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Master of Information Systems

RON ALLEN ADUNA

WEBSITE AND INFORMATION SYSTEM OF LABOMED INCORPORATED

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This Special Project titled

WEBSITE AND INFORMATION SYSTEM OF LABOMED INCORPORATED

is hereby accepted by the Faculty of Information and Communication Studies in partial fulfillment of the requirements for the Master of Information Systems.

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Abstract

The use of various software platforms in the daily operation of Small and Medium-Sized Enterprises (SMEs) like Labomed Incorporated makes companies less efficient due to the cumbersome tasks of switching from one program to another. This project has developed a dedicated Information System (IS) that has the features that the company needs to operate efficiently. An analysis of the company's strengths, weaknesses, opportunities, and threats (SWOT) was conducted to help with the project development.

Based on the user testings and surveys administered, the theory is that SMEs must design and implement their very own IS to attain improved business processes. This study emphasizes that SMEs don't need to be stagnant and rely on just using their accustomed software but rather to be undaunted in taking risks in creating their own IS.

Acknowledgments

This work would not have been possible without the support of Labomed Inc. I am especially indebted to Dr. Jack Baker, CEO of Labomed Inc, who has been supportive in providing any useful information to complete this project.

I am grateful to all of my colleagues and acquaintances who I have had the pleasure to work with during this project. I would especially like to thank Ms. Mari Anjeli Crisanto as my teacher and mentor, she has taught me a lot even before this project started.

Nobody has been more important to me in the pursuit of this project than my family. I would like to thank my loving and supportive wife, Paula, who encouraged me along the way and my three children, Kadmiel, Keira and Keyron, who serve as an inspiration to me.

Most of all, I would like to glorify and praise God for all the opportunity He has given me.

Table of Contents

Dedicated to:

My wife, Paula, who has been a constant source

of support and encouragement.

Chapter I

Introduction

An efficient workflow and organization are essential to any business. Enterprise Resource Planning (ERP) systems are well known for large enterprises today (Imre, 2016). ERPs are designed to help large companies be organized. Due to its success in the large enterprise community, it is their goal to include Small and Medium-Sized Enterprises in their market (Imre, 2016). But since ERP is too complex for Small and Medium-Sized Enterprises (SMEs) to adopt, it is more beneficial for SMEs to design and implement their own Information Systems (IS) that will handle their technological needs. Generally, SMEs use IS to improve their business process (Ghobakhloo, 2015). Bhutani [1] states that “An ideal system is one which can consume any process, automate any workflow and integrate itself with the existing systems while it slowly grows to accumulate all processes of an organization.” Every organization should strive to have that ideal system in order for them to maximize their potential.

Workflow efficiency is vital for every company. Labomed Incorporated is a US-based manufacturing company that has been around for 40 years. This company is one of the leading exclusive distributors of laboratory instruments, their clients are from countries all over the world. Although they generate a good amount of annual sales, they struggle when it comes to everyday workflow efficiency. The challenges when it comes to timely providing accurate product information to their clients is a serious problem that needs to be rectified. This project proves that a more efficient

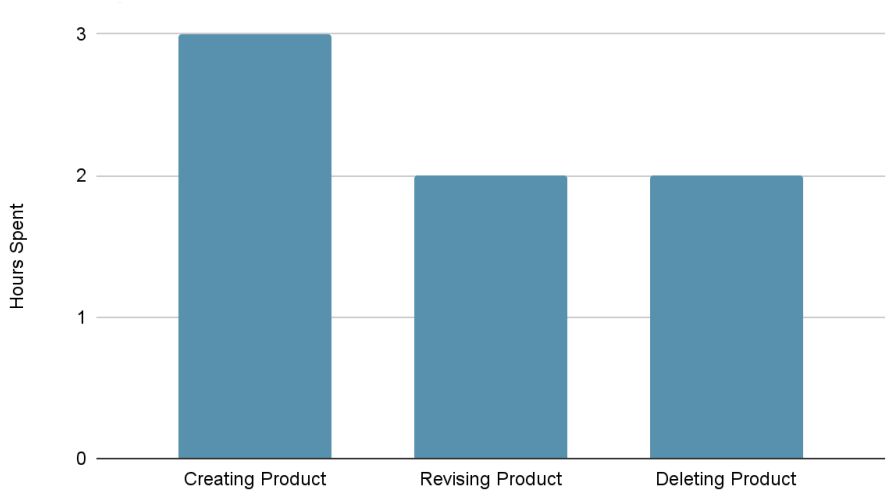
workflow is achievable through the implemented management information system. The cumbersome tasks when it comes to generating product information has been eliminated by consolidating all the features needed in one single system. The creation of Labomed's management information system involved a three-part process. The first was a functional analysis which identified the models used in terms of the company's functions. The second was data analysis which was used for the result of the functional analysis to create the conceptual, logical, and physical designs of the project. Lastly, the implementation stage where all the designs and planning was implemented and tested. The effectiveness of the system was assessed by a user survey, user testing and security testing which was conducted after the system was implemented.

Chapter II

Review of Existing Alternatives

Despite the success of the Labomed Incorporated when it comes to sales, they struggle internally with day-to-day operations. Like other SMEs, the company relies on standard-of-the-shelf systems, which are ready-to-use software to build their IS. Currently, the company uses multiple software such as Microsoft Excel, QuickBooks, and WordPress to accommodate what the company momentarily needs in order to function and deliver. These platforms meet the needs of the company. However, these are different platforms that exchange information in between that take valuable time from the business.

Figure 1. Hours spent in creating, revising, and deleting a product.



There are multiple alternative platforms and services that can be used to help Labomed such as Odoo ERP systems, System Applications and Products (SAP), and Product Information Management (Pimcore). Odoo ERP offers business apps for inventory, manufacturing, invoicing, and websites which the company needs. On

the other hand, SAP manages everything from accounting, manufacturing, and purchasing which is what the company is looking for. Pimcore is a web-based product management system that offers bulk product editing, product searching, and exporting of data to Microsoft Excel which is ideal for the company.

Although these platforms offer most of the requirements of the client, they have numerous features and information that are not needed by the company. The company's stakeholders' capability has also been considered in choosing a system, and with the user's age ranging from 25 -90 years old, using overly complicated systems or software is not ideal. The cost that has accumulated over time was also not ideal for SMEs like Labomed. The only solution was to create a customized IS which will fulfill most of the company needs in being able to have an efficient daily workflow.

Chapter III

Project Details

A. Overview

The Labomed's Website & Management Information System is a Web App that can be accessed by any device that has an internet connection with any web browser regardless of what operating system it has. Software sustainability was chosen to address the objectives and the following software was installed on a web host with a Model-View-Controller architecture pattern. An analysis of the company's strengths, weaknesses, opportunities, and threats (SWOT) was conducted to help with the project development and as well as for the company to understand that a custom IS was necessary to save time in their everyday operation and as well as to avoid any problem in terms of providing accurate product information to clients.

B. Theoretical Framework

According to Mukhtar (2020), "Effective and efficient management information systems will steer the organization towards its goals following the expectations of internal customers as well as external customers." There are numerous IS theories designed to study technological acceptance among companies. The Technology-Organization-Environment (TOE) theory is one of the most used frameworks to determine why an IS should be adopted by a company. According to Ghobakhloo (2015), "TOE has been one of the most popular and robust theories for the study of determinants of IS implementations and use among SMEs".

In this project, the TOE framework was used to identify the determining factors from a technological, organizational and environmental standpoint. The technological factors include internal and external technologies that are relevant to the company. These may include both equipment and processes. The organizational factors refer to the characteristics and resources of the company. Environmental factors on the other hand include the size and structure of the industry, the competitors, and government regulations. These three factors present constraints and opportunities for technological innovation.

In the initial stage of this project, it was important to diagnose the current performance of the company. The Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis was used to understand the current standing of the company. A diagnostic analysis determined that Labomed Inc. requires an IS. The TOE framework was an effective way to identify the constraints and opportunities. The framework showed the company constraints and opportunities that were not recognized before such as the company's lack of efficient workflow and the company's need for a centralized system.

