Automation Framework for E-commerce Solution Based on Competitor Analysis

Nithila Shanmugananthan

(179339H)

M.Sc. in Computer Science

Department of Computer Science and Engineering

University of Moratuwa

Sri Lanka

July 2019

Automation Framework for E-commerce Solution Based on Competitor Analysis

Nithila Shanmugananthan

(179339H)

The dissertation was submitted to the Department of Computer Science and Engineering of the University of Moratuwa in partial fulfilment of the requirement for the Degree of M.sc in Computer Science.

Department of Computer Science and Engineering

University of Moratuwa

Sri Lanka

July 2019

DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Also, I hereby grant to the University of Moratuwa the non-exclusive right to reproduce and distribute my thesis/dissertation, in whole or in part in print, electronic or another medium. I retain the right to use this content in whole or part in future works (such as articles or books).

……………………………….   ……………….

(Signature of the candidate)   Date

The above candidate has carried out research for the Master thesis under my supervision.

 ………………………..   ……………………….

(Signature of the supervisor)   Date

COPYRIGHT STATEMENT

I hereby grant the University of Moratuwa the right to archive and to make available my thesis or dissertation in whole or part in the University Libraries in all forms of media, subject to the provisions of the current copyright act of Sri Lanka. I retain all proprietary rights, such as patent rights. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

ABSTRACT

E-commerce solutions have taken businesses to the next level by making them reach customers across the globe. The User Interface (UI) is the basis for the success of the e-commerce site as it is vital in making the site to be user-friendly, make it easy for customer interactions, be unique, provide the first impression, attract the customers and represent the business. The UI design is involved with different UI design decisions such as menu types, number of products on the home page, background colour, etc. Each of these decisions gets the involvement of UI standards. However, in some instances, the UI standards give contradicting design decisions. In such situations, the designers would have to strike a balance to achieve useful web analytics. However, the problem is "how". The competitor analysis is used for this purpose. In this research, the products sold by the businesses are considered as keywords, and the sales percentage is considered as the weighted average for the keyword. The business's one-month data are used to train the system. The system traces the database according to the collected keywords along with their sales percentage. Then the keywords are searched on the internet, and competitors' UI design decisions are extracted. The dominant decision among the competitors' UI is considered as the final decision. Then that UI design decision is applied to the e-commerce solution by the automated Magento system. Then the system gets evaluated using existing e-commerce solutions available on the internet, and the categories are considered as keywords, and the number of products under each category are considered as sales percentage. The expected decision would be identified by analysing the decision taken by the solution provider of the e-commerce solution and the actual design decision taken by the system. The research outcome would be proof of concern for an automated tool which would get trained through the database and generate e-commerce solutions.

Keywords –

e-commerce, User Interface, Automation Tool, Magento, catalog, XML, xpath, XAMPP

ACKNOWLEDGEMENT

I wish to thank who all helped me to achieve this milestone in my life. Firstly, I would thank my supervisor Dr. Dulani Meedania, who is a senior lecturer in the computer science and Engineering department. She helped me immensely by giving valuable advice, suggestions and motivating me throughout the research to complete it. Further, my sincere thanks go to Dr. Indika Perera coordinator of the M.Sc. batch 2017, who was also helping me to finalize the research proposal and motivating me to complete the research on time.

Also, I would like to thank all the academic and non-academic staff in the Computer Science Department who helped me in various ways to complete this research study. Further, I am thankful to my M.Sc. batch mates who was supporting me to clear the doubts I had with regards to my research and on common matters with regards to the research. Especially, my friends to Mr.Tiran Wijesekara, Miss. Niroshini Ranaweera, Mr.Ryan Benjamin, Mr. Vilochane Vidyarathne, Mr.Lakshan Costa and Mrs. Trisha Melani Amarasekara, whose friendship, hospitality and for support in one way or another in the preparation and completion of this study

I also thank my colleagues for understanding my situation and helping to with my day to day work, allowing me enough time to attend to the research and keeping my office end running smoothly.

Last but not least, I would like to thank my parents and brother who have been accommodative in all the ways when even I wanted some help and providing the moral support whenever I felt being in trouble.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ALGORITHM

LIST OF ABBREVIATIONS

HTML   Hyper Text Mark-up Language

URL   Uniform Resource Locator

CSS   Cascading Style Sheets

UI   User Interface

API   Application Programming Interface

DB   Database

XML   Extensible Mark-up Language

SEO   Search Engine Optimization

PHP   Hypertext Preprocessor

MVC   Model View Controller

IP   Internet Protocol

DOM   Document Object Model

1. INTRODUCTION

1.1. Introduction

This chapter covers the introduction to the research work that forms the background of the research, UI Design Principles for E-commerce, the motivation to carry out this research, the problems encountered when carrying out this study which targeted to solve and the objectives of the research. These are discussed in detail in subsections 1.2 to 1.7.

1.2. Background

E-commerce solutions have many responsibilities regards to business such as being unique, promoting the business and interacting with users. In order to succeed with the responsibilities, the UI plays a vital role by providing information, being user-friendly, being attractive and less time-consuming compared to competitors. The designer of the e-commerce solution should make UI decisions which fulfil all these factors. However, unfortunately, this is not possible because the decisions are contradictory with its properties. The designers should, therefore, aim to strike a balance with UI properties. The problem is deciding on which property to deviate from and to what extent. In the current situation, the e-commerce solution is provided by two parties.

- A Customized Solution - the solution expensive and time-consuming

- Use a readily available e-commerce builders' software – the solution provides a duplicate theme and most probably not suitable for the business

Because of the issues mentioned above, many organizations do not reach an e-commerce solution. Example for e-commerce solution providers are as follows Shopify[1],Weebly[2], Ecwid[3], BigCommerce[4], Volution[5], Wix.com[6], and Woocommerce[7].

1.3. Motivation

The UI design decision-making process is an important activity, and it is currently conducted using the following approaches:

- By Experienced Designer

In the industry, the UI design decisions are taken by an E-commerce UI/UX expert. Initially, the e-commerce solution UI is designed, and the approval is obtained from the business. Once the approved wireframe is delivered to the development team, the development process begins. The implemented solution would go through multiple quality assurance cycles, and the improved e-commerce solution would be sent to user acceptance. The user acceptance tests would be conducted with the collaboration of the sponsors. With the successful UAT, e-commerce is considered to be acceptable for live deployment. Figure 1.1 shows the five steps followed during the e-commerce implementation.

1. The business provides requirement.
2. Designer design the E-commerce solution and get approval from the business.
3. The wire frame is released to the development team.
4. The quality assured solution is provided to the business.
5. Business accepted system is launched to the public.
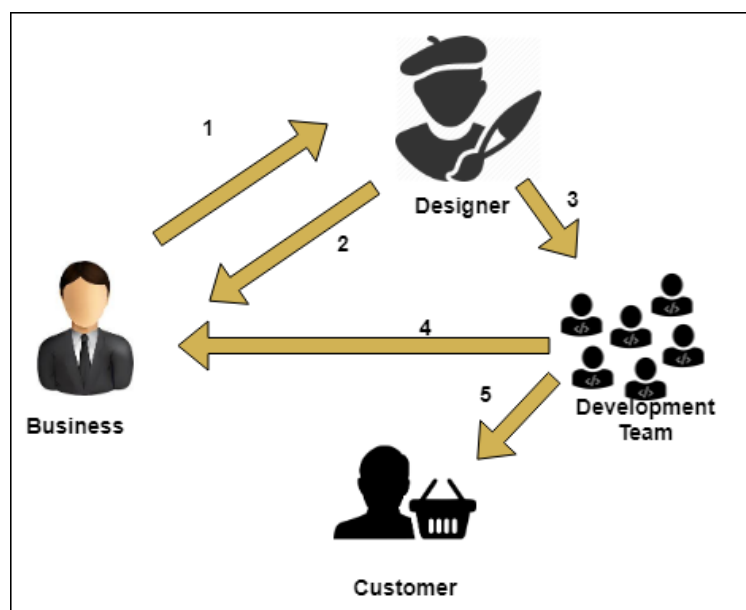
Figure 1.1: E-commerce Solution Development Process

There are two main stakeholders collaborating in the decision-making process. The sponsors, who have the business expertise would provide the requirements, and the designer and development team would provide the implementation using their technical expertise. But both the stakeholders usually lack with the counterpart expertise. Therefore, coming up with a good solution would be challenging.

Once the site is launched, the users start to use the site. The statistics and web matrices would actually evaluate the solution and give an indication of the site user experience. But, at this time, the solution is already available to the users, and the first impression of the site is already build up. This first impression cannot be reverted. Therefore, a mechanism should be placed to find the cavities and build the proper solution first hand. Furthermore, the changes to the existing solution are time-consuming and costly.

- By E-commerce Solution Provider Software

In an e-commerce solution provider software, the template is allocated according to the domain. This solution carries two drawbacks; firstly, the same templates are reused for multiple clients, and another business with a worse reputation could accidentally use it affecting the business; secondly, the solutions provided by the software are generic and may not provide the specializations needed by the clients. The existing e-commerce provider software available in the market are Shopify[1],Weebly[2], Ecwid[3], BigCommerce[4], Volution[5], Wix.com[6], and Woocommerce[7].

In both ways explained above, it is evident that e-commerce design decisions on the domain are made from a business perspective, not from the end user's perspective

1.4. Problem Statement

Businesses need e-commerce to reach a good market share and achieve its goal of high-profits. Those e-commerce solutions need to be attractive, unique and suitable to the domain in order to achieve its goal. For that purpose, using a collection of UI standards is an option. Yet, UI standards are contradictory, and designers have to strike a balance. Through this research, the researcher proposes a solution which answers the question, specifically "Which UI Standard to deviate" and "Which Extend" the design decisions should be applied to the e-commerce solution. This solution would comprise a domain specific and sales sensitive knowledge via analysing the competitive e-

commerce solutions. Currently, e-commerce solution provider software is available in the market such as Shopify [1], Woocommerce [7], Weebly[2], BigCommerce[4], Ecwid[3], Volution[5], and Wix.com[6]. But it does not provide the e-commerce solution up to the expectation.

1.5. UI Design Principles for E-Commerce

[8], [9],[10],[11],[12]The below-described UI design principles are one of the under one UI design theories available in the globe. The set of described below is selected design principles.

1.5.1. Branding Should be Instantly Visible

Branding is crucial for any business to give it a recognizable identity. [13] This would raise awareness and bring recognisability to the product or service. Branding becomes an essential item in user interface design, especially if the digital product is going to be used to increase end-user attraction. If enough time is spent on the marketing and user research, analysis of competition, target audience and development of brand identity prior to the launch of the UI design process, the chances of the product becoming popular are increased. There are various methods to include the branding in an interface, a couple of the layout zones which have the more prospective are discussed.

- Headers: The header is the area which has the highest visibility to the end-user. Therefore, mentioning essential elements in the header can be worthwhile to help the end-users to remember.
- Splash Screen: This is a screen which appears while a mobile application is loading. It is worth including the logo, mascot or any other matters connected to the business on this screen. This would help the end-users remember this site.
- Preloaders and pull-to-refresh indicators: This is a screen that shows the current loading process of an application or a website. Mentioning the branding here makes it memorable.

- Mascots: Mascots are the symbolic images which represent the product or service. The mascot becomes the identity and interconnector between the product and the customer. Also, the mascot is used to deliver messages to the user of the application or website.

1.5.2. User Friendly Navigation

If customers don't buy any products despite the efforts made on designing the e-commerce site, then the site loses its efficiency. This would mean that the stakeholders lose their money [14]. The e-commerce solution should provide easy navigation for its customers and enable them to complete the correct purchase within the shortest period. Further, the customers should know the details listed below about the e-commerce solution to help them during the purchase process [15]:

- What business or brand the company in.
- What page the business is on.
- The menu style.
- How can user get back to the catalog or home page
- Where the search and filters are presented.
- The time is taken to load the home page.
- How the detail of an item presented.
- How the more product features are presented
- How the payment procedure happens for a product or service.
- How the wish list works.
- How the user can gather more information.
- How reviews and ratings per product and per business are presented.

1.5.3. Scalability of the page

[16]Users generally do not read the entire page. Therefore, the essential messages have to be mentioned in the high or naturally visible areas to catch the attention of a scanning user. With a limited scan, the user should be able to buy more products and interact with the e-commerce solution.

1.5.4. Minimise User's Efforts Whenever it is possible

The real attraction to the customers of an e-commerce site is for them to be able to find what they want in the shortest possible time [17]. Below are some of the design practices which would help customers save time:

- Show related Products: Showing recommended products based on the customers' information, which is available from the databases and past searches. Care should be taken only to show suitable items, determined by the algorithms, and not random ones.

- The minimal number of clicks: The process of buying should be easy, using only a few clicks. If the user has to follow a long process to buy an item, they become tired and are unlikely to return to the site.

- Simplified sign-in process: [18] If the sign in process is long, the customer would dislike signing in or logging in again as they waste much time on the initial stages. Also, this may give an impression to first-time users that the buying process would also be long, and they would not use the site.

- Shape or colour to group the items: Shape and colour grouping the products together in the buying process makes it easy for the users to remember the process and progress faster through the site.

- Natural and harmonic interface: If the site is arranged randomly with unreadable and non-combining fonts, varying text and sizes, eye-tensing colours, aggressive backgrounds, and annoying sounds, the user would not want to visit again. Care should be taken to avoid such issues.

1.5.5. Usage of Landing Page

[19]The landing page should not have too much information that can distract the users. [20], [21] The landing page should be used to pass any important messages and to highlight any specific items.

1.5.6. Make the Home Page Informative

The home page should only carry relevant information; any irrelevant information may make the user dislike the site. The correct home page would make the user proceed further into the site. The home page would contain the below detail[22]: nature of the e-commerce solution, elements would present company or brand, internal search, links to the core communication zones, communication channel through the social network, signs of trust (testimonials, reviews, a significant amount of appearance in social networks, etc.).[23] For e-commerce solutions, it could also be a visual exhibition of the best-selling and special items, including specific books, clothing, equipment, and toys. The result to how the points stated above are going to be involved, and how they are going to be binge throughout the layout should be influenced by on the goals set for the e-commerce solution and the research of the target viewer [24].

1.6. Objectives

The objective of this research is to automate the e-commerce solution generation. Which includes the following area.

- Identify keywords and weighted average by tracing database.
- Identify the direct competitors by Google search.
- Identify competitors' UI design decision.
- Identify the parameters of design decisions (menu style, number of products can be on the home page, and Full-width/narrowed width).
- Automate Magento to implement the solution.

2. LITERATURE REVIEW

2.1. Introduction

In this chapter, the background of e-commerce solution and little analysis of e-commerce on device perspective, customer perspective, customer's expectation from e-commerce solution and the possible platform for e-commerce and the competitors are addressed.

2.2. Challenges of Using UI Standards

Google search results provide 7,860,000 results for the keyword of the search for "web design guidelines". The good question that needs an answer is "Which one to follow". In a single set of UI standards, the principles are contradictory. The expectation behind the guidelines is to the user-friendly design and eye-catching interface gradually, the profit of the business with customer satisfaction. [25] Yenny Purwati, did a content analysis which performed towards hundred and twenty furniture e-commerce solutions belongs to U.S, China, German, and Indonesia in order to identify similarities in the UI standard among countries. He proved that the UI standards, Practices and user expectations differ across countries with the results of the differences in UI design decisions. The UI standard which is not unique; have contradictory principles and differs country wise. Answering the below questions are critical: which set of UI standards to follow, which principle to switch in order to overcome others and which country to target [26].

