Diagram Customer Side

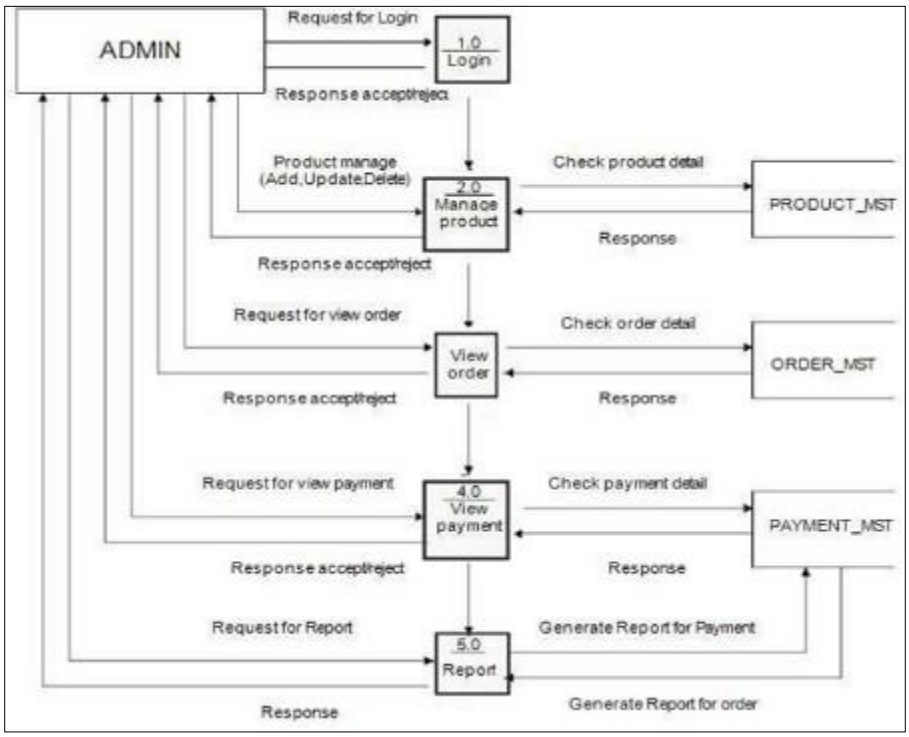


Figure 4 Level 1 Data Flow Diagram Admin Side

The level 1 data flow diagram for the administrative side is shown in figure 4. It demonstrates that before managing the products, the admin must log in via the web. During this time, the admin has the ability to add, edit, and remove products. The following step is to view the customer's order. During this phase, the admin begins to confirm if the order has been accepted or denied. The admin decides whether to approve or deny the customer's order based on the view payment process, which comes next. Finally, during this procedure, the administrator can view the system reports, including the sales report, inventory reports, and sales forecasting.

3.4. Use Case

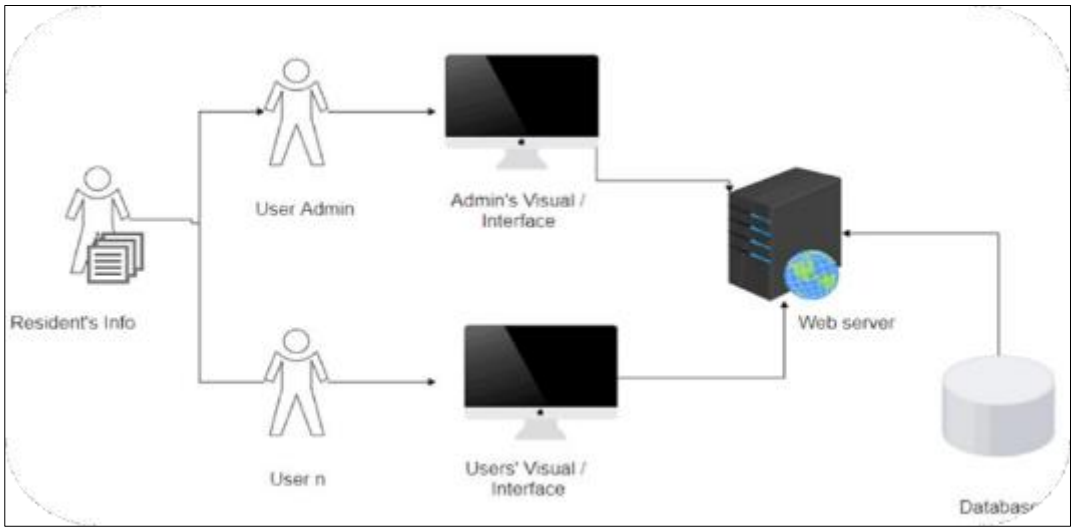


Figure 5 Use Case

The proponents use Case is shown in the figure above.