C. Technologies Used

The web technologies used in this project are *PHP, Linux Web Host, Bootstrap, HTML, CSS, MySQL,* and *Cpanel*. They are accessible by using any device by a web browser. These technologies cost less to maintain compared to existing alternatives.

- PHP is a stable open-source programming language that has hundreds of

contributors all over the world which makes it reliable to use. The client and admin credentials are encrypted using the latest PHP encryption for maximum security.

- Linux Web Host recurring fees are cost-effective. The project's web server is automatically updated with the latest web stack release which doesn't require additional cost.
- Bootstrap enables the website to be responsive to whatever device the client or stakeholder uses.
- MySQL provides ease of use as most IT professionals are familiar with it, it delivers appropriate high availability and scalability to meet the service level requirements of the company.
- Cpanel is a web server control panel application that is loaded with tools needed to create and automate all server management tasks. It gives the user more control of their web server without paying for a dedicated server which costs more.

D. System Design

a. System Features

- A product information module was created to be used to manage and configure product details.
- A customer and manufacturer module was designed to generate price quotes, sales, and purchase orders.
- Business analytics has been added to the dashboard to show historical trends of customer registrations, quotation requests and orders as well

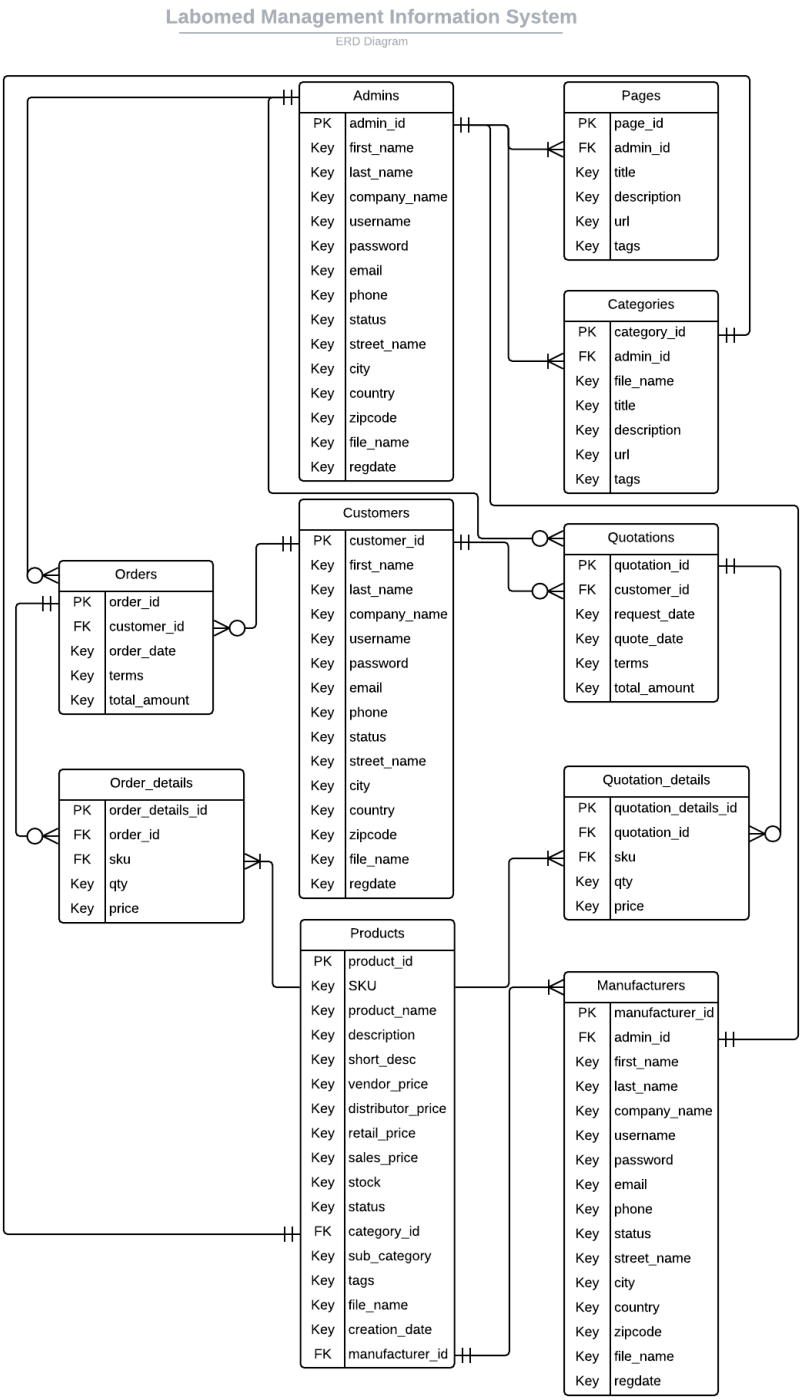
as predictive and prescriptive analytics to identify recently added products as well as products that are running low on stocks.

- Website registration and user login was created to enable clients to request price quotes immediately after they are registered.
- Dynamic publishing of products enables the user to create or modify and import products using a CSV file for the bulk creation.
- A dedicated page to display orders, quotation requests, and history of orders generated.
- A product module that can be used in generating and exporting price lists in CSV format.
- An admin control panel is made to manage and configure contents like customer and product details.

b. Database Design

An Entity Relationship Diagram as shown in Figure 2, was created to ensure that the IS database is using normalized forms as much as possible to avoid data redundancy, verify that only related information is stored and promote data integrity.

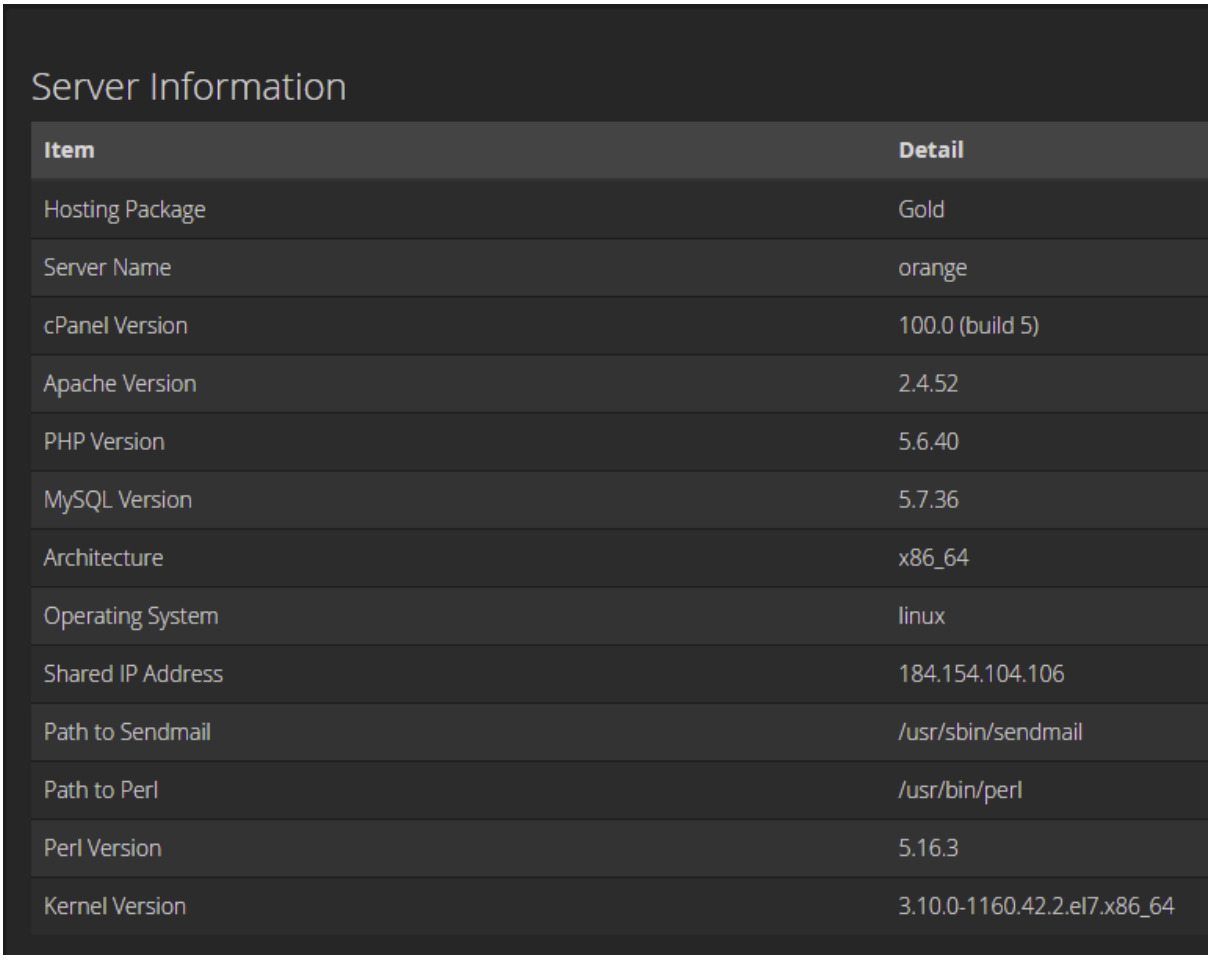
Figure 2. ERD Diagram for Labomed Management Information System