2.3. The Importance of the E-Commerce site for the Business

As Figure 2[27], [28] shows E-commerce sites provide an extension to the business. The use of e-commerce sites by the public depends on factors such as age, gender, and country.[29] According to the statistics analysed,[30] America shows that the likelihood of online purchase vs offline purchase depends on the group of people and the type of business.
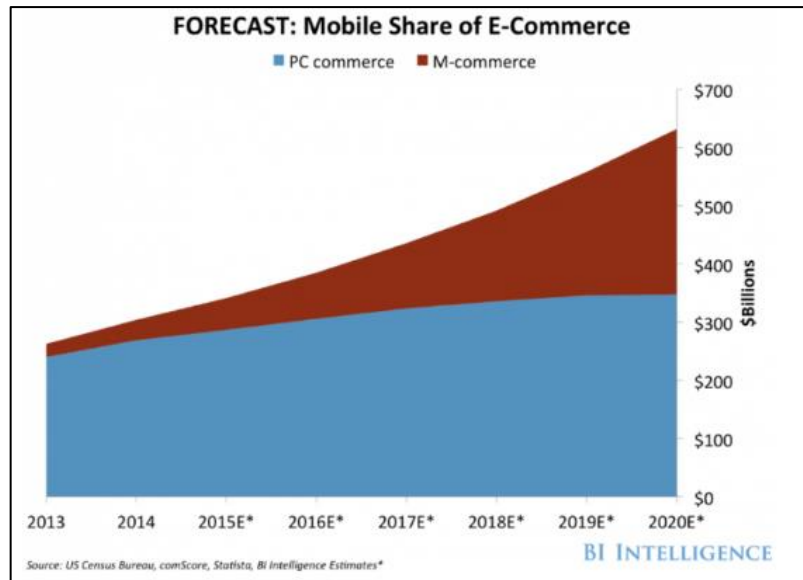
Figure 2.1: Forecast Mobile Share of Mobile E-Commerce [27], [28],[31],[32]

According to the researchers as shown in Figure2.2 [29],[33],[34], "If there is a question who shops online, the answer is almost everyone 96% of American's with internet access have made a virtual buying at some point in the users' survives." [27]
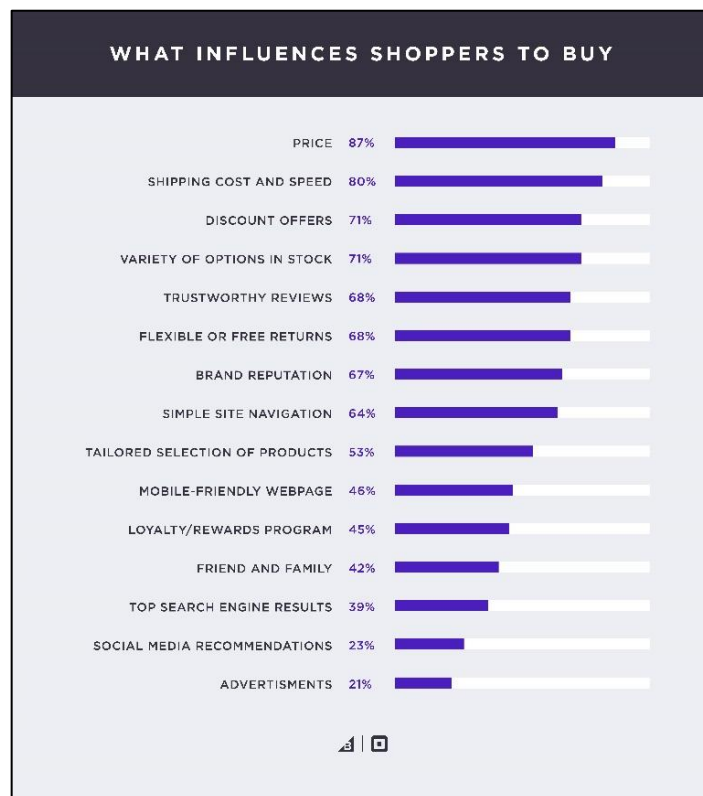
Figure 2.2: What Shoppers Influence to Buy [29], [33],[34]

According to the researchers, the majority of shopper's buying behaviour depends on the sellers' activities, such as availability of products online, the price, shipping cost, and speed, discount offers, variety of options in stock, flexible or free returns, brand reputation, loyalty/rewards programme, and advertisements. The e-commerce site's attributes such as trustworthy reviews, simple site navigation, tailored selection of products, mobile-friendly webpage, top search engine results, social media recommendations and friend and family also influence behaviour. The e-commerce site's responsibility is to satisfy the customer on its quality and give recommendations to the sellers to improve their actions.

Figure 2.3[27],[33],[35] shows some features shoppers dislike in online businesses. The site may suggest to the sellers the features customers hate, and it may improve the experience of online business by the customers. The e-commerce site may provide more images of the product, product review, side by side product comparisons, customer testimonials, video product demonstration, and live chat with shopping assistant, links to media coverage and music on the home page in order to improve customer experience.

WHAT SHOPPERS HATE

PAYING FOR SHIPPING	58%
NOT BEING ABLE TRY OUT A PRODUCT FIRST	49%
DIFFICULT TO RETURN ITEMS	34%
WAITING FOR DELIVERY	34%
CONCERNS ABOUT PRIVACY	29%
UNATTRACTIVE OR HARD-TO-NAVIGATE SITES	21%
ENTERING PAYMENT INFO	19%
OVERWHELMING AMOUNT OF PRODUCTS	10%
NOT KNOWING WHERE TO SEARCH FOR A PRODUCT	9%

Figure 2.3: What Shoppers Hate [27], [33], [35]

2.4. Design Features of E-Commerce

The authors of this paper have summarised the principles behind "e-commerce and web 2.0" and the interaction with social media and analysed the collection of principles that can be applied [36]. The e-commerce site design principles are user-friendly, quality of information, quality of system, playfulness, and quality of service [37].

Table 2.1[27], [38] explains the usability design principles in e-commerce sites. It elaborates on the collection of characteristics of the e-commerce site and UI design that motivates the users to engage more, and eventually, it leads to increased sales in the e-commerce business.

Table 2.1: Usability Design Principle [27],[38]

Characteristics	Business Objectives
Easy to Use	Create the site stress-free to use and operate
User-friendly	Create a user-friendly e-commerce solution interface
Simplicity	Deliver a light weight structure and functions
Navigation	Support customer effort within the solution
User control	Permit the customer to leave the solution at all times
Error prevention	Prevent a customer from making errors
Help function	Help and documentation could be offered
Understandability	Easy to understandable content would be created
Accessibility	Creates the solution accessible for all customers
Speed	Reduce time to loads
Visibility of system status	Keep customers up-to-date about the site
Match real world	Monitor real-world conventions
Consistency	Keep the same design features through the solution
Recognition rather than recall	The information would be easy to remember
Aesthetic design	The design aesthetic and eye-catching e-commerce solution
Personalisation	Create a solution as customizable according to the user perspective

The information relating to quality design principals in e-commerce solutions are described in Table 2.2[36], [39],[40] which provides guidelines on the quality of the information provided in the e-commerce solution. It can be either product details, location details or rating and reviews.

Table 2.2: Information Quality Design Principle [36], [39],[40]

Characteristics	Business Objectives
Relevance	provide the information relevant to the user
Accuracy	provide information more accurate
Completeness	provide information complete manner
Update	provide information as updated
Authority	ensure user to confidence about the information
Objective	provide information as unbiased and objective
Usefulness	provide information as useful
Sufficiency	provide information as sufficient to make decision

System quality design principles of e-commerce are solution listed in Table 2.3[24][36][41], which provides guidelines for the overall quality of the e-commerce solution by providing a secure and flexible environment for its users. It increases trustworthiness and freedom.

Table 2.3: System Quality Design Principle [24], [36], [41]

Characteristics	Business Objectives
Security	Task performance could be ensured in a secure manner
Access	Quick access to services could be enabled
Error Recovery	Recovery from the error could be provided
Operation and computation	Make system and services easy to use and operate
Appearance	Visual design elements would appear
Functionality	Provide adequate functions
Payment	Payment methods could be easy and secure
Ordering mechanism	Process user order and track order status
Content	Content would match user expectations

Service quality design principles of e-commerce solutions are provided in Table 2.4. It lists the characteristics required by the users to continue shopping conveniently. This enables the customers to build a long-term relationship and maintain a long purchase history with the e-commerce business.

Table 2.4: Service Quality Design Principle [37]

Characteristics	Business Objectives
Responsiveness	Customer requirement could be addressed quickly
Assurance	Support for the customer to solve the problem
Empathy	Provide caring and kindness to users
Following up service	Acquire user feed back
Trust-worthiness	Deliver reliable and trustworthy services

Table 2.5[37] elaborate on the playfulness design principle in e-commerce solutions. These features allow customers to engage happily with an e-commerce solution and spend more time on it. It enables us to spend more time deciding what to purchase and eventually, online sales increased.

Table 2.5: Playfulness Design Principle [37]

Characteristics	Business Objectives
Enjoyment	Provide a pleasant experience
Attractive appearance	Provide a creative e-commerce solution
Control	Give the consumer control
Curiosity	Motivate consumer reasoning curiosity
Intrinsic interest	Match consumer interests

Table 2.6[27], [42] provides overall guidelines on Web 2.0 design principles. It explains the principles that need to be addressed when building an e-commerce solution. If an e-commerce solution is included in the e-commerce solution, these principles need to be applied to e-commerce solutions as well.

Table 2.6: Web 2.0 Design Principles [27], [42]

Design principles	Characteristics	Business objectives
Participation	Create user content	The user could be encouraged to create content
	Sharing the information	Users could be encouraged to share content
	Instant Participation	Users could be allowed to engage continuously and more often
	Incentives provision	On the performance of user's monetary incentives could be provided
	Create task	Users could be enabled to take on different roles, such as co-creator or co-designer
Conversation	Interaction	Encourage intense communication among customers
	Communication	Build communication around areas
	Connection	Keep users associated under both online and offline circumstances
Community	Networking effects	Let associations to be recognised and a community to be constructed
	Collaboration	Provides teamwork among users
	Identity	User identification

User Identification	Content representation and expression	Use features such as videos and pictures to signify users' content
	Interface features	Deliver a responsive, user-friendly and flexible interface
	Simplicity	Ensure effortlessness in design and features
	Tools and multimedia-rich environment	Deliver an immersive but simple to explore the environment
	Crowdsourcing	Foster open source, open invention, and co-design
	Transparency	Offer a transparent process
	User control	Deliver control for users over data

Figure 2.4[27],[42] shows the e-commerce solution principles on how interactions start with an individual, and lead to a positive or negative outcome, according to the e-commerce solution design. The playfulness attribute allows an individual to spend more time on the e-commerce solution. Gradually it motivates the users to obtain more information about the products, seasonal offers, price or shipping, etc. the attractive details passed to the colleagues through conversation. The usability features allow the colleagues to interact with the e-commerce solution. When this grows, it leads to the community, and when it reaches the community, the system quality features become more important. The service quality becomes more important when the e-commerce solution reaches the community. The quality of information plays a vital role once the e-commerce solution gains popularity beyond commerce.
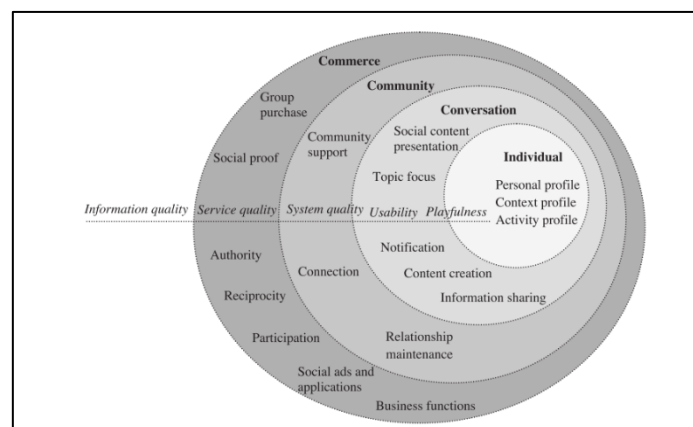
Figure 2.4: Social Commerce Designing Model [27], [42]

14

2.5. The Role of the Domain in UI Design

Authors of this paper [43] discuss how the update in technology design strategy and practical design influences users' motivation to decide on existence in an e-commerce solution. The authors further describe how the design differentiates according to the domain. Some examples are as follows:

- Persuasion in the Advertising Domain

The authors provide an example of e-bay.com e-commerce solution design, with the design of the star rating system for its customers, where it reminds all customers to review their auction actions to avoid a poor score. It indicates trust and more stars indicate more trustworthiness of the seller or the satisfaction [44] with goods and services.

- Persuasion in the Health Domain

The authors [45] used Tesco as an example, where the mobile application named "Chick Clique" is used to influence young daughters to exercise. The application has been considered to deliver information about fitness to its user at an appropriate period. From the results of the study, the authors identified that the application does not only increase the mindfulness of the importance of exercise and health, food but also enables its users to discuss health-related issues and tips with each other. The authors further confirmed through research that "there is significant evidence that persuasive technology is efficient in changing customer's attitude, particularly in health-related advertising systems."

- Relationship

This is responsible for creating a bond between UI and users. Placement, connotation, mutuality, promise, steadiness, participation, and similarity are some applicable techniques.

- Emotion

A persuasive e-commerce solution is expected to entertain the users by applying some techniques, including inadequacy, change, affection, astonishment, care, agreement, stimulation, and passion. The typeface, colour, image, animation, and icons are also included the interactivity of the UI element.

- Credibility

Recognisability, assurance, compatibility, trust-worthiness, authority, evidence, social proof, obligation, and third-party endorsement are an influence on the incredibility of an e-commerce solution.

- Logic.

Framing, reasoning, simplicity, variety, and verifiability are included in the logical value of the design. These techniques motivate the cognitive thinking of users.

- Persuasion in the Tourism Domain

The authors [45] identified that usability, functionality, design, trustworthiness, efficiency, and likeability are the significant factors that influence trust in a tourism e-commerce solution. The influence of informativeness, usability [46], inspiration, credibility, involvement, and reciprocity was tested by authors [47] to measure the persuasiveness of 50 endpoint e-commerce solutions in the US. The authors were further proved that "usability, inspiration, and credibility are the most favourable key drivers of people's first impression of tourism e-commerce solutions".

The authors of the paper [43] highlighted four persuasion factors in UI design: relationship, emotion, credibility, and logic that are used to exploit the persuasiveness and the attractiveness of an e-commerce solution.
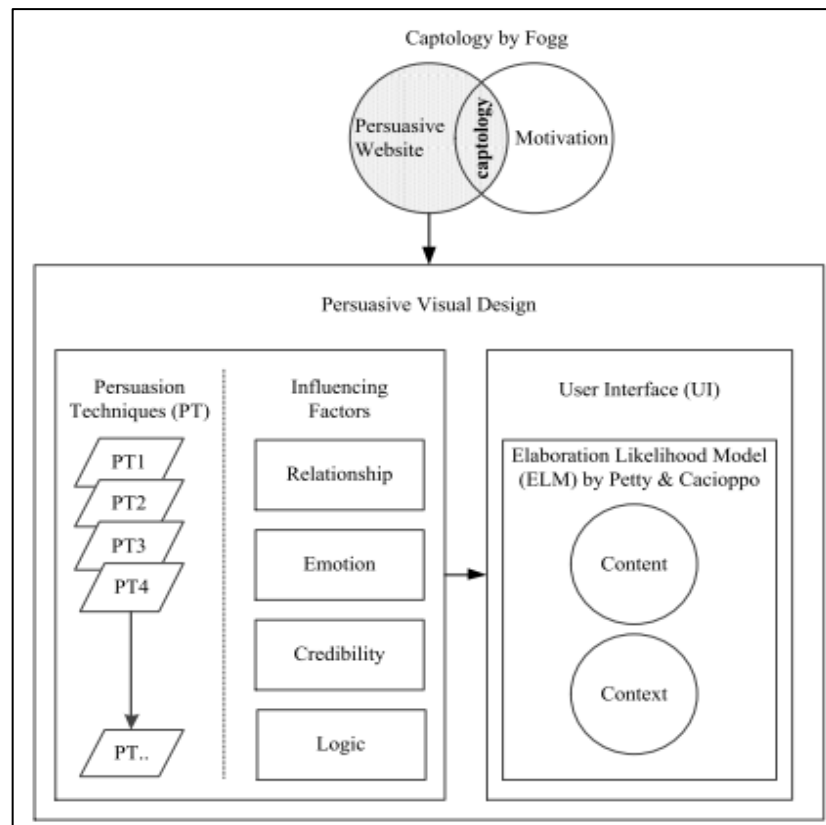
Figure 2.5: Conceptual framework for persuasive visual web design [35]