3.5. System Design

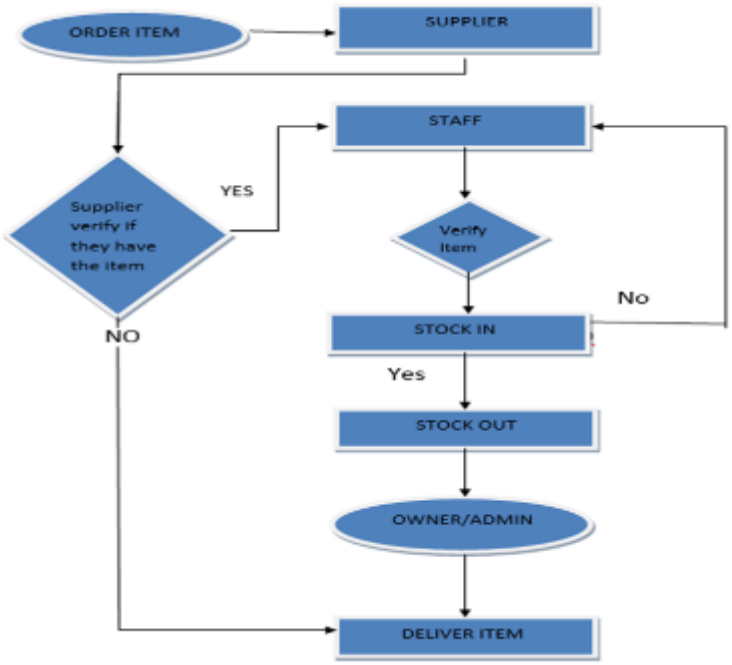


Figure 6 System Design

4. Results

The researchers delve into the findings of their extensive research in this section and conduct a thorough examination of the data and findings. Online shopping statistics are a great way to measure the shifts in consumer preferences over time. For example, despite the effects of the COVID-19 pandemic, many shoppers still prefer shopping in person. For more interesting trends, check out these statistics. Data is gathered from a total of fifty (100) respondents, all of whom are online shopping. The subjects are chosen at random process.

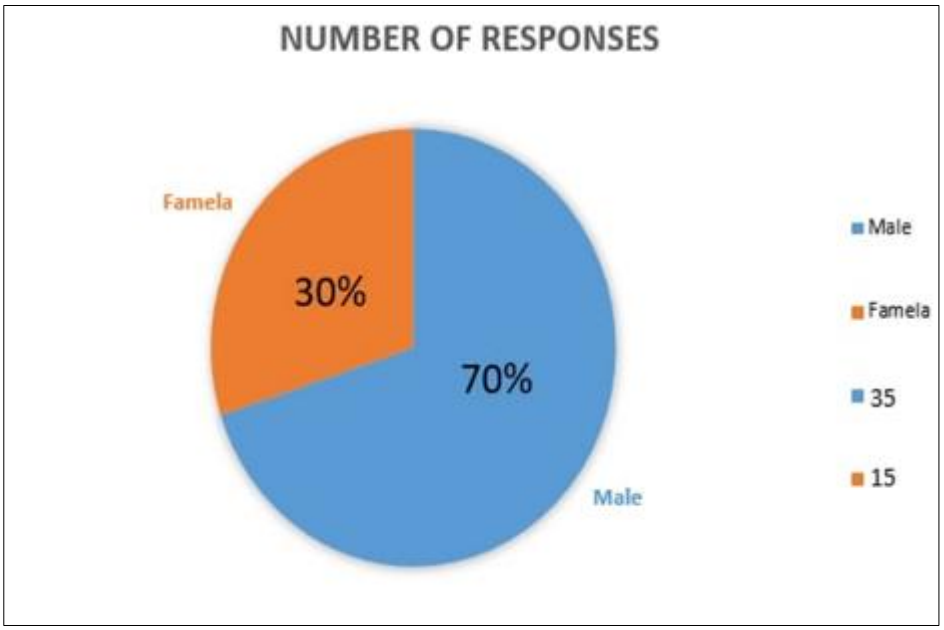


Figure 7 Respondents According to its Online Shopping rate for survey.