E. Implementation

Combinations of web technologies such as PHP, Linux Web Host, Bootstrap, HTML, CSS, MySQL and Cpanel as shown in Figures 3 and 4, are deployed and selected to cater to what the company needed to implement their custom IS.

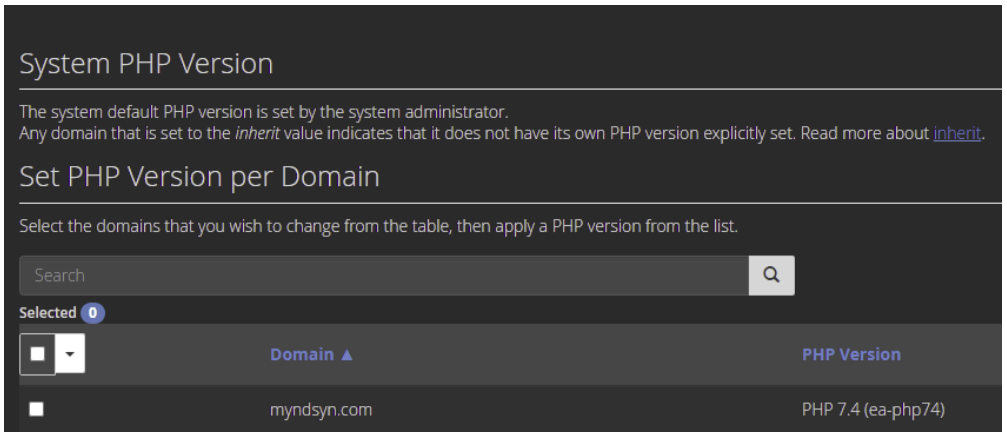
Figure 3. Server Information containing MySQL version and Operating System



Server Information

Item	Detail
Hosting Package	Gold
Server Name	orange
cPanel Version	100.0 (build 5)
Apache Version	2.4.52
PHP Version	5.6.40
MySQL Version	5.7.36
Architecture	x86_64
Operating System	linux
Shared IP Address	184.154.104.106
Path to Sendmail	/usr/sbin/sendmail
Path to Perl	/usr/bin/perl
Perl Version	5.16.3
Kernel Version	3.10.0-1160.42.2.el7.x86_64

Figure 4. Server Information containing PHP version



Chapter IV

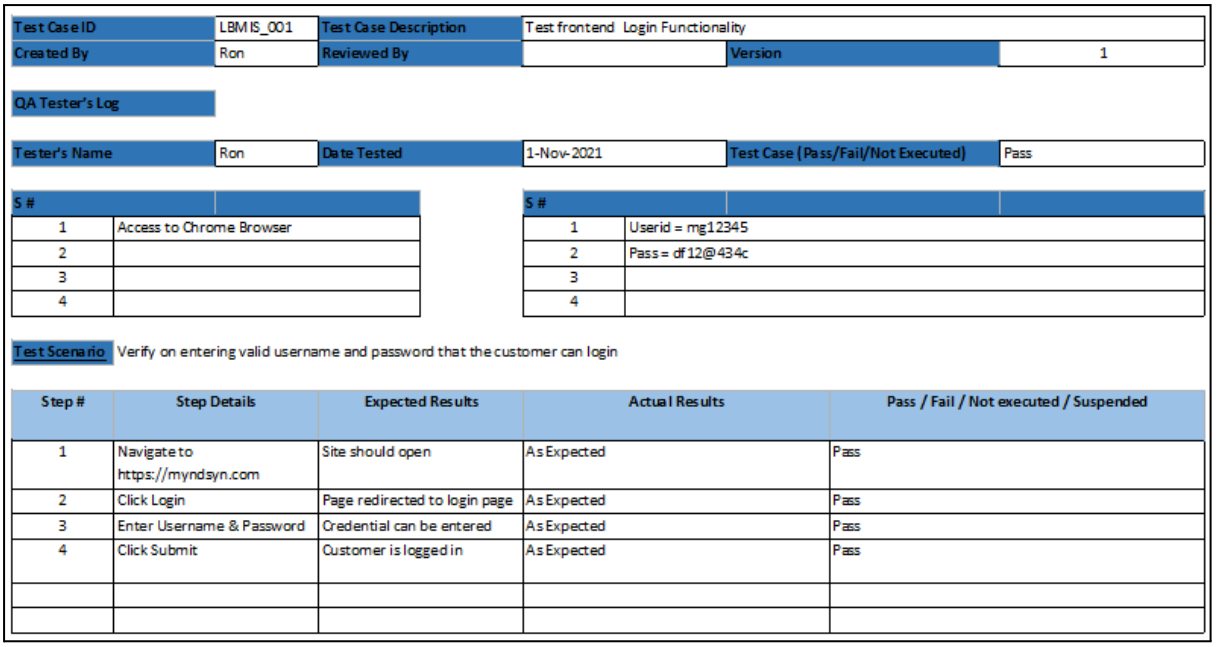
PROJECT ASSESSMENT

A. User Testing

The researcher used manual unit testing to test the system. He administered all the manual tests to each feature specified on the Software Requirements Specification (SRS) document. These unit testing results contain test case status such as “Pass”, “Fail” and “Not Executed”. Test cases with fail and not executed status have been used to point out errors and corrections that are needed to be addressed also known as bugs. Bugs encountered in each build are then corrected and resolved before the next build is created.

A three-part process was conducted to complete the user testing. The first step taken was preparing a test specification form for each functionality. The second step was to conduct a unit test. Re-running previous unit tests are required for regression testing to ensure that previously developed and tested functionalities are working after changes are made. The last step was to fill up the test specification report. Samples of completed test specification report for testing customer login and product creation are shown in Figures 5 to 6.