2.6. XPath Learning

In order to traverse through DOM trees, Xpath is used. For the representation of a well-formed XML document, DOM tree is considered by Tobias Anton [48]. According to Tobias Anton "A DOM tree is a well-organised tree, in which every node has allocated a name and a value. [49] The authors differentiate two types of nodes: Element nodes and text nodes. Text nodes probably occur only as leave node. Their name is frequently "#text", their node value is a random string. The name of an element node E could be selected randomly, while its value is guarded to be the concatenated value of its text node children if any. Furthermore, every element node is also connected to a collection of attribute-value pairs. Figure 2.6 shows a small DOM tree that results from parsing the below XML document: Now, an XPath statement (or path, synonymously) describes a traversal through a DOM tree. The authors would only provide a quick overview, while the authors refer to the details. [50] A path is an arrangement of steps, separated by slashes. Each step contains three parts: A search pathway (also termed "axis"), followed by "::", a node filter and a (possibly empty) arrangement of

establishes. The axis describes the direction of document traversal, e.g. to the super node, to the sub node, to below or preceding neighbours. Node filters restrict the set of applicable nodes along the search direction. [51]Finally, predicates are XPath terminologies in square brackets that are used to restrict the set of results further". Examples for XPath statements are:

1. /descendant-or-self::H1
2./child::BODY/child::H1
3./child::BODY/child::H1[following-sibling::P[child::HR]]
4./descendant-or-self::H1[preceding-sibling::IMG[@src='filename.gif']]/child::text()

Each step is evaluated on a set of DOM nodes and yields a set of DOM nodes as its result. A path is then evaluated by evaluating the first step on the initial set of nodes and using each step's result as the input for the following step. For example, statement 1 calculates to a set of nodes containing all H1 elements in the document. When applied to the sample DOM tree from Figure 2.6, declarations 1, 2 and 3 outcomes in the set contains the single H1 element. Statement 4 yields the text node belongs to the same H1 element.

```
<BODY>
 <IMG SRC="filename.gif"/>
 <H1>Playing tonight:</H1>
 <P>
  Star Wars
  <HR/>
 </P>
</BODY>
```

Figure 2.6: XML Code [48]
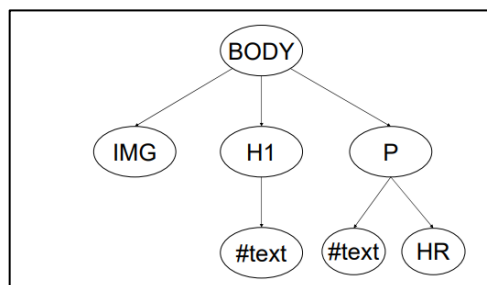
Figure 2.7: Sample DOM Tree [48]

2.7. Analyse Usability of Google Analytics in E-Commerce

Layla Hasan, Anne Morris and Steve Probets [52] analysed three solutions using Google analytics and provided the following results:

Table 2.7: Web Metrics and Results [52]

No	Metric	Site1	Site2	Site3
1	Average page view per visit	17.00	12.56	5.62
2	Percentage of time spent visits			
	Percentage of Low time spent visits (between 0 seconds and 3 minutes)	60.16%	76.76%	77.75%
	Percentage of Medium time spent visits (between 3 minutes and 10 minutes)	21.67%	14.48%	13.23%
	Percentage of High time spent visits (more than 10 minutes)	18.17%	7.77%	10.01%
3	Percentage of click depth visits			
	Percentage of low click depth visits (2 pages or fewer)	31.29%	32.36%	59.20%
	Percentage of medium click depth visits (between 3 pages to the value of metric 1)	42.57%	40.98%	22.99%
	Percentage of high click depth visits (more than the value of metric 1)	26.14%	26.66%	17.81%
4	Bounce rate	22.77%	30.50%	47.58%
5	Order conversion rate	1.07%	0.37%	0.25%
6	Average search per visit	0.07	0.05	N/A
7	Percent of visits using search	2.14%	3.16%	N/A
8	Search results to site exists ratio	0.79	0.53	N/A
9	Cart start ratio	5.94%	2.89%	N/A
10	Cart completion ratio	18.07%	12.98%	N/A
11	Checkout start ratio	3.63%	1.02%	1.7%
12	Checkout completion ratio	29.55%	36.61%	15%
13	Information found conversion rate (ranges for second pages)	[0.23% to 4%]	[0% to 2.41%]	[0% to 2.71%]

The authors of this paper analysed the data further and came to the following conclusions:

- Customer Service

The limited information on conversion rate indicates the users could not conveniently navigate to the customer support page.[53],[54] This shows that either the architecture of the e-commerce solution has issues or the search results have issues.

- Navigation

[55]Bounce rate is the matrix used to identify the navigational problem. In e-commerce solution three, the highest value for bounce rate indicates a serious navigational problem in that e-commerce solution. [56],[57]Low average page views per visit and a high percentage of click depth visit for e-commerce solution 3 provides further evidence to it. E-commerce solution 1 and 2 have a low average search per visit and percentage of visit using search. [58]It indicates that either those e-commerce solutions have a good navigation scheme so the search is not required or maybe it has a severe issue in search.

- Internal Search

[59]The average searches per visit and percentage of visits using search metrics provide information about issues in the internal search facility. For e-commerce solution 1 and e-commerce solution 2,[60] these two matrices are quite low. However, these two e-commerce solutions have a relatively high number of the page visit. It shows that the users are using the navigation in order to complete their activity rather than relying on search results. The high amount of the search results to e-commerce solution exit ratio highlights there is a severe issue in internal search functionality[61].

- Architecture

The percentage of time spent per visit is used to evaluate the issues in architecture. All three e-commerce solutions have a severe issue in overall design and architecture. Most of the users of all three e-commerce solutions left within three minutes. Other metrics highlights further issues with the architecture including limited usage of search facility, the smaller number of the average page views per visits metric for e-commerce solution 3, and e-commerce solution 3 has a complex architecture which limits the navigation.

- Content or Design

Most users of all three e-commerce solutions have spent less that than three minutes on e-commerce solutions. This indicates that the content of these three e-commerce solutions is not interesting enough to motivate the user to spend more time. Even though the percentage of click depth visit is performing better in e-commerce solution 1 and e-commerce solution 2, than e-commerce solution 3. It simply highlights all three e-commerce solutions have issues in content, but e-commerce solution 3 is worst.

The bounce rate matrix provides a percentage of the users who left the e-commerce solution; they visited the homepage and then left.[62] High bounce rate implies that either the content is not interesting or the e-commerce solution has targeted the wrong users.

- Purchasing Process

The reduced order conversion rate for all three e-commerce solutions indicates that the low number of visitors converted to buyers. [63]The reduced cart completion rate, checkout completion rate and percentage of high time spent demonstrated that very few users ended up purchasing products.[64],[65] This indicates that users are having severe issues not only in completing the order process but also in initiating the process.

2.8. Entropy Based Robotic Wrapper Generation for Weblog Data Extraction

The authors of this paper [66] proposed a model to generate a fully automated wrapper. The method is distributed into three steps as below:

- Step 1: Feed processing and capturing of post properties

"Prerequisite is the acquisition of weblog's feed URL. The content fetched and processed through an XML parsing library. A feed holds a section of entries that point to similar weblog posts. For every entry, the below listed attributes are typically identified and stored." [66]

  o Title: Optional. Only one title can be presented in on post.
  o Author: Optional.
  o Published Date: A required object of type date. A post can contain precisely one publication date. Publication date presented in the post
  o Summary: An optional HTML encoded part of the weblog post's content (frequently the foundation of the post's content).
  o Permalink: A mandatory URL which points to the original weblog post.
  o Categories: A possible pool of phrases or words defining the topic presented in the post

- Step 2: Generation of filters

The filter is a concept used in many types of research. Baumgartner et al. [67] have explained filter as the construction of patterns, which, in turn, define a general tree path in the HTML parse tree. The authors of this paper [66] use the term filter as contained triples, which apprise and encompass existing solutions their proposed style is "to overcome anomalies performing through absolute path values by providing extra means of defining the HTML element (namely the CSS Classes and HTML Identifiers)"[66]. They further evaluate the CSS Classes are used as extraction rules positively. Further, they describe filter using three attributes, namely, the absolute path, the CSS Classes and the identifiers of the HTML element. Figure 2.8[66] elaborates the filter with an example. As shown in the example when an HTML element pointed set of HTML identifier and CSS Classes with single-valued absolute path added to the filter.

Figure 2.8: The Structure of a filter [66]

- Step 3: Overview of rules and blog data pulling out

After the second step, "a pool of filters is populated for every property. The values of these filters are such that, when applied to the weblog posts from which they were extracted, they link back to the HTML element containing the value of the coordinated property. However, due to multiple incidences of values during the identical text process of the second step, there are cases where a value is presented in more than one

HTML element. This results in generating several filters equal to the number of values identified. Therefore, the collected filters are not yet suitable for extracting the detail out of a weblog; the collection contains dissimilar and contradictory figures that needs further handling" [66]. Figure 2.9 Summary of all three steps. As of feed processing, filter generation, and wrapper execution.
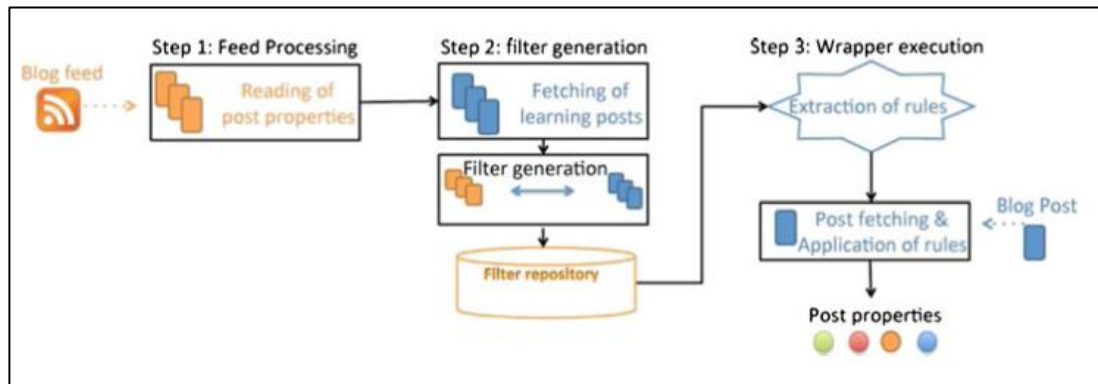
Figure 2.9: The structure of a filter [66]

2.9. Magento

One of the leading e-commerce platforms is Magento [68]. Which is built on open source technology and enables the creation of e-commerce solutions with minimum effort. Magento provides two types of implementation: code base and configuration. The code base can be used by technical people, and the configuration option can be used by non-technical people, such as administrators and business owners. Magento has recently released version 2.3. The Magento Community Version has features including; Website Management Features; Checkout, Payment, & Shopping; Search Engine Optimization (SEO); Analytics and Reporting; Marketing Promotions and Tools, Order Management; Customer Service; Customer Accounts; Catalogue Management; Product Browsing; Catalog Browsing.

2.10. Yii

Yii [69] is a framework built in PHP with high performance and component base. It is secure, fast and efficient compared to other frameworks available in the market. A generic type of web framework allows the development of virtually any type of web application.

2.11. Google Analytics

Google analytics [70] provides information about the e-commerce solution owned by a business, which enables the business to detect its potential customers, peak and non-peak time, the location of customer population, real time users, bounce time, traffic source, cross device, etc. This feature allows the business to decide which location to promote, which category to improve, and which products should be promoted for offers. For e-commerce solution providers, Google analytics warns about implementation mistakes and congratulates businesses for good designs by providing analysis of customer behaviour. It enables the e-commerce solution providers to update design decisions and provide better user experience to the customers.

2.12. Word press

WordPress [71] is an online tool that generates websites that are implemented on top of PHP. It is a convenient and powerful blogging and website content management system. WordPress can build blogs, e-commerce, businesses, news, photography, music, and membership. Customising a website implemented in WordPress is much easier. The following features are available at this moment: dozens of themes, mobile friendly, fast, friendly support and built on social sharing.

2.13. Joomla

This is an open source platform [72] for website generation that has been contributed to by hundreds of engineers. The first version of Joomla released in 2005. It is very popular, user friendly, protected and stable. Thousands of free extensions and templates are available on top of Joomla. The features associated with the framework are; SEO friendly, mobile friendly, unlimited design, multilingual, flexible and fully extensible and has the multi-user permission level.

2.14. The Influence of Commercial Features behind Success of E- Commerce

Angel Herrero Crespo and Ignacio Rodriguez Del Bosque described in [73], the commercial features such as age, gender, education, occupation and risk perception [74] have influenced a customer to reach e-commerce. The authors further built up below hypothesis and analysed [75]. Individual attitude towards e-commerce

positively influences online buying intention., Subjective norm positively influences online buying intention, Perceived behavioural control positively influences online buying intention, Perceptions of products supplied by online sellers positively influence attitude towards online buying, Shopping experience provided by online sellers positively influences attitude towards online buying, Access to information provided by online sellers during searching and comparison processes positively influences attitude towards online buying, E-commerce risk awareness negatively influence online buying intention, E-commerce risk awareness adversely influence attitude toward online buying, Gender of the user influences the factors defining the decision to purchase online, Age of the consumer influences the factors defining the decision to purchase online, Education the customer has influenced the factors defining the decision to purchase online and Profession the consumer obtain influences the factors defining the decision to purchase online.

The author of [76], recommends the market analysis for e-commerce. Furthermore, the researches built the below model presented in Figure 2.10with Hypothesis 1 to hypothesis 12.
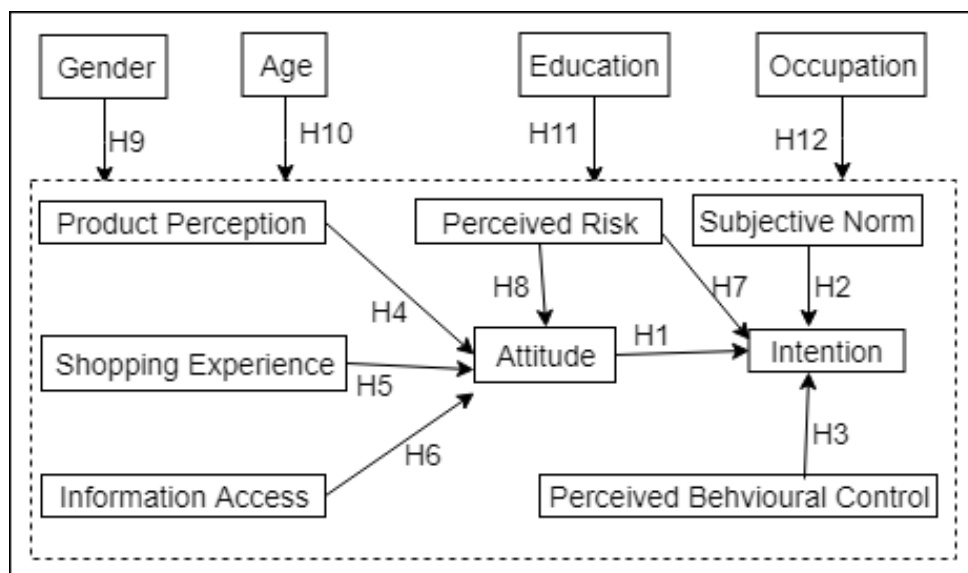
Figure 2.10: Research Model [76]

3. SYSTEM DESIGN AND IMPLEMENTATION

3.1. Introduction

In this chapter, the proposed solution, how the system works, and the chosen approaches for the implementation, detail explanation of implementation and pseudo code used to implement are explained.

3.2. Design Aspects

In this section, the proposed solution, how the system works, and the chosen approaches for the implementation are explained.

3.2.1. Proposed Solution

The proposed approach initially identifies the main business of the company, next, analyse the competitor's decision on UI, then, finalise the decision to be taken on UI perspective and finally, the system generates the e-commerce application by automating Magento. For this purpose, a pipe and filter pattern has been used for the architecture of the system. Figure 3.1 shows the high-level architecture for the proposed approach.
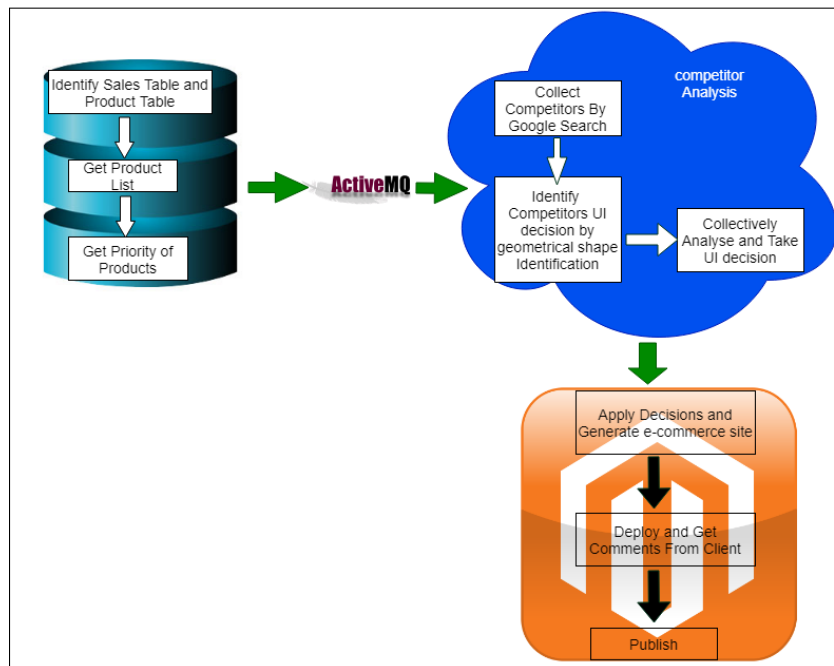
Figure 3.1: High Level View of Proposed System

Figure 3.2 shows the activity diagram for the proposed solution, which explains the flow of activity in the process.