Figure 7 The researchers were able to collect feedback from the chosen individuals in Caloocan City, with a total respondent of Caloocan City with a total respondent of 35 or 75% Male and 15 or 30% Female.

4.1. Optimizing Inventory Management and Demand Forecasting System Using the Series Algorithm in terms of Functional Suitability, Compatibility, Usability, Reliability, Maintainability and Portability.

The ISO25010 evaluation model was used as a framework for the Web-based Ordering System for start-up Business with forecasting. This evaluation considered functional Suitability, Performance Efficiency, Usability, Compatibility and Portability. The survey used a Likert scale to evaluate the system. Respondents ranked their answers on a five-point scale using the questionnaire.

Table 3 Level of Satisfaction Verbal Interpretation

Scale	Range	Verbal Interpretation
5	4.21 – 5.00	Strongly Agree
4	3.41 – 4.20	Agree
3	2.61 – 3.40	Neutral
2	1.81 – 2.60	Disagree
1	1.00 – 1.80	Strongly Disagree

4.2. Evaluation of the Respondents according to ISO 25010:

Table 1.0 depicts the respondent's evaluation according to Function suitability of the web-based ordering system for start-up business with forecasting. The average weighted mean for the function suitability is 4.31 having a verbal interpretation of "Strong agree".

Table 4 Respondents Evaluation According to Functional Suitability

Function Suitability	**1**	**2**	**3**	**4**	**5**	**W.M**	**Verbal Interpretation**
How does the system provide support for demand forecasting and replenishment planning?	0	1	6	13	30	4.44	Strongly Agree
How does the inventory system been thoroughly tested to ensured that it accurately calculates and reports. inventory levels, order quantities and demand forecast?	0	0	8	19	23	4.3	Agree
Is the demand forecasting methodology used by the system suitable for the specific industry and products its service?	0	1	8	22	19	4.18	Agree
Weighted Mean						4.31	Strongly Agree

Table 5 Respondents Evaluation According to Compatibility

Compatibility	**1**	**2**	**3**	**4**	**5**	**W.M**	**Verbal Interpretation**
How will the inventory system integrate with existing business processes, ensuring minimal disruption and a smooth transition?	0	0	6	16	28	4.44	Strongly Agree
How does the inventory system handle data format compatibility and data synchronization when interrogating with other system, ensuring smooth interoperability?	0	3	17	14	16	3.86	Agree
Weighted Mean						4.15	Agree

Table 5 depicts the respondent's evaluation according to Compatibility of the web-based ordering system for start-up business with forecasting. The average weighted mean for the Compatibility is 4.15 having a verbal interpretation of "agree".

Table 6 Respondents Evaluation According to Usability

USABILITY	**1**	**2**	**3**	**4**	**5**	**W.M**	**Verbal Interpretation**
Does the system align with the company's user interface designed with recognizable icons, labels and technology that are familiar to user's inventory management strategies and goals?	0	0	7	9	34	4.54	Strongly Agree
How quickly can new users become proficient in using the inventory system with demand forecasting?	0	1	8	23	18	4.16	Agree
Does the system offer a smooth and efficient workflow for tasks such as inputting data, penetrating forecast and making inventory management deadline?	0	2	5	18	25	4.32	Strongly Agree
Does the system protect user against making errors to prevent mistakes in data entry, order processing and stock monitoring?	0	3	7	22	18	4.1	Agree
Is the user interface visually appealing and designed with a user-friendly, layout, color scheme and typography?	0	1	8	14	27	4.34	Strongly Agree
The system can be used to accessible to different users with abilities and disabilities to promote inclusively and equal participation in decision-making and planning?	0	1	9	8	32	4.42	Strongly Agree

Weighted Mean		4.31	Strongly Agree

Table 6 depicts the respondent's evaluation according to Usability of the web-based ordering system for start-up business with forecasting. The average weighted mean for the Usability is 4.31 having a verbal interpretation of "Strong agree".