Figure 5. User Testing - Test Specification Report - Customer Login



Test Case ID	LBMIS_001	Test Case Description	Test frontend Login Functionality		
Created By	Ron	Reviewed By		Version	1

QA Tester's Log

Tester's Name	Ron	Date Tested	1-Nov-2021	Test Case (Pass/Fail/Not Executed)	Pass

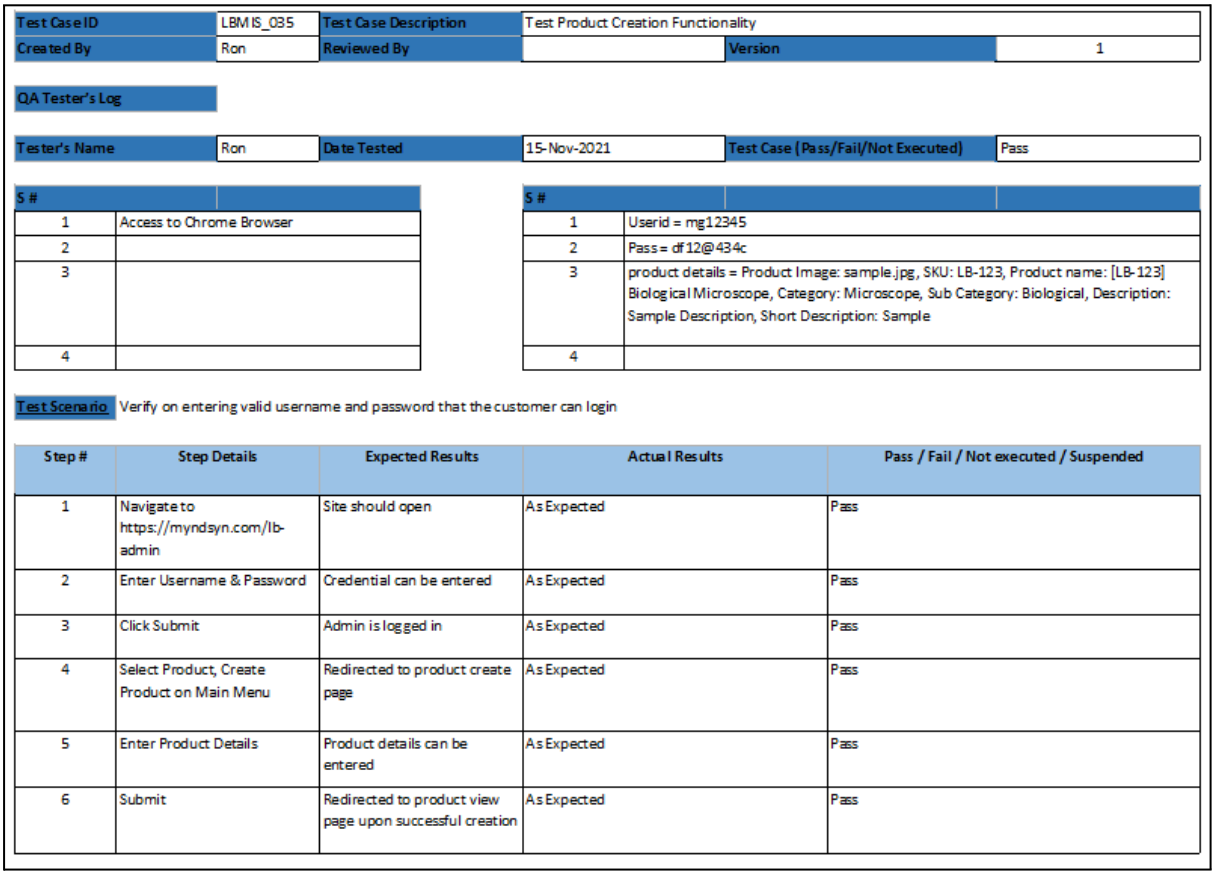
S #	
1	Access to Chrome Browser
2	
3	
4	

S #	
1	Userid = mg12345
2	Pass = df12@434c
3	
4	

Test Scenario: Verify on entering valid username and password that the customer can login

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Navigate to https://myndsyn.com	Site should open	As Expected	Pass
2	Click Login	Page redirected to login page	As Expected	Pass
3	Enter Username & Password	Credential can be entered	As Expected	Pass
4	Click Submit	Customer is logged in	As Expected	Pass

Figure 6. User Testing - Test Specification Report - Product Creation



Test Case ID	LBMIS_035	Test Case Description	Test Product Creation Functionality		
Created By	Ron	Reviewed By		Version	1

QA Tester's Log

Tester's Name	Ron	Date Tested	15-Nov-2021	Test Case (Pass/Fail/Not Executed)	Pass

S #	
1	Access to Chrome Browser
2	
3	
4	

S #	
1	Userid = mg12345
2	Pass = df12@434c
3	product details = Product Image: sample.jpg, SKU: LB-123, Product name: [LB-123] Biological Microscope, Category: Microscope, Sub Category: Biological, Description: Sample Description, Short Description: Sample
4	

Test Scenario: Verify on entering valid username and password that the customer can login

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Navigate to https://myndsyn.com/lb-admin	Site should open	As Expected	Pass
2	Enter Username & Password	Credential can be entered	As Expected	Pass
3	Click Submit	Admin is logged in	As Expected	Pass
4	Select Product, Create Product on Main Menu	Redirected to product create page	As Expected	Pass
5	Enter Product Details	Product details can be entered	As Expected	Pass
6	Submit	Redirected to product view page upon successful creation	As Expected	Pass

In addition to unit tests, surveys were also conducted. The Latest survey was created using the web-based application SoGoSurvey to allow users and stakeholders to share their feedback while using the Labomed's Website & Management Information System. The survey link was shared to Labomed's owners, employees, customers, and manufacturers. There were 10 survey respondents with different relationships with the company. The survey is intended to measure and quantify the usability and readiness of the system.

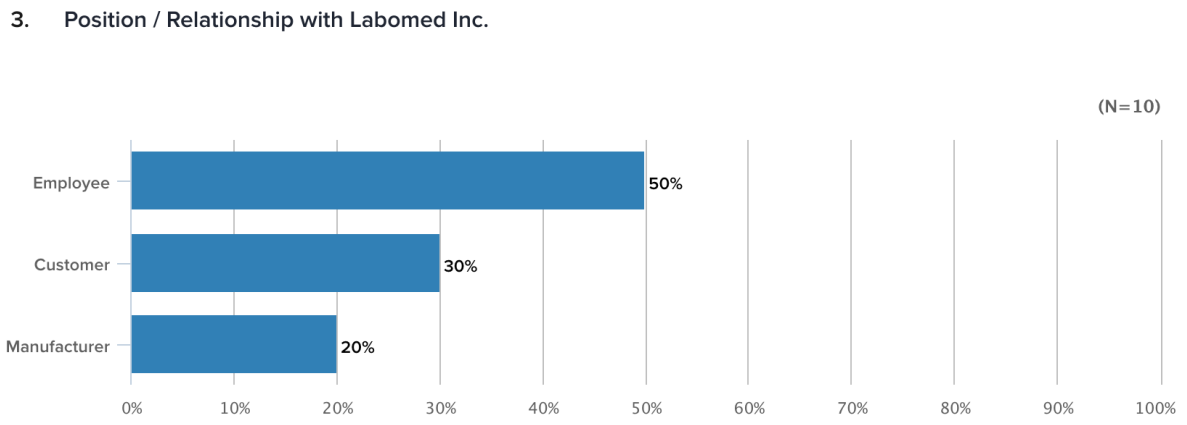
The respondent has been categorized based on their relationship with the company. Table 1 shows the participant profiles. Majority of the respondents belong to the internal category while others are customers and manufacturers as shown in Figure 7.

Table 1. Participant Profiles

ID	Name	Relationship with Labomed Inc.	Occupation
1.	Participant 1	Owner	CEO
2.	Participant 2	Employee	Operations Manager
3.	Participant 3	Employee	Sales Representative
4.	Participant 4	Employee	Warehouse Manager
5.	Participant 5	Employee	Marketing Manager
6.	Participant 6	Customer	Sales Representative
7.	Participant 7	Customer	Sales Personnel
8.	Participant 8	Manufacturer	Customer Relations Officer
9.	Participant 9	Manufacturer	Customer Account Manager

10.	Participant 10	Customer	Sales Associate

Figure 7. Relationship with Labomed



The results are interpreted using the system usability scale where the converted response scale ranged from 0 to 4 with four being the most positive. By adding responses from all participants and multiplying the total by 2.5 converts the range from 0-40 to 0-100.

The computed scores are converted into letter grades for better understanding.

Score	Letter Grade	Adjective Rating
Above 80.3	A	Excellent
Between 68 and 80.3	B	Good
68	C	OK
Between 51 and 67	D	Poor
Below 51	F	Awful

Figures 8 to 18 are the actual survey responses to the standard system usability questions.