The following activities have been followed in a sequence in a process.

- Analyse the client's database
- Identify sales and product tables
- Extract product and sales details
- Google search and collect competitors
- Finalise UI decision
- Automated Magento creates an E-commerce solution
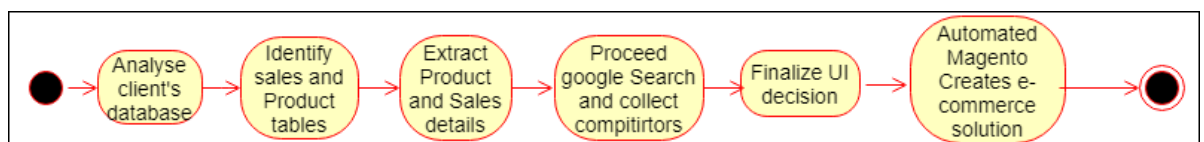
Figure 3.2: Activity Diagram

Figure 3.3 shows the data flow throughout the system. Stages One to four shows the data flow from module to module.

1. Keywords to search and weighted average are delivered.
2. The collected competitors under each keyword are delivered
3. The decision made by each competitor is delivered
4. The final decision which is ready to apply is delivered.
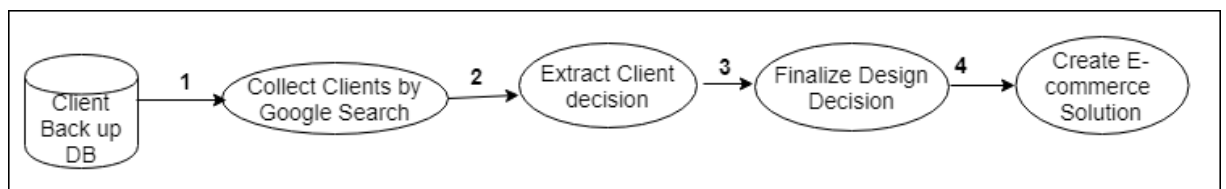
Figure 3.3: Data Flow Diagram

The programming language used for this solution is python. MySQL has been used as a database to store data. Magento has been used as an e-commerce platform, which is automated and e-commerce solution is created. Apache has been used to deploy Magento.

3.2.2. Identify Sales Table and Product Table

The sales table name can be identified using an information schema with supervised learning. The relationship between the product table and sales table can be recognised from the information schema with foreign key mapping. With the foreign key relationship, the product table name is known.

3.2.3. Get Product List

The list of products can be identified from the database using the discovered product table name. With supervised learning and trace relationship between tables, the product name, the category, subcategory and category hierarchy, product price and image, etc. are recognised, and the product list can be extracted.

3.2.4. Get Priority of Products

By analysing the sales table, the sales data can be extracted. With the use of the sales data, the number of sales per product can be calculated. By prioritising each product's sales percentage can be identified. By using the sales table and product table mapping, product details can be identified.

3.2.5. Collect Competitors by Google Search

Each product can be passed as a keyword to Google search, and URLs of the search results are collected. For each URL, the home page can be identified, and homepage screenshots can be collected, for this process, a selenium web driver can be used.

3.2.6. Identify Competitors Decision by Geometrical Shape Identification

Each image can be considered separately and uniquely identifies squares using open cv library. The product on the home screen is recognised by getting the highest number of same size rectangles. The menu decision can be taken as if there is the possibility of finding a rectangle with more than 75% of the total image width and can be positioned on the top of the image its top menu and if the top menu width is more than 98%, it can be considered as top menu Full-width. Otherwise, it can be considered as a side menu. The dominant colour of the image can be considered as the background colour of the image.

28

3.2.7. Collectively Analyse and Take UI Decision

Each product versus the competitor's decision summary can be analysed on each decision perspective. Each decision point, a weight can be gotten according to two variables, one is the weight of the product according to sales percentage, and the other variable is the majority of the competitor's decision. The maximum weight wins the game. As explained in Figure 3.4, the collective decision-making process happens. In Figure 3.4 1, 2...n are the sales percentage for each product. 1.1,1.2..1.n; 2.1,2.2..2.n;…; n.1,n.2,...,n.n shows the competitors who are selling the product as follows product1, product2,.., production. The weighted average for the decision made upon a collective weighted of competitors and weighted sales percentage using the below equation.
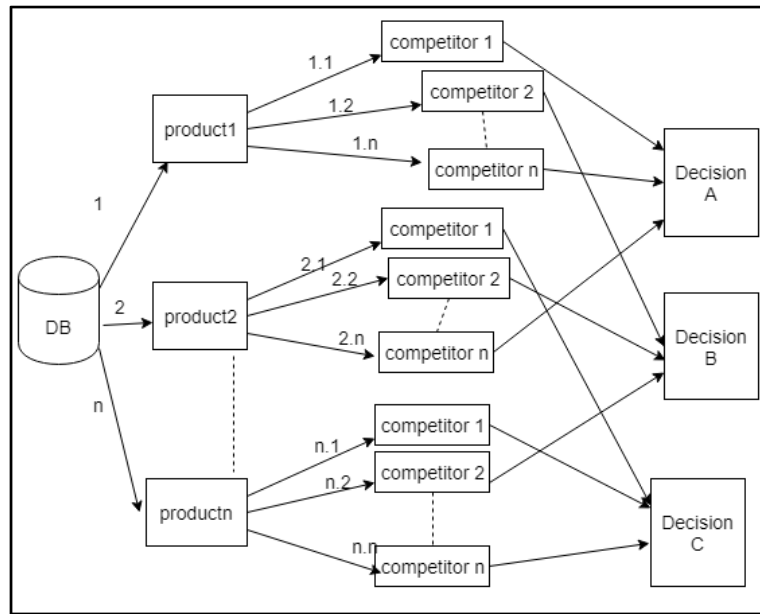
Figure 3.4: Collective Decision-Making Process

WAD = Weighted average for Decision

SPP = Sales Percentage for Product

$PCSP$ = Percentage of Competetors Selling Product

$$WAD_A = SPP_1 * PCSP_{1A} + SPP_2 * PCSP_{2A} + \cdots + SPP_n * PCSP_{nA} \qquad (1)$$

$$WAD_B = SPP_1 * PCSP_{1B} + SPP_2 * PCSP_{2B} + \cdots + SPP_n * PCSP_{nB} \qquad (2)$$

$$WAD_C = SPP_1 * PCSP_{1C} + SPP_2 * PCSP_{2C} + \cdots + SPP_n * PCSP_{nC} \qquad (3)$$

3.2.8. Apply Decision and Generate E-commerce Solution

Magento 2.3.1 has been used for the implementation of the e-commerce solution. XAMPP Control panel 2.3.2 and Apache have been used for deployment purpose. For the database, MySQL has used. The finalised decision has been applied, and the e-commerce solution has been generated.

3.2.9. Deploy and Get Feedback from Client

The application has been deployed to a unique URL on a restricted mode and has been released to the client. The application has been checked based on the feedback given by the client.

3.2.10. Deploy non Restriction Mode

With confirmation from the client, the e-commerce solution has been launched for public use. Feedback from the customers has been taken into consideration for future improvement of the framework.

3.3. Implementation

In this section, each step explained in the methodology has been described in the implementation perspective, and code snippets have been attached.

3.3.1. Identify Sales Table and Product Table in Database

The database has been analysed in order to identify the sales table. DB query, as shown in Figure 3.5, is used. This gives all the tables under the name related to sales. Under the name of the sales table, either current sales or back up sales are there. Either backup data or actual data of the business can be used in this situation. The output of the query is highlighted in Table 3.1. The system expects the sales table name contains one of the below keywords such as SALES, sales, and Sales.

```
1  SELECT * FROM INFORMATION_SCHEMA.TABLES WHERE TABLE_NAME
2  LIKE 'SALES' OR TABLE_NAME LIKE 'sales' OR TABLE_NAME
3  LIKE 'Sales'
```
Figure 3.5: Identify Sales Table

Information schema, where the information about the database, is stored such as table, column and constraint details. The query shown in Figure 4.1 tries to check that any table names containing the keyword sales as case ignored.

Table 3.1: Sales Tables in Database

TABLE_CATALOG	TABLE_SCHEMA	TABLE_NAME	TABLE_TYPE
def	Nolimit	Sales	BASE TABLE

The product table has been recognised by passing the identified sales table name to the query. Figure 3.6 shows the query and Table 3.2 shows the output. This query confirms that the sales and product table have a relationship; the product table name is expected to contain one of below such as PRODUCT, Product and product.

```
1  SELECT  *  FROM INFORMATION_SCHEMA.REFERENTIAL_CONSTRAINTS
2  WHERE TABLE_NAME='sales' AND  REFERENCED_TABLE_NAME LIKE
3  '%PRODUCT%' OR REFERENCED_TABLE_NAME  LIKE '%product%' OR
4  REFERENCED_TABLE_NAME  LIKE '%Product%'
```
Figure 3.6: Identify foreign key to product

Similar to the sales table has been identified, by using the query shown in Figure 3.6 the product table has been revealed with the use of identified sales table and mapping towards the product table and sales table.

Table 3.2: Foreign key Product Output

CONSTRAINT_CATALOG	CONSTRAINT_SCHEMA	TABLE_NAME	REFERENCED_TABLE_NAME
def	Nolimit	Sales	Product

3.3.2. Get Product List

In order to understand the product table structure, the relevant column names for the image, name, and price should be identified; for that query below is used. The query gives all the name of the columns as output. From the output, the relevant column names can be filtered. The query is shown in Figure 3.7 and output is shown in Table 3.3. Then the list of products is collected.

```
1  SELECT  *  FROM  INFORMATION_SCHEMA.COLUMNS  WHERE
2  TABLE_NAME = 'PRODUCT'
```
Figure 3.7: Analyse Product Table

With the use of column property in information schema and identified product table, the columns have been mapped under the product table list using the query shown in Table 3.3.

Table 3.3: Column Details in Product Table

TABLE_CATALOG	TABLE_SCHEMA	TABLE_NAME	COLUMN_NAME
def	Nolimit	product	id
def	Nolimit	product	name
def	Nolimit	product	image
def	Nolimit	product	number_of_item
def	Nolimit	product	code

3.3.3. Get Priority Products

The sales table has been analysed, and priority products identified, and the name of the columns for the product has been identified, and the quantities have been identified. By collecting the sales information, a weighted average has been taken for a product. The mapping from the sales table to product table has been used to find the corresponding product name for product identification.

3.3.4. Collect Competitors by Google Search

By passing the product as a keyword, the system searches the keyword on Google and obtains the results. For each URL, the URL is modified in order to navigate to the homepage. Then the URL which contains the "You Tube"," Facebook" and "news" is ignored as it navigates to social media, YouTube or a news channel. The coding snippets are shown below in Algorithm 3.1 and Algorithm 3.2. The screenshots of the URL are collected for further analysis. Algorithm 3.1 shows the keyword to search, in which location the keyword should be searched, the number of results expected and the limit to stop the query are passed as parameters and the Google search results are returned. Each URL in the Google search results is filtered, social media, Youtube and news channels are ignored. The URLs are rewritten in a way to locate the home page. Each URL is loaded into a browser, and the screenshots are collected. The captured screenshots saved in an allocated folder path.

```
Algorithm 3.1: Collect Websites
Require: Accessible file path
Ensure: E-commerce solutions selling the product getting
collected
Input: Product Name, webdriver
Libraries: Selenium, Google Search
1.    Search from google using the product name as a keyword
2.    For each website in search results
3.      Identify website URL from website object
4.      If identified URL does not belong to any social media
5.        Format URL to navigate to the home screen
6.        If the URL is not accessed before under the same
          product
7.          Disable popups and notifications in webdriver
8.          Configure the path to download screenshot
9.          Configure Full screen in webdriver
10.         Load formatted URL in the browser
11.         Invoke Save Screenshot
Output: Collected E-commerce solutions
```

According to Algorithm 3.1, the process of collecting website as follows: search for google results for the provided keyword, each result has an object of information about the website. The URL of the website is included in the object. The identified URL is filtered as of it is not social media, news channel, wiki, or the URL is not already accessed for the same product. The webdriver is prepared for download path, block unnecessary pop ups. The filtered URL is formatted to navigate the home screen. The formatted URL is opened in webdriver. Further with invoke save screenshot the screenshot saved. Selenium and Google Search are used as libraries in this algorithm. Selenium is used for scraping purpose and Google Search is used for the purpose of keyword search through google. The provided input is file path to save the screenshot. The requirement is the file path should have read and write permission to the algorithm.

Algorithm 3.2, the body tag has been captured, and the screenshot has been collected. This enables full screen images. Algorithm 3.2 explains the screenshot capturing process. The main idea behind identifying the body element is to get the full screenshot. For the purpose of getting screenshot screen shot function from selenium, the library is used.

```
Algorithm 3.2: Save Screenshots
Require: Accessible Filepath
Ensure: Screenshot of E-commerce Solution Saved in Directory
Input: the path of the Directory, webdriver
Libraries: Selenium
1.   Identify element name by tag name body
2.   Invoke screenshot
3.   Quit driver
Output: Saved Screenshot
```

3.3.5. Identify Competitors UI Decision

The taken screenshots were analysed, and the following decisions were identified from the competitor. Each image can be considered separately and uniquely identifies squares using open cv library. The product on the home screen is recognised by getting the highest number of same size rectangles. The menu decision can be taken as if there is the possibility of finding a rectangle with more than 75% of the total image width and can be positioned on the top of the image its top menu and if the top menu width is more than 98%, it can be considered as top menu Full-width. Otherwise, it can be considered as a side menu. The dominant colour of the image can be considered as the background colour of the image.

- Background colour

The background colour has been identified through the dominant colour. The image has been analysed, and all the colours used in the image have been recognised. The colours used in the image have been prioritised according to their usage. The predominantly used colour has been considered as the background colour of the website. Algorithm 3.3 shows code snippet, and Figure 3.8 shows the output of the sample input.

Figure 3.8: Dominant Colour Output

```
Algorithm 3.3: Get Dominant Colour
Require: Image File in the Input Directory Path
Ensure: Identified Dominant Colour
Input: Input Directory Path
Libraries: CV2, Numpy
1.   Open image file in the input directory path
2.   Resize the image
3.   Colours=Invoke get colours
3.   For each colour in colours
4.     Identify the colour with maximum percentage
Output: Identified Dominant Colour
```

- Number of products on the home page

The system identifies all rectangles in the image. The images having the same height and width are grouped. The maximum number of rectangle groups has been considered as the rectangle which contains the product details. The number of images horizontally has been calculated as the image width divided by rectangle width, then subtract one from the answer. The reason is that there would be white space between two images, as well as between images and the side of the UI, and this should be considered. The below equation is used for the purpose:

$$Number\ of\ Images\ Horizontally = (Image\ width/rectangle\ width) - 1 \qquad (4)$$

In the same way as the number of products horizontally, the number of products vertically also has been calculated by dividing image height by rectangle height. The number of the product is one subtracted from the answer for the same reason explained for the number of images horizontally. The below equation used for the purpose.

$$Number\ of\ Images\ Vertically = (Image\ height/rectangle\ height) - 1 \qquad (5)$$

- The Menu Style

If there is a rectangle with more than 75% of the image width and its height is less than 50% of image height, the menu style decision is considered as the top menu; otherwise, it is side menu.

- Full screen or Narrowed Screen

If there is a rectangle with more than 98% of the image width, or if there are any rectangles with y coordinates of 0 or similar range and other y coordinate as of Full-width of the image or nearby range that URL can be considered as full screen, otherwise it is narrowed screen.