Table 7 Respondents Evaluation According to Reliability

Reliability	**1**	**2**	**3**	**4**	**5**	**W.M**	**Verbal Interpretation**
How mature is the inventory system with demand forecasting in terms of its development?	1	3	16	20	10	3.7	Agree
How satisfied are you with the system that can be ensure the products are consistent available and in stock to meet customer demands while reducing overstocking or understanding problem?	0	2	6	22	20	4.2	Agree
How does the system handle unexpected errors or issues without compromising data integrity or forecasting accuracy?	0	3	5	20	22	4.22	Strongly Agree
Weighted Mean						4.04	Agree

Table 7 depicts the respondent's evaluation according to Reliability the web-based ordering system for start-up business with forecasting. The average weighted mean for the Reliability is 4.04 having a verbal interpretation of "agree".

Table 8 Respondents Evaluation According to Maintainability

Maintainability	**1**	**2**	**3**	**4**	**5**	**W.M**	**Verbal interpretation**
Does the system employ a clear and well-defined interface between modules to facilitate integrations and sociability?	0	0	9	21	20	4.22	Strongly Agree
How does the system effectively promote code reusability to reduce development time and effort?	1	0	11	19	19	4.1	Agree
Can the inventory system be effectively analyzed and understood by develops and stakeholders?	0	2	8	15	35	4.26	Strongly Agree
How flexible is the system when it comes to accommodating changes in business requirements or inventory management struggles?	0	1	3	19	27	4.44	Strongly Agree
Is the inventory system designed in a way that allows for effective testing of its various components and function?	2	3	7	23	15	3.92	Agree
Weighted Mean						4.19	Agree

Table 8 depicts the respondent's evaluation according to Maintainability the web-based ordering system for start-up business with forecasting. The average weighted mean for the Maintainability is 4.19 having a verbal interpretation of "agree".

5. Discussion

5.1. Overall

Table 9 Respondents Evaluation of Distributions to Respondents According to ISO25010 criteria

ISO 25010	Weighted Mean	Verbal Interpretation
Functional Suitability	4.31	Strong Agree
Compatibility	4.15	Agree
Usability	4.31	Strong Agree
Reliability	4.04	Agree
Maintainability	4.19	Agree
General Weighted Mean	4.2	Agree

Table 9 shows the respondents summary of evaluation according to ISO25010 criteria. The average weighted mean for Functional Suitability is 4.31 having a verbal interpretation "strongly agree". For Compatibility is 4.15 having a verbal interpretation "agree". For usability is 4.31 having a verbal interpretation "strongly agree". For Reliability is 4.04 having a verbal interpretation "agree". And lastly For Maintainability 4.19 having a verbal interpretation "agree" level of satisfaction.

Table 10 Displays how the application's effectiveness and dependability to users.

EVALUATION (ISO 25010)							
FUNCTIONAL STABILITY	SD	D	N	A	SA	Sub-characters	Overall Weighted Mean
Q1	0	1	6	13	30	Functional Completeness	4.31
Q2	0	0	8	19	23	Functional correctness	
Q3	0	1	8	22	19	Functional Appropriateness	
COMPATIBILITY	SD	D	N	A	SA	Sub-characters	Overall Weighted Mean
Q4	0	0	6	16	28	Co-Existence	4.15
Q5	0	3	17	14	16	Interoperability	
USABILITY	SD	D	N	A	SA	Sub-characters	Overall Weighted Mean
Q6	0	0	7	9	34	Appropriateness Recognizability	4.31
Q7	0	1	8	23	18	Learnability	
Q8	0	2	5	18	25	Operability	
Q9	0	3	7	22	18	Use Error Protection	
Q10	0	1	8	14	27	User interface Aesthetics	
Q11	0	1	9	8	32	Accessibility	
RELIABILITY	SD	D	N	A	SA	Sub-characters	Overall Weighted Mean
Q12	1	3	16	20	10	Maturity	4.04
Q13	0	2	6	22	20	Availability	
Q14	0	3	5	20	22	Fault Tolerance	

MAINTAINABILITY	SD	D	N	A	SA	Sub-characters	Overall Weighted Mean
Q15	0	0	9	21	20	Modularity	4.19
Q16	1	0	11	19	19	Reusability	
Q17	0	2	8	15	35	Analyzability	
Q18	0	1	3	19	27	Modifiability	
Q19	2	3	7	23	15	Testability	

6. Conclusion

In conclusion, the implementation of an integrated web-based ordering and forecasting system holds immense promise for start-up businesses. Through this system, start-ups can streamline their operations, enhance customer experience, and make data-driven decisions for efficient inventory management and business growth.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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