Figure 8. Question #1

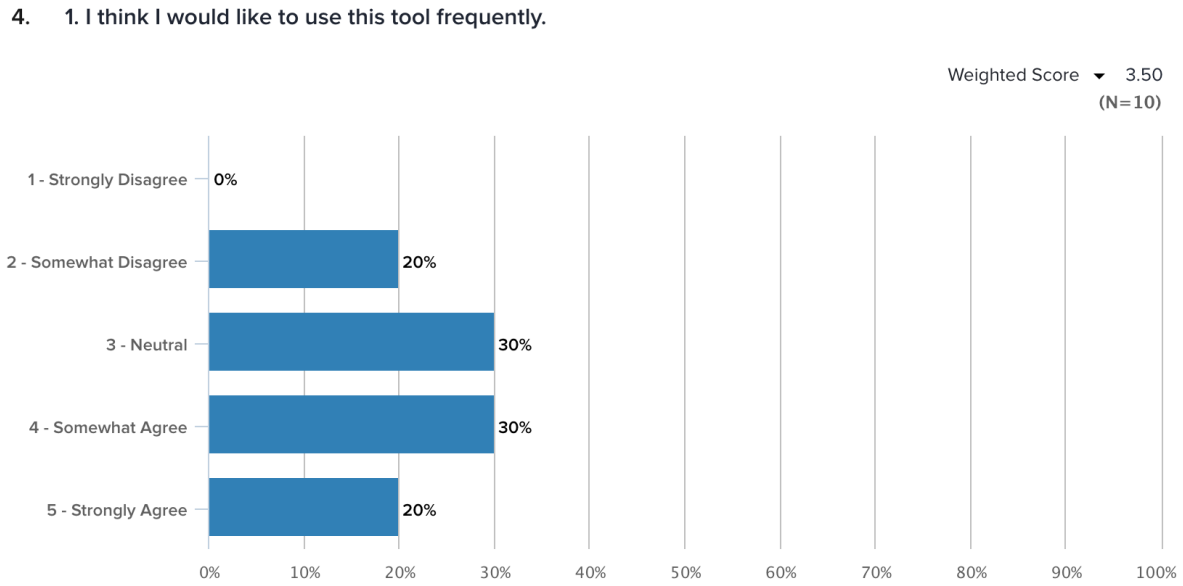


Figure 9. Question #2

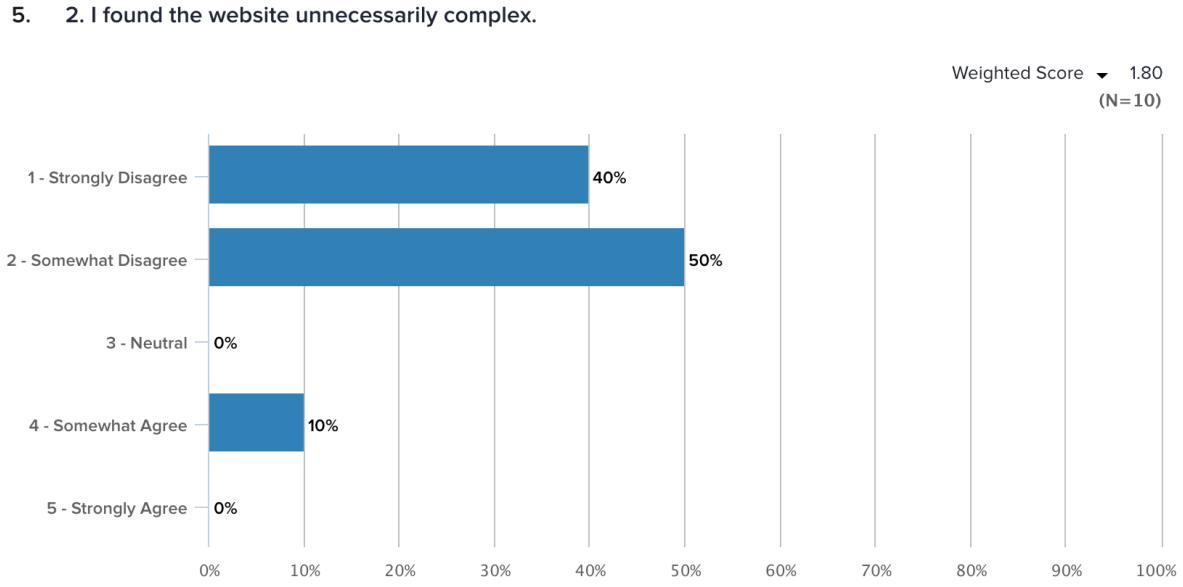


Figure 10. Question #3

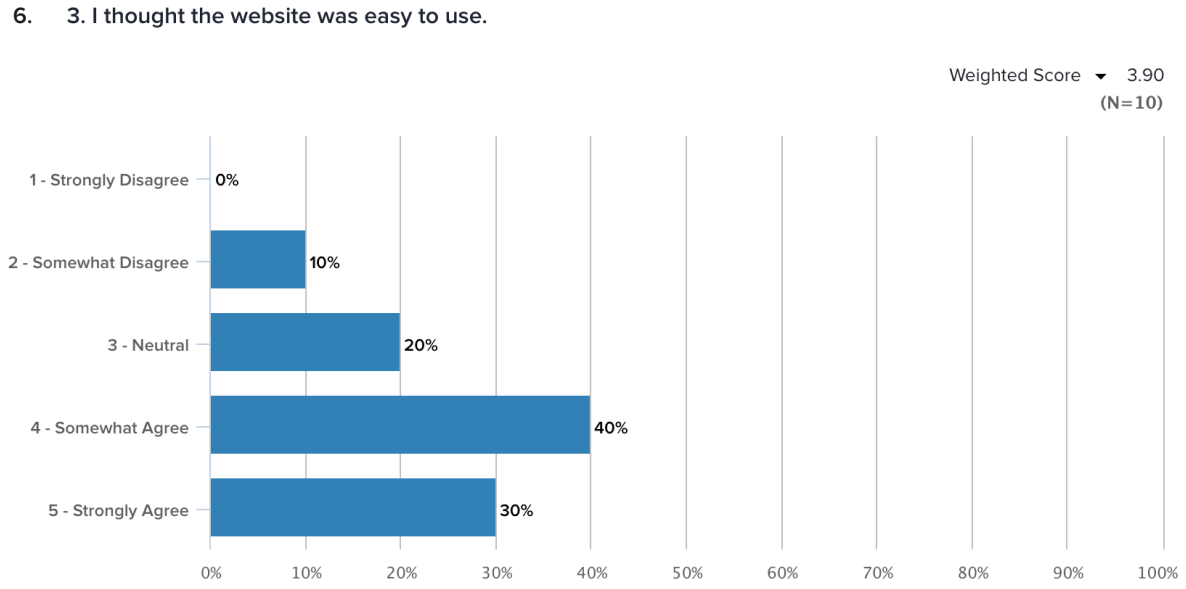


Figure 11. Question #4

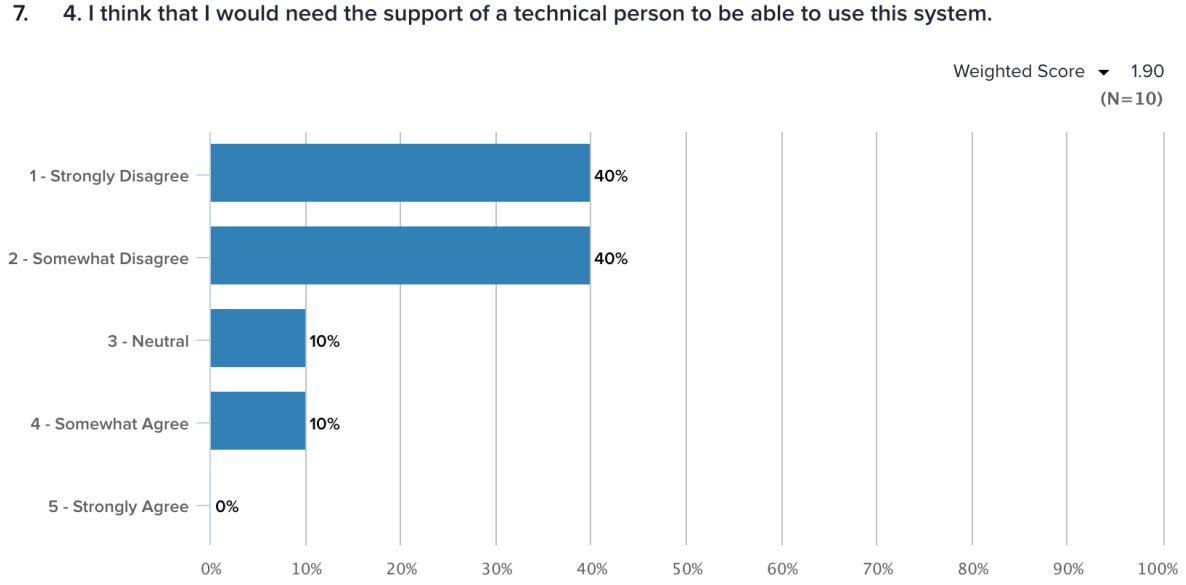


Figure 12. Question #5

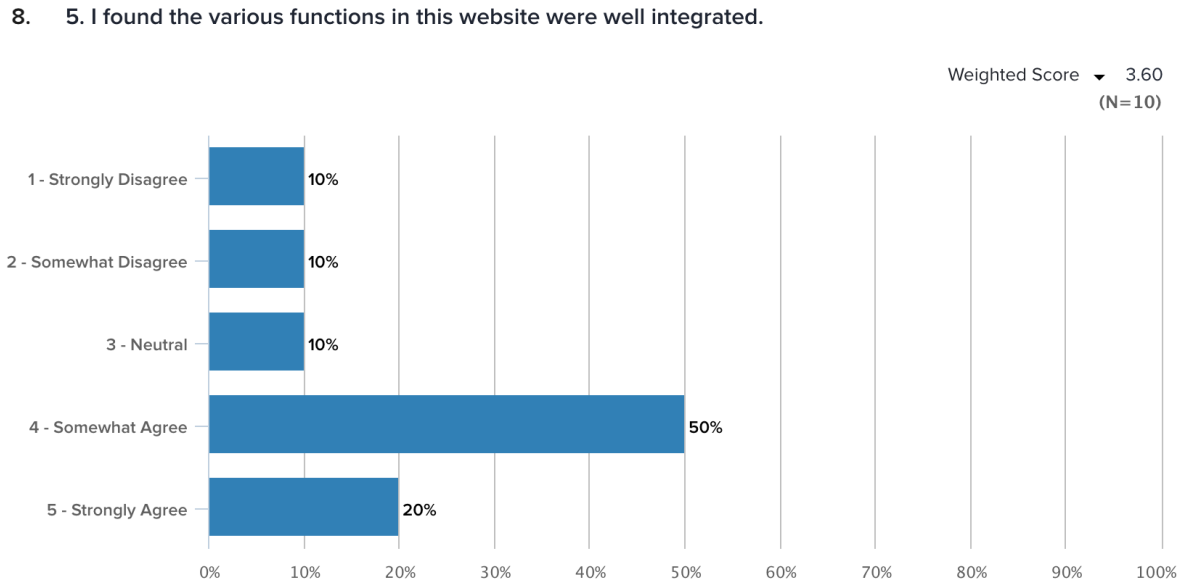