Appendix B shows the code snippets to identify all polygons in the image and all the polygons that have four edges are categorised as rectangles, and all the rectangles are identified. Each rectangle has four coordinates, and each coordinate is identified. Width and height of the image are calculated by getting the difference of minimum and maximum values of x and y coordinates. For the purpose of checking if there are any top menus, we checked for the condition as "Are there any squares with the width of 75% or more" and for the same image "Is the height less than 50%". With the finding of the top menu, the decision would be taken as top menu narrowed home page further. The identified squares get filtered according to the height and width of the image. Images with the same height and width are saved in the same array. The array has maximum squares, where each square is considered as a product. As per the equations explained above, the number of products per row and products per column are finalised. The same figure includes the coding of finalisation for menu decisions and width decisions. The identified rectangles are shown in Figure 3.9.

3.3.6. Collectively Analyse and Take UI Decision

Each decision points have been analysed to identify decisions taken by the competitors and the affect this has on decisions. Initially, the weighted average of the keyword (WAK) has been calculated by dividing the number of sales (NS) in the product by the total number of sales (TNS). The below equations used for the purposes;

$$WAK = NS/TNS \qquad (6)$$

The weighted average of decision (WAD) for design is shown in the below equation. Summation of every keyword weighted average has been multiplied by the number of competitors who took this decision under competitors got searched under the same keyword divided by a total number of e-commerce solutions for the same keyword.
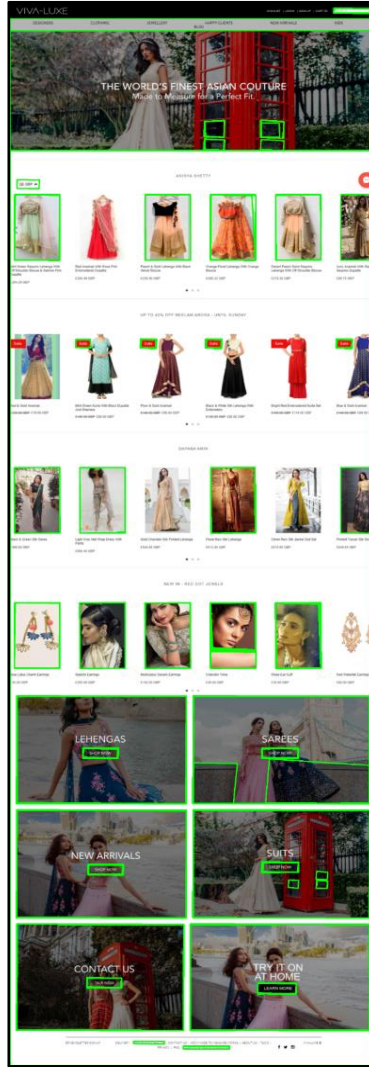
Figure 3.9: Identified Rectangles

$$WAD - \textit{weighted Average of Decision}$$

$$\text{TNK} - \textit{total number of keywords}$$

$$\text{WAK} - \textit{weighted Average of keyword}$$

$$\text{NCTDK} - \textit{Number of Competitors took this decision under same keyword}$$

$$TNEK - \textit{total number of ecommerce sites for keyword}$$

$$\text{WAD}_1 = \left(\text{WAK}_1 * \frac{\text{NCTDK}_1}{\text{TNEK}_1} + \text{WAK}_2 * \frac{\text{NCTDK}_2}{\text{TNEK}_2} + \cdots + \text{WAK}_n * \frac{\text{NCTDK}_n}{\text{TNEK}_n} \right) \qquad (7)$$

$$\text{WAD}_2 = \left(\text{WAK}_1 * \frac{\text{NCTDK}_1}{\text{TNEK}_1} + \text{WAK}_2 * \frac{\text{NCTDK}_2}{\text{TNEK}_2} + \cdots + \text{WAK}_n * \frac{\text{NCTDK}_n}{\text{TNEK}_n} \right) \qquad (8)$$

3.3.7. Apply Decisions and Generate E-commerce Solution

By automating the Magento e-commerce solution creation, the application has been created, and the final decision for the solution has been applied. The steps of e-commerce solution creation are described below:

Step 1: Login

Initially, the system navigates to Magento (http://127.0.0.1:8080/magento231/admin/) then username and password are filled then gradually login. Algorithm 3.4 shows the code snippet for login.

Loading of Magento URL is a general login, by identify username by xpath and fill username, identify password by xpath and fill. Finally, identify the login button by xpath and click.

```
Algorithm 3.4: Login to Magento
Require: Magento up and Running, XAMPP up and Running, and
MySQL up and Running
Ensure: Successfully Logged in to Magento
Input: Username, Password
Libraries: Selenium
1.   Load Magento Login URL in browser
2.   Maximize window
3.   Identify textbox element for username using xpath
4.   Fill username
5.   Identify password element for username using xpath
6.   Fill password
7.   Identify button element for login using xpath
8.   Click login
Output: Successful login
```

Step 2: Root Category Creation

Navigate to "CATALOG" then navigate to "Categories" then navigate to "Add Root Category" then fill the information and create new "Root Category". Figure 3.10 shows the navigation to "Catalog and then Navigate to "Categories". Figure 3.11 shows the navigation to "Add Root Category". Figure 3.12 shows create a new

38

category. Algorithm 3.5 shows the navigation code snippet and the root category and Algorithm 3.6 shows the code snippet to "Add Root Category".
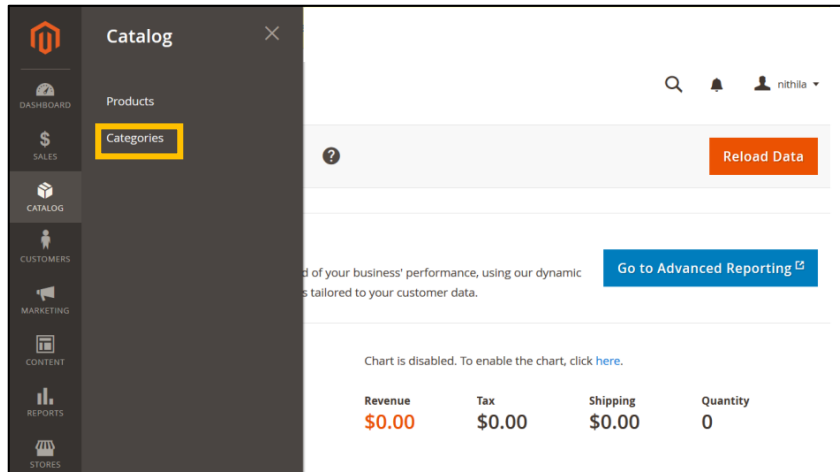
Figure 3.10: Navigate to Categories in Magento UI

The highlighted menu in Figure 3.11 needs to be clicked automatically in order to navigate to "CATLOG". For that, the xpath of that menu learned and clicked. After navigating to "CATALOG", the system should navigate to "Add Root Category". As is highlighted in Figure 3.12, the particular button's xpath is identified and navigated.
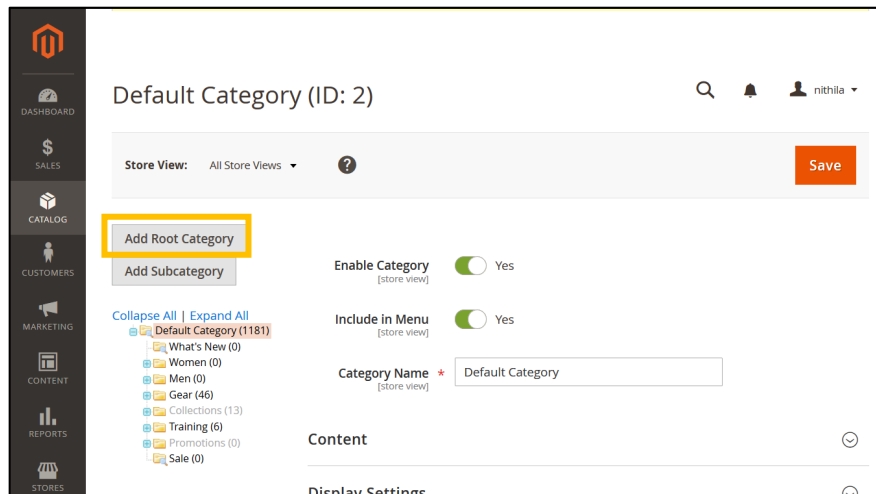
Figure 3.11: Navigate to Add Root Category in Magento UI

As per pseudo code shows in Algorithm 3.5, navigate to CATALOG and category in the same order by identifying and clicking corresponding menu using xpath. Algorithm 3.6 for creating a root category, shows navigation towards "Add Root Category" by finding the xpath followed by creating root category and Category hierarchy creation is mentioned.
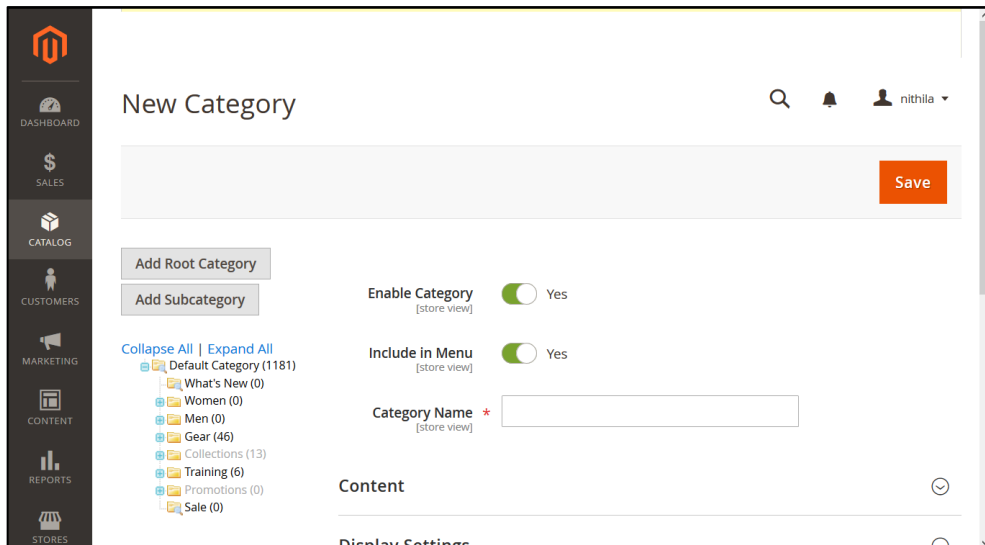
Figure 3.12: Create New Root Category in Magento UI

Algorithm 3.5: Navigate to Categories
Require: Magento up and Running, XAMPP up and Running, MySQL up and Running, and Successfully Logged in to Magento
Ensure: Navigated to Categories
Input:
Libraries: Selenium
1.   Identify menu for catalog using xpath
2.   Click catalog menu
3.   Identify sub menu for the category using xpath
4.   Click category sub menu
Output: Successfully navigated to the category sub menu

Algorithm 3.6: Add Root Category
Require: Magento up and Running, XAMPP up and Running, MySQL up and Running, Successfully Logged in to Magento, and Navigated to Category
Ensure: Add Root Categories
Input: Root Category Name, category list
Libraries: Selenium
1.   Identify button element for root category using xpath
2.   Click the root category button
3.   Identify textbox element for root category name using xpath
4.   Fill the root category name
5.   Identify the button element for save using xpath
6.   Click save button
7.   For each category in the category list
8.   Invoke add sub category
Output: Successfully added root category

40

Step 3: Add Sub Category

Navigate to "Sub Category" and create category hierarchy under the created root category. Figure 3.13 and Figure 3.14 show the navigation and creation of a sub category. Appendix B shows the code snippet for sub category creation. In Appendix B, the navigation to "Add Sub Category" using xpath learning followed by creating each category mentioned by filling each category details. In the form elements, each element identified by xpath and by-passing keys to the element details is filled.
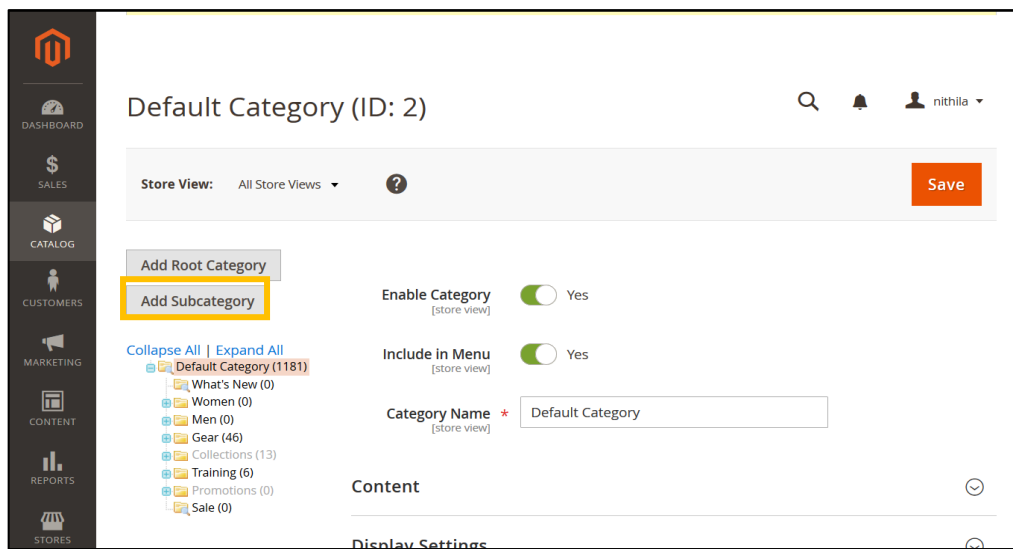
Figure 3.13: Navigate Sub Category in Magento UI
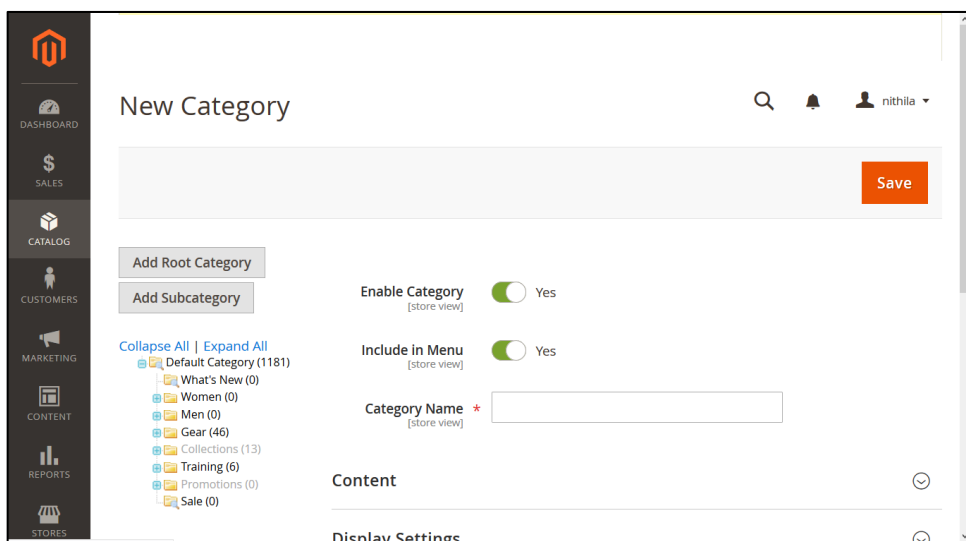
Figure 3.14: Create Category

Step 4: Add Product

Navigate to "CATALOG", navigate to "Products", navigate to "Create Product" and create new products. The whole product list is created under the correspondent categories. Figure 3.15, Figure 3.16 shows the navigation path and Figure 3.17 shows the new product creation. Figure 3.18 shows code snippet for the implementation.
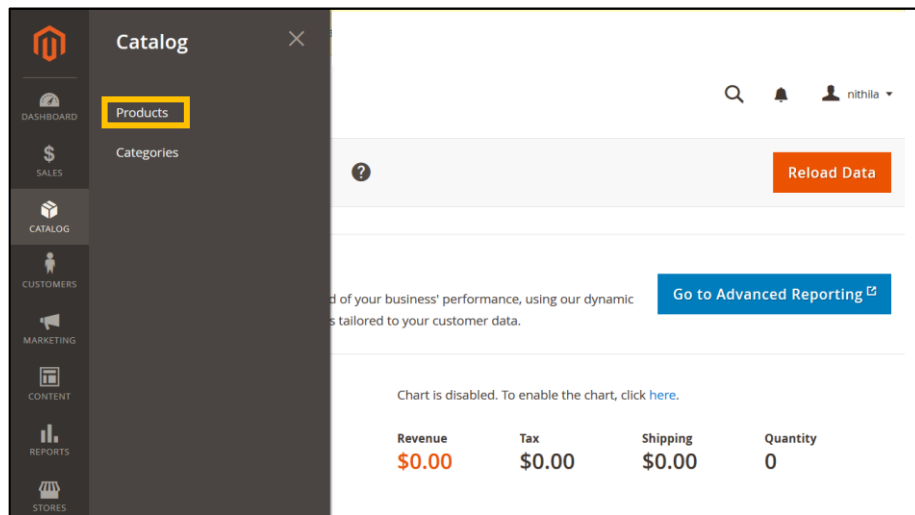
Figure 3.15: Navigate Products in Magento UI

Under" catalog" there are two tabs, one is the product, and another one is category the category creation can be reached through the category tab and the product creation process reached through the product tab.