Figure 13. Question #6

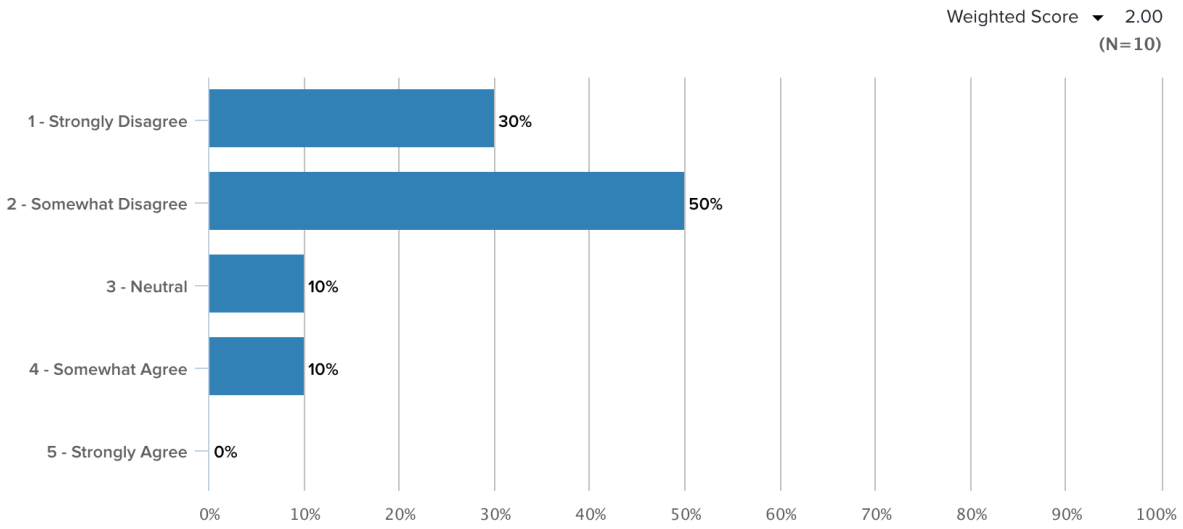


Figure 14. Question #7

10. 7. I would imagine that most people would learn to use this website very quickly.

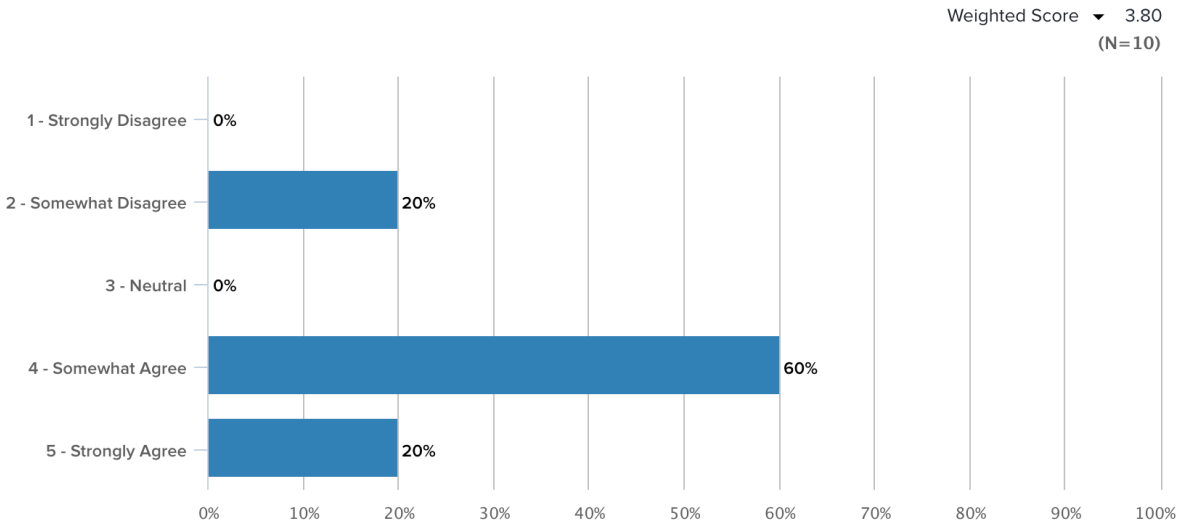


Figure 15. Question #8

11. 8. I found the website very cumbersome to use.

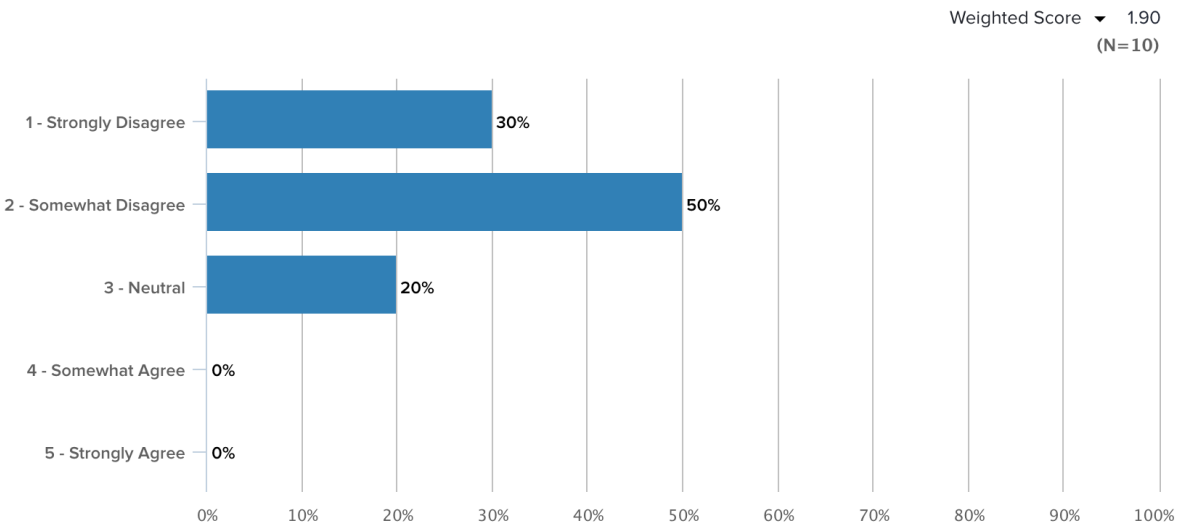


Figure 16. Question #9

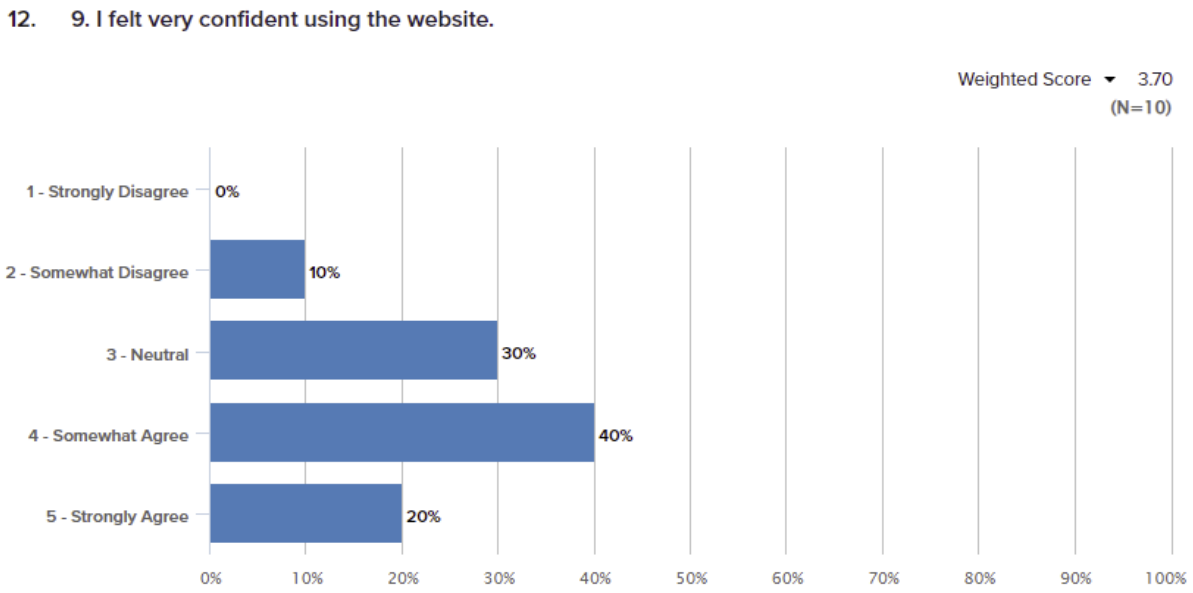


Figure 17. Question #10

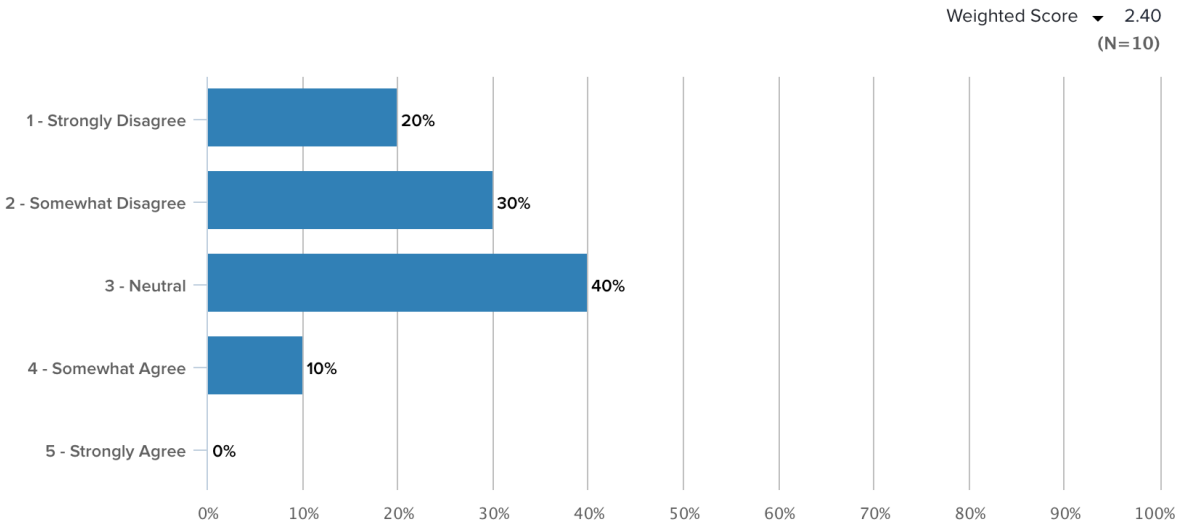
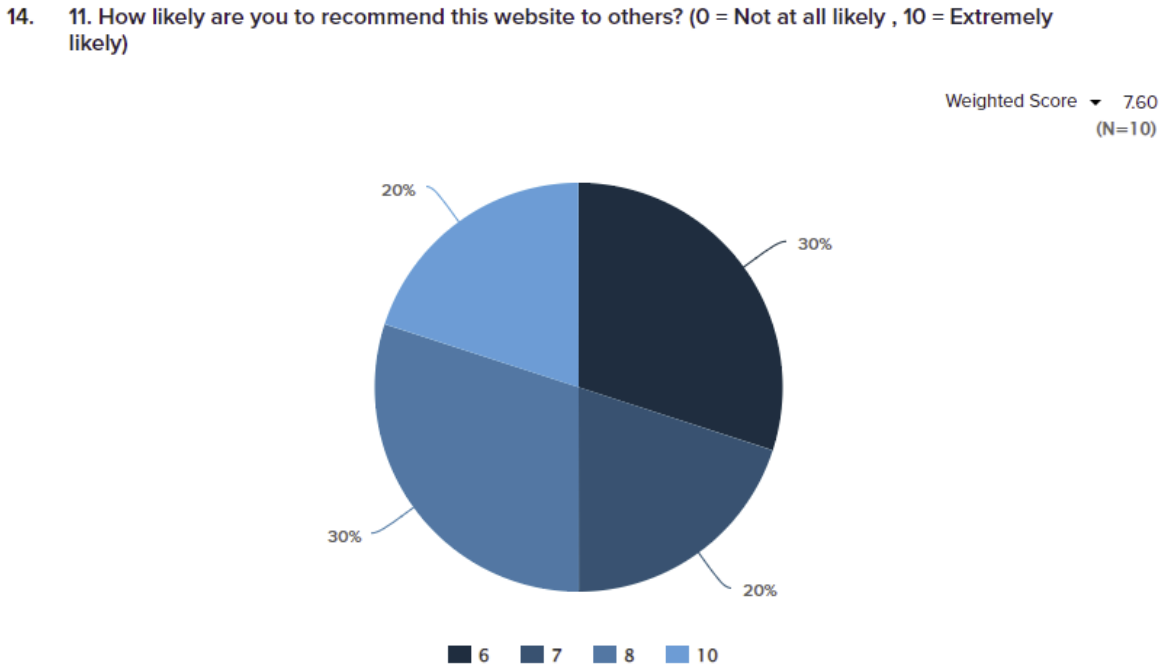


Figure 18. Question #11



Based on the latest survey responses, the SU score is 71.25 which means that the management information system is good enough to be used since the score has met the “Good” standing but it still requires more improvement. Although the SU score is just slightly above average, most respondents are likely to recommend the IS based on their response to the last question with 50% in the 8 and 10 rating while 30% of the respondents have remained neutral and all of the responses are above 5 rating.