Figure 3.16 shows the Products page needs to be navigated only once. The add product process can continue until the whole products get created. The product created needs to be assigned to a category.
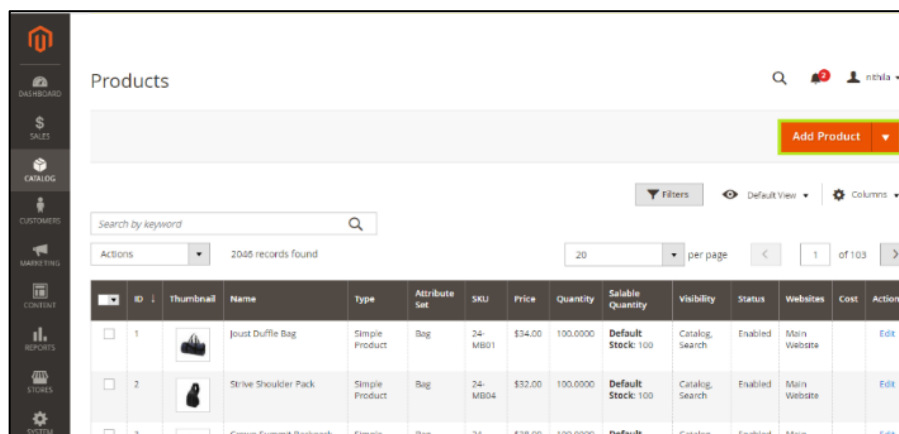
Figure 3.16: Navigate to Add Product in Magento UI

Figure 3.17 shows navigation towards product creation, and form elements are filled according to the product details with the use of xpath learning and by sending keys towards elements. This process continues for all products.
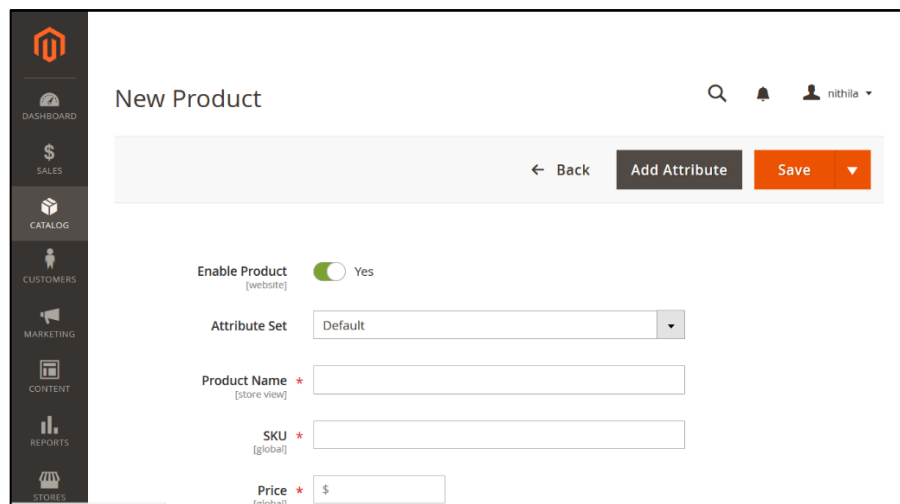
Figure 3.17: Add New Product in Magento UI

Appendix B shows the mapping of products under the relevant category. Each product should belong to a category.

Step 5: Website Creation

Navigate to "STORES", navigate to "All Stores", navigate to "Create Website" and create a new website. Figure 3.18 shows the Navigation to "All Stores", Figure 3.19 shows the navigation to "Create Website", Figure 3.20 shows the website creation. Algorithm 3.7 shows the code snippet to navigation, and Algorithm 3.8 shows the algorithm for website creation.

Figure 3.19 shows that All Stores need to be navigated in order to navigate to either website creation, store creation or store view creation. Figure 3.20 has three buttons for website creation, store creation and store view creation separately. Magento allows the creation of more than one store views on a website, more than one store to a store view and the default store for store view. In general, the website may contain more than one domain, or more than one language and more than one country. The site may differ for each, the stores and store views are used for this purpose.

43
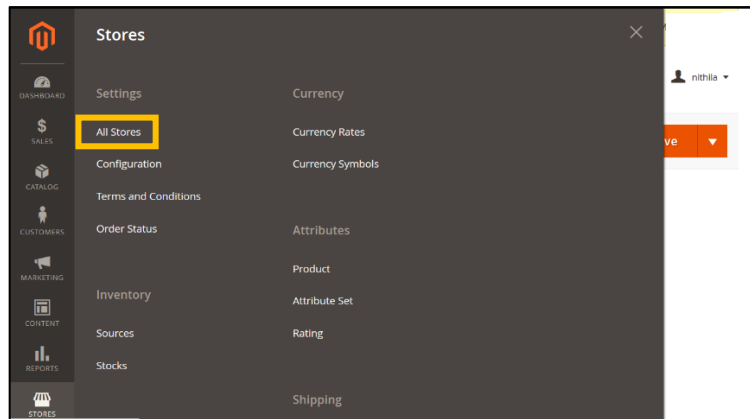
Figure 3.18: Navigate to All Stores in Magento UI
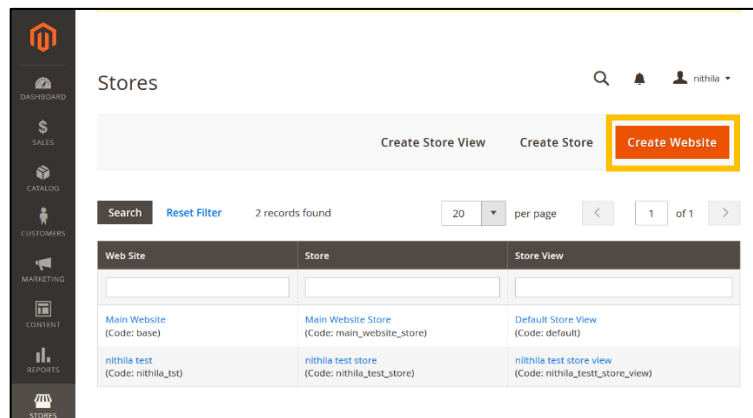
Figure 3.19: Navigate to Create Website in Magento UI
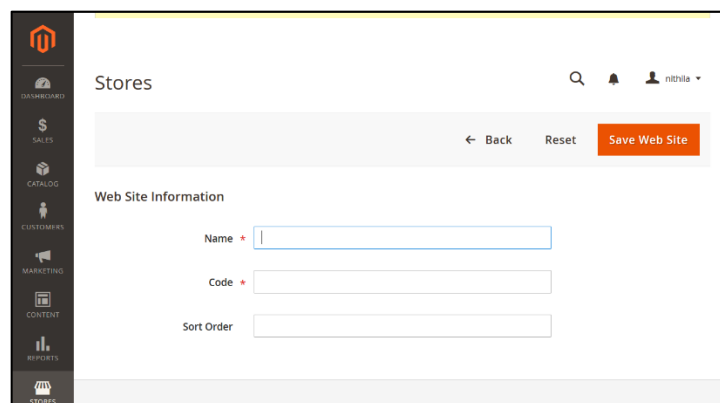
Figure 3.20: Create New Website

Algorithm 3.7 shows the navigation of creating a store. xpath is used to recognise elements and click the function used to navigate towards the identified element. In Algorithm 3.8 the website is created by filling in a form, where the text fields need to get filled are getting cleared before passing any values. After interacting with each element, there is a waiting time because the system should confirm that the element is released properly before getting it gets engaged with the new element.

44

```
Algorithm 3.7: Navigate Store
Require: Magento up and Running, XAMPP up and Running, MySQL
up and Running, Successfully Logged in to Magento
Ensure: Navigated to Store
Input:
Libraries: Selenium
1.   Identify menu element for the store using xpath
2.   Click store menu
3.   Identify sub menu for all store using xpath
4.   Click all store sub menu
Output: Successfully Navigated to store
```

```
Algorithm 3.8: Create Website
Require: Magento up and Running,
XAMPP up and Running, MySQL up
and Running, Successfully Logged
in to Magento
Ensure: Website Created
Input: Website Name
Libraries: Selenium
1.   Invoke navigate store
2.   Identify create website
     button element using xpath
3.   Click create website
4.   Identify textbox element for
     website name  using xpath
5.   Fill website name
6.   Prepare unique website code
7.   Identify textbox for website
     code using xpath
8.   Fill website code
9.   Identify button for saving
     using xpath
10.  Click save button
11.  Invoke append store
Output: Successfully Created
Website
```

Step 6: Store Creation

Navigate to "Create Store" and create the store. Figure 3.21 shows the navigation UI. Figure 3.22 shows the creation of UI. Appendix B shows the code snippet for it. This needs to be filled in by learning xpath. Each element identified in the form needs to traverse from HTML tags to identify the nearest root for the element which has an id or any uniquely identifiable property following the path towards the element. The text boxes are filled by passing keys and dropdowns are filled by selected visible text. The

reason for choosing selected visible text is the id of the selections are not trust worthy as of it would not change.
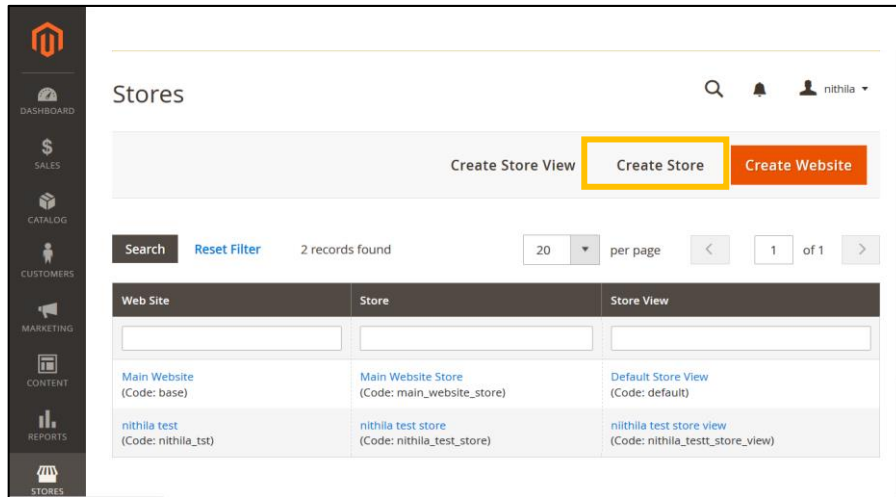
Figure 3.21: Navigate to Create Store Magento UI
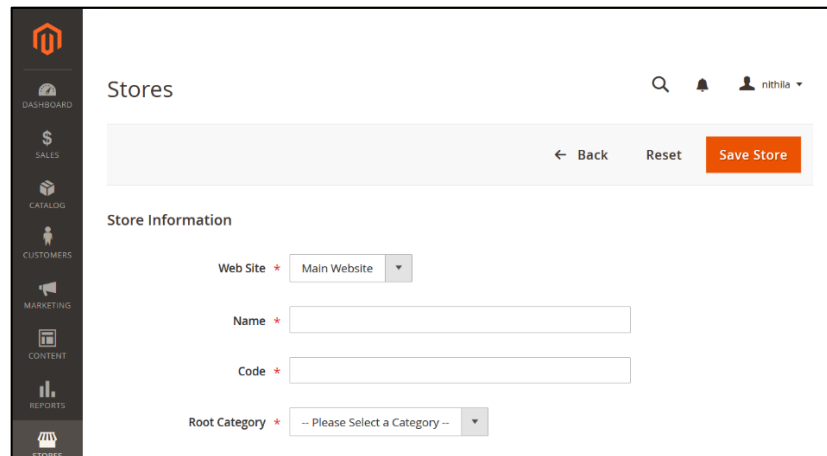
Figure 3.22: Store Creation in Magento UI

Step 7: Store View Creation

Navigate to "Create Store View" then create a new store view. Figure 3.23 shows the creation of the store view. The coding snippet for this is shown in Algorithm 3.9, and Figure 3.33 shows apply the default store to the store view. Appendix B shows the code snippet to recognize add the store and navigate and fill the form using store details. UI elements identified through xpath and by clicking the element navigation happens and by-passing keys the form fill happens. To the created store view, the default store needs to be mapped. Algorithm 3.9 shows the mapping. For that, the site is navigated and mapped xpath used for the purpose.
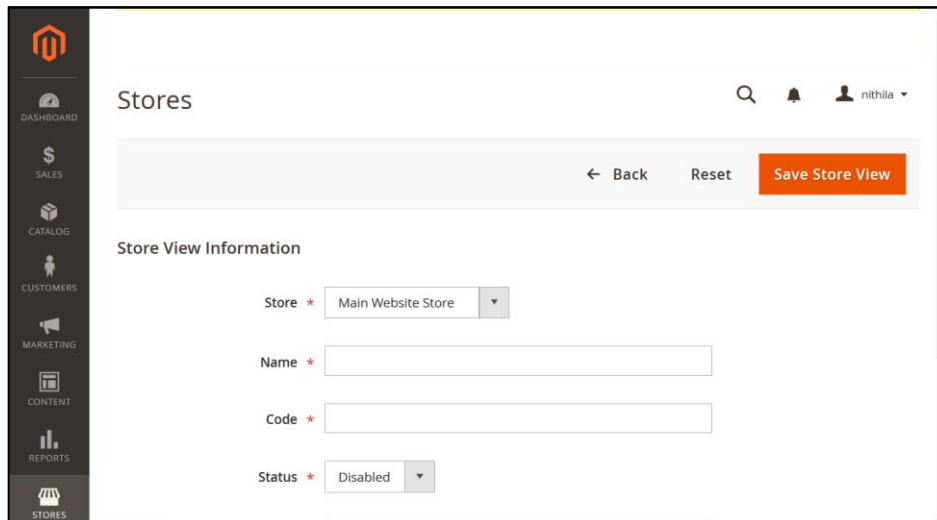
Figure 3.23: Store View Creation in Magento UI

```
Algorithm 3.9: Append Default Store
Require: Magento up and Running, XAMPP up and Running, MySQL
up and Running, Successfully Created Store
Ensure: Default Store Appended to the Website
Input: Default Store Name, Website Name
Libraries: Selenium
1.   Invoke navigate store
2.   Identify the table element using xpath
3.   Identify all row elements in the table
4.  For each row in rows
5.     Identify row element using xpath
6.     For each column in the row
7.        Identify cell has the website name
8.        Click on the cell element
9.        Identify dropdown element for default category
10.       Select created root category
11.       Identify save button element
11.       Click save button
Output: Successfully default store appended to the website
```

3.3.8. Deploy and Get Feedback from Client and Publish

The system has been deployed, and the mail has been sent to the client automatically. According to the feedback, the upgrade would be done manually. With client approval, the e-commerce site has been made available to the public.

4. EVALUATION

4.1. Introduction

This chapter explains the system evaluation using a verity of workloads. The identified results are used to evaluate system implementation. Section 4.2 briefs the workloads used in the evaluation process. The performance evaluation techniques that were used are mentioned in section 4.3. The system accuracy calculated based on the evaluation is presented in section 4.4.

4.2. Workloads

In order to evaluate the system, a variety of websites were selected as workloads. These e-commerce solutions were chosen from different domains which comprised of different levels of user experiences. These experiences could be differed according to the information that is presented or the selection criteria that were provided or the alignments of the view panel.