The management information system has been tested and evaluated multiple times by internal and external users and their latest response shows that the information management system is user friendly. However, the latest system usability score which has resulted in a 71.25 or a letter grade of B means that the information system is not that exceptional and needs more improvement. It is expedient that the

development of the Labomed Management Information System should continue and new builds should be created to attain a more stable and reliable information system.

B. Security Testing

Security Testing is conducted using the software OWASP Zed Attack Proxy (ZAP). This web app scanner is used to identify vulnerabilities on the IS. Both manual and automated scans are utilized to maximize the found security vulnerabilities; for manual scanning the researcher used ZAP Heads Up Display (HUD) and for automated scan the researcher used the ZAP software.

Multiple security vulnerabilities are found on the IS but only high and medium alerts are considered critical by the researcher. Some of the alerts reported by ZAP software are as shown in Figures 19 and 20.

Figure 19.Security Testing - Using ZAP Heads Up Display (HUD)

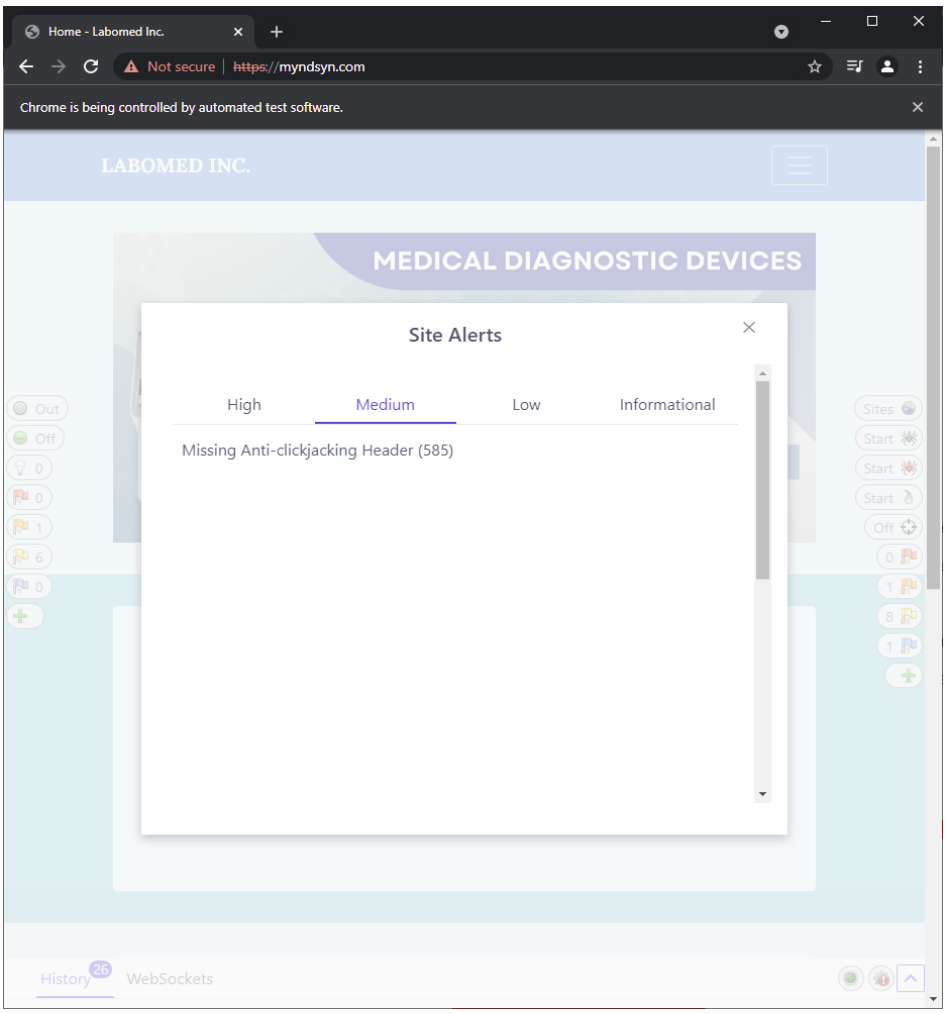
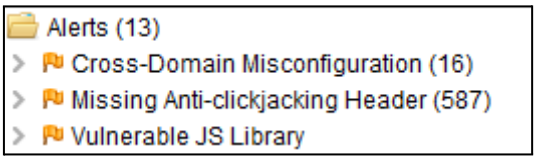


Figure 9. Security Testing - ZAP Software



Security vulnerabilities discovered by the web app scanner will be addressed individually by order of priority. All alerts both flagged as high and medium needs to be resolved first. Practical solutions to found issues are also given by the ZAP software. According to their recommendations, most of these found vulnerabilities can be resolved by updating third party libraries and web technologies up to their latest versions. The Missing anti-clickjacking header issue can be resolved by adding

lines of codes in the page headers. All these resolutions will be applied, and regression testing will be conducted after solutions are applied.

Chapter V

Discussions

SMEs struggle when it comes to everyday workflow efficiency. The results may indicate that implementing IS helped minimize cumbersome tasks by eliminating the use of multiple platforms. As well as, consolidating all organizational functions into a custom IS. The results may fit the theory that it is beneficial for SMEs to design and implement their own IS to improve their business process. The reliability of this data is impacted by the short amount of time given to finish the project. It is beyond the scope of this study to imply that the study is successful or not as it needs more time to implement the IS and test it in a live audience. Features such as converting quotation requests to sales invoice are not fully functional at the time of project submission. Further research is needed to establish that what SMEs need to improve their overall workflow efficiency is to have their own custom IS.

Chapter VI

Conclusion

For an SME like Labomed Inc. to improve their daily workflow efficiency, a centralized system in the form of a custom IS needed to be implemented. Having a custom IS compared to a ready-made system or using multiple separated software is more suitable for the company due to the given facts that most SMEs are limited when it comes to finances, and the available existing alternatives has unnecessary features that can only lead to confusion and more time of training the stakeholders or users to get familiarized with. This project can serve as a reference for SMEs who are considering building a custom IS for the purpose of having efficient daily operations.

Chapter VII

Future Work

Further improvements recommended are user permission module, customer bidding system, website marketing system and company information system. User permission module will enable a super user to assign permissions to view or edit to a specific user. This module will hide unnecessary parts of the system to a specific user promoting privacy and user friendliness. The customer bidding system would be able to handle multiple client bids and determine which customer won the bidding. Website marketing system focuses on the search engine optimization of the website. Lastly, the company information system creates a module that enables an admin to edit the company information.

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APPENDICES

1. **Complete program listing**
   - Source Code - https://github.com/ronknight/labomed-v2
   - Theme for Admin Control Panel - https://github.com/ColorlibHQ/AdminLTE
2. **Technical reference**
   - Final system specifications
     - Hardware - Web Hosted
     - Operating System: Linux
     - Programming Language - PHP
     - Server applications used - MySQL
   - Maintenance plan for the software system
     - Server is web hosted therefore no maintenance and installation is necessary.
     - Server is web hosted therefore no dependencies are necessary.