The sites that were created based on the workloads showed that the differences in the domains did not affect the outcome. The accuracy of the decisions and each number of competitors. Table 4.1 and Figure 4.1 show the created workload and the results according to the domain. From the results, it is shown that the developed tool is not dependent on the domain it is used, and it provided more than a 70% accuracy per domain. This is proven that this framework would be used in any domain.
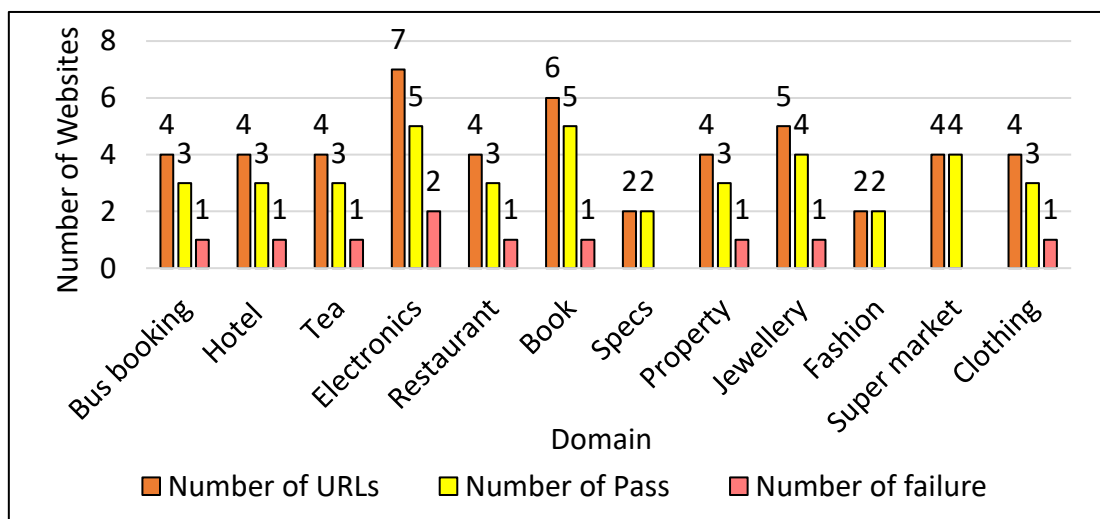
Figure 4.1: Workload Characterization

Table 4.1: Workload Characterization

Domain	Number of URLs	Number of Passes	Number of Failures	Percentage of Pass Rate
Bus booking	4	3	1	75 %
Hotel	4	3	1	75 %
Tea	4	3	1	75 %
Electronics	7	5	2	71%
Restaurant	4	3	1	75%
Book	6	5	1	83%
Specs	2	2		100%
Property	4	3	1	75%
Jewellery	5	4	1	75%
Fashion	2	2		100%
Super market	4	4		100%
Clothing	4	3	1	75%

4.3. Performance Evaluation

Table 4.2 shows the workload results captured during the evaluation. The results include several keywords and the average time it took to gather them. The system parameters used to evaluate the proposed system are Processor: Intel(R) Core (TM) i7-2630QM CPU @ 2.00GHz, System Type: 64 bit, Random Access Memory: 8.00 GB and Operating System: Windows 10.

Based on the evaluated results, it was identified that average processing time per keyword is around 2min 30 seconds. This includes collecting competitors and analysing their e-commerce implementation. On the average case, it is expected to include 30 keywords per commerce site. By using this analysed information, the system would be able to build a workable system within 1 hour and 15 mins. The execution time is depended on the keywords it searches for, example: If the keyword is a commonly available product such as a mug, t-shirt, laptops, etc. the competitor count would be high.

Table 4.2: Performance Evaluation

Number of Keywords	Time Taken to Process on Average
4	20 minutes
10	40 minutes
30	60 minutes
40	90 minutes

The total execution time varies based on the number of competitor count. Figure 4.2 shows the graphical representation of the performance results.
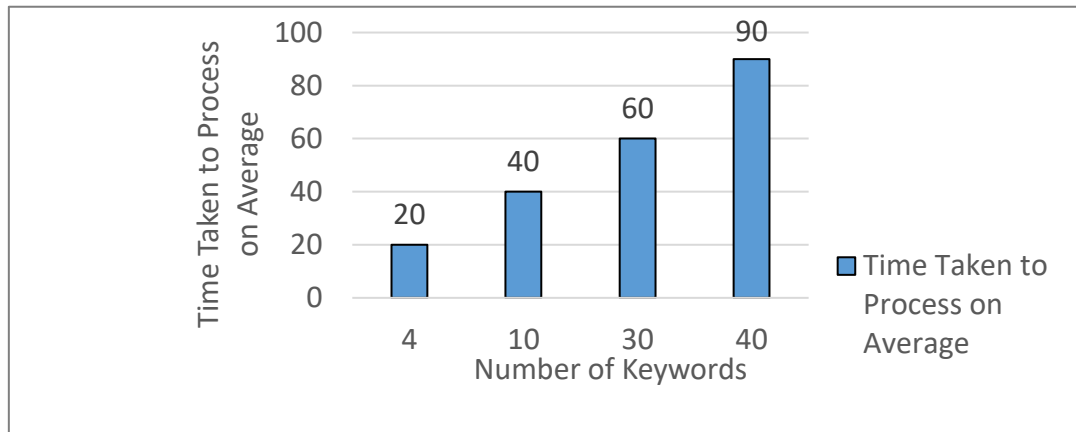
Figure 4.2: Performance Evaluation

4.4. Accuracy Level Evaluation and Results

Existing websites were used for the evaluation process. The categories such as "men, women, accessories, electronic, etc." were considered as keywords, and the number of products under these categories are considered as a weighted average for those categories. The fifty websites listed below in Table 4.3 are used for the evaluation.

Table 4.3: Accuracy Level Evaluation Results

	e-commerce (URL)	Background Colour Decision	Menu Style Decision	Width Decision	Number of Product Decision
1.	https://coolplanet.lk/	Pass	Pass	Pass	Pass
2.	https://www.weddingconnections.lk	Pass	Pass	Pass	Pass
3.	https://www.busbooking.lk/	Pass	Pass	Pass	Pass
4.	http://www.bogawantalawa.com/	Pass	Pass	Pass	Pass
5.	https://www.talawakelleteas.com/	Pass	Pass	Pass	Pass
6.	http://www.malwatte.lk/	Pass	Pass	Pass	Pass
7.	https://www.halpetea.com/	Pass	Pass	Pass	Pass
8.	https://www.zestaceylontea.com/	Pass	Pass	Pass	Pass
9.	http://www.ceylonta.com/en/	Pass	Pass	Pass	Pass
10.	https://www.singersl.com	Pass	Failed	Pass	Pass
11.	https://www.shanmugas.com/	Pass	Pass	Pass	Pass
12.	https://www.sarasavi.lk/	Pass	Pass	Pass	Pass
13.	http://pragnabooks.com/index.php/home/	Pass	Pass	Pass	Pass

14.	https://www.jeyabookcentre.com/	Pass	Pass	Pass	Pass
15.	https://www.brother-usa.com/home	Pass	Pass	Pass	Pass
16.	https://hxdchina.en.made-in-china.com/	Pass	Pass	Pass	Pass
17.	http://www.anomaopticians.lk/	Pass	Pass	Pass	Pass
18.	https://www.visioncare.lk/	Pass	Pass	Pass	Pass
19.	http://www.georgegooneratne.lk/	Pass	Pass	Pass	Pass
20.	https://www.titanworld.com/lk-en/	Pass	Failed	Pass	Failed
21.	https://www.lankapropertyweb.com/	Pass	Pass	Pass	Failed
22.	http://www.simplyproperty.lk/	Pass	Pass	Pass	Pass
23.	http://www.voguejewellers.lk/	Failed	Pass	Pass	Pass
24.	http://nithyakalyani.com/?SID=cc61eef71d99b05ceb7442a91595458b	Pass	Pass	Pass	Pass
25.	https://www.keellssuper.com/	Pass	Pass	Pass	Pass
26.	http://www.hayeshajewellers.com/	Pass	Pass	Pass	Pass
27.	http://www.renellejewellery.com/	Pass	Pass	Pass	Pass
28.	https://www.lankalaptophouse.com/	Pass	Pass	Pass	Pass
29.	https://www.laptop.lk/	Pass	Pass	Pass	Pass
30.	http://www.nanotek.lk/	Pass	Pass	Pass	Pass
31.	http://www.japansoft.lk/	Pass	Pass	Failed	Failed
32.	https://speedtech.lk/	Pass	Pass	Pass	Pass
33.	https://www.epsi.lk	Pass	Pass	Pass	Pass
34.	http://www.lap.lk/	Pass	Pass	Pass	Pass
35.	https://aiprintingsolutions.com/	Pass	Pass	Pass	Pass
36.	https://www.krish.com.lk/	Failed	Failed	Pass	Pass
37.	https://toy-mart.business.site/	Pass	Pass	Pass	Pass
38.	http://www.panther.lk/	Failed	Failed	Failed	Failed
39.	https://lk.oriflame.com/	Pass	Pass	Pass	Pass
40.	http://www.glamours.lk/	Pass	Pass	Pass	Pass
41.	https://www.britishcosmetics.lk/	Pass	Failed	Failed	Failed
42.	https://viana.lk/	Pass	Pass	Pass	Pass
43.	https://divas.lk/	Pass	Pass	Pass	Pass
44.	https://thelover.lk/	Pass	Pass	Pass	Pass
45.	https://www.healthguard.lk	Failed	Failed	Failed	Failed
46.	https://www.kleenpark.com/	Pass	Pass	Pass	Pass
47.	https://www.yamu.lk/	Failed	Pass	Failed	Failed
48.	http://www.willsdesign.lk/	Pass	Pass	Pass	Pass
49.	http://arthurdesilvajewellers.com/	Pass	Pass	Pass	Pass
50.	http://www.nolimit.lk/	Pass	Pass	Pass	Pass

The websites versus the results according to decision points elaborated in the table. The summary of each decision points is shown in Table 4.4 and Figure 4.3.

Table 4.4: Decision Vs Results Summary

Decision	Background Colour Decision	Menu Style Decision	Width Decision	Number of Product Decision
Pass	45	44	45	43
Fail	5	6	5	7
Total	50	50	50	50

$$Background\ color\ decision\ success\ rate = \left(\frac{45}{50}\right) * 100 = 90\%$$

$$Menu\ style\ decision\ success\ rate = \left(\frac{44}{50}\right) * 100 = 88\%$$

$$Width\ decision\ success\ rate = \left(\frac{45}{50}\right) * 100 = 90\%$$

$$Number\ of\ product\ decision\ success\ rate = \left(\frac{45}{50}\right) * 100 = 90\%$$

During the evaluation, it was noticed that 90% of the websites' decision on background colour match with the decision made by the system. The 88% of menu style decision same as system generated menu decision. 90% of width decision same as system generated decision. 86% of the number of product decision same as system generated.
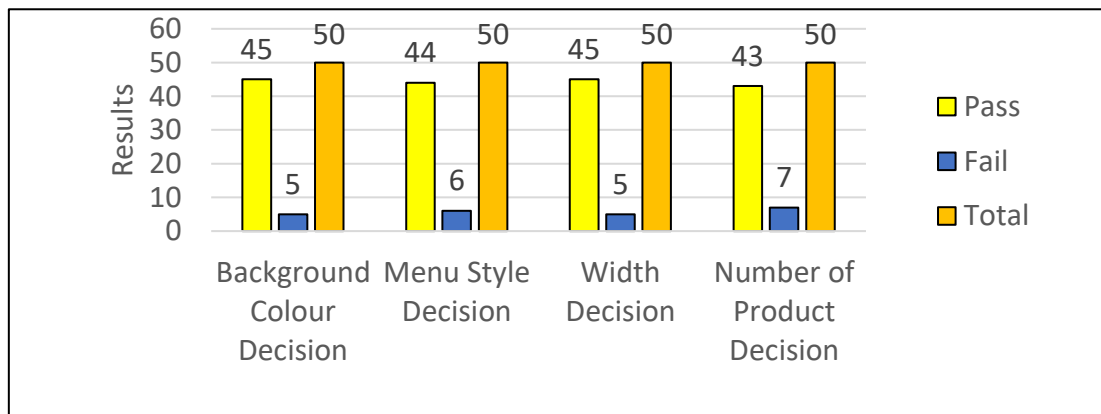
Figure 4.3: Summery of Decision vs Results

A new requirement traverse through the system has 80% of the chance of developing a good e-commerce solution. There is only a 20% chance for poor design. The e-commerce requirement with a high unique product or service has a high possibility for the failure to reach customer expectation. Since the actual approach of identifying keywords and the weighted average differs from the way the system is evaluated, the accuracy of the results may vary.

4.5. System Evaluation

The system is evaluated on the perspective of the system, implemented e-commerce solution and worthiness of the system on future perspective. In order to evaluate the system; the questions on the following point of views such as maintainability, time saving, and understandability of the system are included. For the perspective of evaluating the implemented e-commerce solution the questions on the following area has been included maintainability of the implemented e-commerce solution, acceptability of the e-commerce solution by the client, suitable to the domain, and uniqueness. In order to identify the future perspective; a couple of questions included in the following perspective, such as boring and challenging tasks got automated provide room for cutting edge design and allow research and development.

For that purpose questionnaire with 20 questions is used. 20 people selected from industry including 13 developers, 5 quality assurance engineers 2 project manager. The people are allowed to go through the system, results, and findings before filling the questionnaire. Each question made with Likert scale 1-5. The scales are as follows: 1-Strongly Agree,2-Agree,3-Neutral,4-Disagree, and 5-Strongly Disagree.

The questionnaire which is used to capture the information is presented in Appendix A, and the results gathered from the users are presented in Appendix A. The Appendix-A shows the questions versus response collected from 20 practitioners. 15 developers, 5 quality assurance, and 2 project managers are included in the analysis. The results collected are presented.

The results are analysed. Average of all 20 questions are less than 2. The people who received the questionnaire are from different expertise. The above results show that the practitioners who reviewed the system are happy about the system in all analysed perspective. As showed in Figure 4.4, the results got from developers, Project Managers and Quality Assurance for all 20 questions are on average less than 2. The average of the total of 20 people for all 20 questions also less than 2.
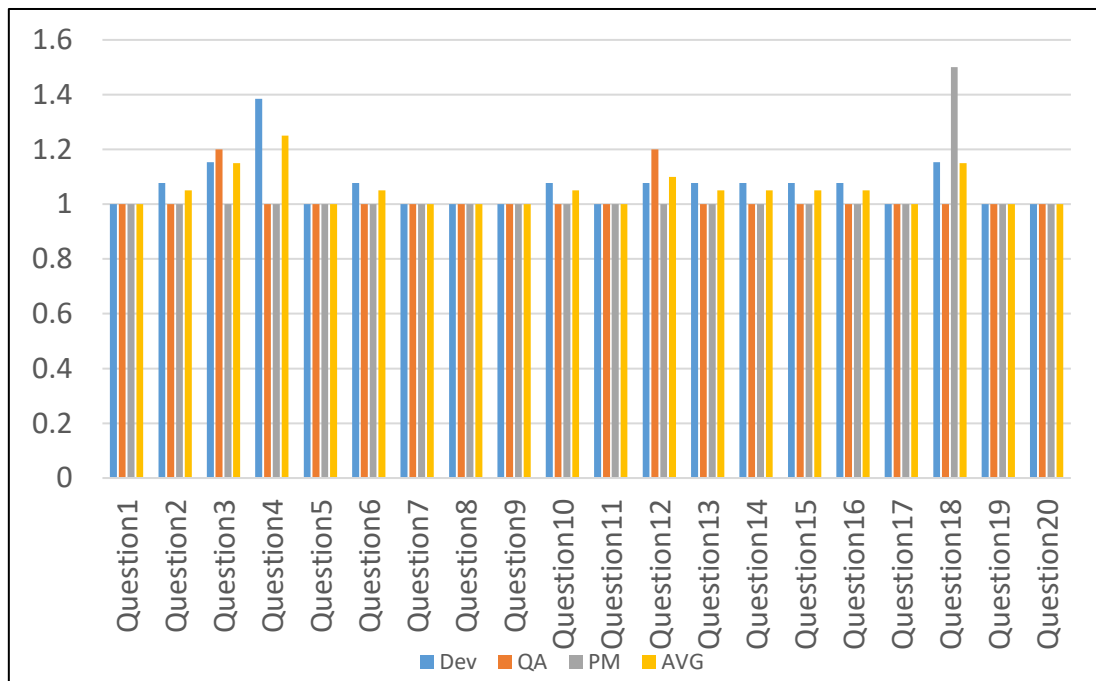
Figure 4.4: Question vs Response

The response of the questionnaire from the practitioners is proving that this system is mostly welcome to the industry. Since the results from the questionnaire show the system is maintainable, understandable, and time saving. The each implemented e-commerce solution by the system is acceptable by the client, suitable to the domain, and unique. On the future perspective, the system is proven that the value for money needs to be spent to the system will be paid back with the cost saving; the system allows the team to focus on cutting edge technologies on design decisions which provide the implemented e-commerce solution to be mostly loveable by the public.

From the evaluation results, the motivation behind the future work is high. The questions related to future work such as recommendation for spending time and money, the recommendation for automating maintenance also getting less than 2 on average.

The reason behind the appreciation of the research is most repetitive and most challenging tasks are getting automated. With the automation of repetitive tasks, there will be huge time available for research and development on cutting edge design and user attraction, which is not possible with current deadlines. The difficult part in the e-commerce solution implementation lifecycle is getting the approval of the design from the client and identify the domain. Both are getting handled very smooth manner with this research. The main burden from the automation is bringing the fear of job losses among practitioners. However, in this research, the attractiveness of the e-commerce solution would highly depend on how good the CSS and html provided, and the new trend CSS needs to be updated. So there would be always the research and development part is available. The job role of an individual is twined up from boring to interesting. Beyond everything, each module in this research can be used partially even though not fully automated.

4.6. Summary

The system evaluated with different categories of the domain. The conclusion of the workload is that the system is eligible for all the evaluated domain. The performance evaluation is conducted with a different number of keywords. The average time for the keyword to analyse the competitor is 2 mins and 30 seconds. There will be 30 keywords on average, so one hour and 15 mins take to analyse the competitor's decision. The system evaluated using existing e-commerce solutions for accuracy level. The calculated accuracy level is 80 %. The system further evaluated for usability, maintainability, extendibility. Cost cutting, fast delivery, etc. are using questionnaire from development, quality assurance, and project manager. The average response is explained.

5. CONCLUSION

5.1. Introduction

Section 5.2 discusses the contribution of the study, recommendations for this study present in section 5.3, research implication presents in section 5.4, in section 5.5 presents limitations of this study and future work presents in section 5.6.

5.2. Contribution

This research is proof of concept for this approach to competitor analysis and UI decision making. Though it is focused on a few decisions, including menu decision, home page alignment decision, especially the number of products per page and background colour decision. Every decision that needs to be taken to create an e-commerce solution can be taken the same way as explained in future work. The research further explains that an e-commerce site can be automatically created, and the decisions can be applied to it. The research explains that the relevant data can be taken from the database and shows that the solution is to generate an e-commerce solution with less human resources, with less time and money.

In chapter one, the background of the research, motivation towards the problem, problem statement and existing approaches are discussed. Chapter two further explains the existing possible platforms, the way of analysing e-commerce solutions after the build and xpath learning. Chapter three provides the high-level architecture of the solution; the activities used to achieve the solution, chosen technologies, and processes how the application works. Chapter four further explains the implementation and code snippets. Chapter five evaluates the system on accuracy, error rates and workload error and further describes the workload created to evaluate the system.

5.3. Less Human Intervention

One of the main objectives of the research is reducing human involvement. From database processing towards keywords and weighted average calculation, collect competitors, analyse competitors' decision, finalise UI decision up to create e-commerce, can be done by automating Magento each process is done automatically

without human involvement. Once the e-commerce solution is created, addressing the clients' feedback is a manual process.

5.4. Limitation

In this research, the author only considered a few parameters, so any decisions are limited to those parameters. The results presented and evaluated here are based on category and number of products under the category. However, the actual system is implemented by extracting the database and product details and sales percentage, which is more accurate and relevant to the business.

5.5. Challenges

This research has its challenges, especially in restaurants. For example, some foods are defined using different names in different establishments. Similarly, in services, the well customizable service providers find it difficult to implement this approach. Businesses which name their products in a unique manner and businesses that provide unique products are not eligible to create an e-commerce solution using this system.

5.6. Future Work

Decision points can be extended to the home page; more design decisions can be considered according to trend. Slider, video, ticker or promotional event details are a few of the possible enhancements in the future.

The product list page can be varied according to the category, and the product details page can be varied according to the product. The decisions on the product list page may carry the decisions such as the number of products per page, height of the page, full-width or narrowed width, and customizability. The product list page may have options to provide change, look and feel, colour options, size options, and customizability options. Either in product detail or product list, the above detailed features should be limited towards product type and product group type.

Similarly, with the deployment, the protected URL released to the client is attached to Google questionnaire. The feedback collected from Google questionnaire can be considered as the final decision, and the previous decision can be revert to a new decision.

The maintenance of the e-commerce solution can be automated in various areas. The product with zero inventory and the category with zero sub-categories or zero products can be dynamically removed. Google analytics should be monitored twenty-four seven, and any abnormal changes should be critically evaluated. The changes identified that need UI modification could be amended with client approval. The analytics, which is a result of bad business practices, can be sent to the client automatically via e-mail and SMS.

Furthermore, social media can be monitored twenty-four seven for public activity towards the business. A weekly analysis report can be provided to the business highlighting the positive and negative comments spreading among users. The business can then react to negative spreading comments, and the positive comments provide more user preferences and location to promote.

The e-commerce solution can be monitored for sales, customer visit and purchase history. The recommendation provided to a business on product versus the location is reached and potential areas. Future decisions based on customer records. There will be a possibility of load balancing at high peak time in order to provide fast response, and on the other hand, reduce replicas on idle time in order to manage resources.

E-commerce solution can be provided and personalised on the user perspective; the users' interaction in e-commerce solutions can be actively monitored and stored in a separate database. When the user revisits the site, once the same user back, the products aligned in the home page, product list page, and product detail page can be aligned as a custom page for that user according to their preference. Users who logged in to the system can be tracked through their username, and the visitors can be traced through IP address, which is representative to the specific location.

5.7. Recommendation for Future work

This is a real challenge facing in the industry in day to day life, and the challenging question to answer is "How many e-commerce sites available in the market are high quality and getting good analytics". Since the depth of the problem is strong and the available research in this area is limited, so the research in this area is highly recommended in the future.

REFERENCES

[1] "Start, grow, and scale your business - Shopify", *Shopify*, 2019. [Online]. Available: https://www.shopify.com/. [Accessed: 10- Jul- 2019]

[2] "Start Your Online Store", Weebly.com, 2018. [Online]. Available:https://www.weebly.com. [Accessed: 03- Jan- 2019].

[3] "Ecwid: #1 Free and Easy E-commerce Shopping Cart Solution - Try Ecwid Today!", Ecwid | E-Commerce Shopping Cart, 2018. [Online]. Available: https://www.ecwid.com/. [Accessed: 03- Jan-2019].

[4] "BigCommerce: Ecommerce Platform & Shopping Cart Software", Bigcommerce, 2018. [Online] Available: https://www.bigcommerce.com. [Accessed: 03- Jan- 2018].

[5] "Ecommerce Website Store & Shopping Cart Software | Volusion", Volusion.com, 2019. [Online]. Available: https://www.volusion.com/v1/. [Accessed: 10- Jul- 2019].

[6] "Create an eCommerce Website | Online Store Builder | Wix.com", Create an eCommerce Website | Online Store Builder | Wix.com, 2018. [Online]. Available: http://www.wix.com. [Accessed: 03-Jan- 2018

[7] Bluehost.com, 2018. [Online]. Available: https://www.bluehost.com/products/woocommerce. [Accessed: 03- Jan- 2018].

[8] Godwin J. Udo & Gerald P. Marquis (2002) Factors Affecting E-Commerce Web Site Effectiveness, Journal of Computer Information Systems, 42:2, 10-16, DOI: 10.1080/08874417.2002.11647481.

[9] B. Beier and M. W. Vaughan, "The bull's eye," *Ind. Eng. Chem.*, vol. 10, no. 9, p. 674, 1918.

[10] Zhu, W. M. J. Smith, G. Salvendy, D. Harris, & R. J. Koubek," Designing and evaluating a Web-based collaboration application: A case study, in Usability evaluation and interface design: Cognitive engineering, intelligent agents, and virtual reality", Vol. 1, Erlbaum, Mahwah, NJ, 2001, 838-842

[11] Zhao X., Zou Y., Hawkins J., Madapusi B. (2007), "A Business-Process-Driven Approach for Generating E-Commerce User Interfaces. In: Engels G., Opdyke B., Schmidt D.C., Weil F. (eds) Model Driven Engineering Languages and Systems. MODELS 2007. Lecture Notes in Computer Science", vol 4735. Springer, Berlin, Heidelberg

[12] J. Nichols and A. Faulring, "Automatic Interface Generation and Future User Interface Tools," Interfaces (Providence)., no. Scheme 2, pp. 1843–1853, 2005.

[13] R. Rozin and L. Magnusson, "Processes and methodologies for creating a global business-to-business brand", *Journal of Brand Management*, vol. 10, no. 3, pp. 185-207, 2003. Available: 10.1057/palgrave.bm.2540116

[14] V. Hollink, M. van Someren and B. Wielinga, "Navigation behavior models for link structure optimization", *User Modeling and User-Adapted Interaction*, vol. 17, no. 4, pp. 339-377, 2007. Available: 10.1007/s11257-007-9030-0

[15] G. Stenzel and K. Wolfram, "(12) Patent Application Publication (10) Pub. No.: US 2004/0095383 A1," vol. 1, no. 19, 2004.

[16] Roger Hallowell (2001) "Scalability": the paradox of human resources in e-commerce", *International Journal of Service Industry Management*, Vol. 12 No. 1, pp. 34-43

[17] T. Dinev and P. Hart, "An extended privacy calculus model for e-commerce transactions," *Inf. Syst. Res.,* vol. 17, no. 1, pp. 61–80, 2006.

[18] F. Nah and S. Davis, "HCI research issues in e-commerce," *J. Electron. Commer. Res.*, vol. 3, no. 3, pp. 98–113, 2002.

[19] HASAN, L., MORRIS, A. and PROBETS, S., 2009." Using Google Analytics to evaluate the usability of e-commerce sites. IN: Kurosu, M. (ed.). Human Centered Design", HCII 2009, Lecture Notes in Computer Science 5619, pp. 697-706.

[20] A. Sivaji, A. G. Downe, M. F. Mazlan, S. T. Soo, and A. Abdullah, "Importance of incorporating fundamental usability with social & trust elements for e-commerce website," *ICBEIA 2011 - 2011 Int. Conf. Business*, Eng. Ind. Appl., pp. 221–226, 2011.

[21] C. J. Carmona, S. Ramírez-Gallego, F. Torres, E. Bernal, M. J. Del Jesus, and S. García, "Web usage mining to improve the design of an e-commerce website: OrOliveSur.com," *Expert Syst. Appl.*, vol. 39, no. 12, pp. 11243–11249, 2012.

[22] E. K. R. E. H. Associate, "The content and design of web sites : an empirical study*," Inf. Manag.*, vol. 37, no. July 1999, pp. 123–134, 2000.

[23] A. Stefani and M. Xenos, "A model for assessing the quality of e-commerce systems," *Proc. PC-HCI 2001 Conf. Hum. Comput. Interact. Patras*, no. December, pp. 105–109, 2001.

[24] M. Cao, Q. Zhang, and J. Seydel, "B2C e-commerce web site quality: An empirical examination", *Ind. Manag. Data Syst*., vol. 105, no. 5, pp. 645–661, 2005.

[25] Y. Purwati, "Standard Features of E-Commerce User Interface for the Web," J. Arts, Sci. Commer, vol. II, no. 3, pp. 2231–4172, 2011.

[26] R. W. Proctor, K.-P. L. Vu, L. J. Najjar, M. W. Vaughan, and G. Salvendy, "Content preparation and management for e-commerce Web sites," *Commun. ACM*, vol. 46, no. 12, p. 289, 2004.

[27] T. Wallace, "Omni-Channel Retail and The Future of Commerce [2017 Data]", The BigCommerce Blog, 2017. [Online]. Available: https://www.bigcommerce.com [Accessed: 23- Nov-2018].

[28] Faramarz Damanpour and Jamshid Ali Damanpour (2001) "E-business e-commerce evolution: perspective and strategy", *Managerial Finance*, Vol. 27 No. 7, pp. 16-33

[29] "Online Shopping Vs. Offline Shopping. Trends and Future Development Predictions", Bright Vessel, 2019. [Online]. Available: https://www.brightvessel.com/online-shopping-vs-offline-shopping-trends/. [Accessed: 23- Nov- 2017].

[30] S. J. Barnes, "The mobile commerce value chain: Analysis and future developments," *Int. J. Inf. Manage.*, vol. 22, no. 2, pp. 91–108, 2002.

[31] M. R. Rahimi, J. Ren, C. H. Liu, A. V. Vasilakos, and N. Venkatasubramanian, "Mobile cloud computing: A survey, state of art and future directions," *Mob. Networks Appl.*, vol. 19, no. 2, pp. 133–143, 2014.

[32] P. E. Kourouthanassis and G. M. Giaglis, "Introduction to the Special Issue Mobile Commerce: The Past, Present, and Future of Mobile Commerce Research," *Int. J. Electron. Commer.*, vol. 16, no. 4, pp. 5–18, 2012.

[33] M. Limayem, M. Khalifa, and A. Frini, "What makes consumers buy from Internet? A longitudinal study of online shopping," *IEEE Trans. Syst. Man, Cybern. Part ASystems Humans.*, vol. 30, no. 4, pp. 421–432, 2000.

[34] E. G. Publishing, E. Group, P. Limited, A. R. Reserved, O. Url, and E. Uri, "Understanding how Millennial shoppers decide what to buy : digitally connected unseen journeys. International Journal of Retail and Distribution" Management, 45 (5). pp .," 2017.

[35] R. M. Al-tal, "Electronic Commerce deployment, motivations, and satisfaction : A qualitative perspective," no. October 2016, 2019.

[36] Z. Huang and M. Benyoucef, "From e-commerce to social commerce: A close look at design features", Electron. Commer. Res. Appl., vol. 12, no. 4, pp. 246–259, 2013.

[37] Ahn, T., Ryu, S., and Han, I. "The impact of Web quality and playfulness on user acceptance of online retailing. Information & Management", 44, 3, 2007, 263–275. AIMC. 211.

[38] J. Pane and B. Myers, "Usability Issues in the Design of Novice Programming Systems," *Education*, no. August, p. 78, 1996.

[39] S. J. Barnes and R. T. Vidgen, "An Integrative Approach to the Assessment of E-Commerce," *J. Electron. Commer. Res.*, vol. 3, no. 3, pp. 114–127, 2002.

[40] B. Susser and T. Ariga, "Teaching e-commerce Web page evaluation and design: a pilot study using tourism destination sites," *Comput. Educ.*, vol. 47, no. 4, pp. 399–413, 2006.

[41] S. J. Barnes and R. T. Vidgen, "Data triangulation and web quality metrics: A case study in e-government," *Inf. Manag.*, vol. 43, no. 6, pp. 767–777, 2006.

[42] Z. Huang and M. Benyoucef, "From e-commerce to social commerce: A close look at design features," *Electron. Commer. Res. Appl.*, vol. 12, no. 4, pp. 246–259, 2013.

[43] N. Ibrahim, M. F. Shiratuddin, and K. W. Wong, "A dual-route concept of persuasive User Interface (UI) design", Int. Conf. Res. Innov. Inf. Syst. ICRIIS, no. November, pp. 422–427, 2013.

[44] Fenech, T., and O'Cass, "A. Internet users' adoption of Web retailing: user and product dimensions. Journal of Product and Brand Management", 10, 6, 2001, 361–381

[45] Hasle, P., "Persuasive design: a different approach to information systems (and information)". Library Hi Tech. 2011. 29(4): p. 569- 572.

[46] Dholakia, R. R., and Uusitalo, O.," Switching to electronic stores: consumer characteristics and the perception of shopping benefits. International Journal of Retail & Distribution Management", 30, 10, 2002, 459–469.

[47] Kim, H. and Fesenmaier, D.R., "Persuasive Design of Destination Web Sites: An Analysis of First Impression", *Journal of Travel Research*. 2008. 47(1): p. 3-13.

[48] T.Anton, "XPath-Wrapper Induction by generalizing tree traversal patterns", n *Lernen, Wissensentdeckung und Adaptivitt (LWA).* 2005. 126-133.

[49] N. Laranjeiro, M. Vieira, and H. Madeira, "A learning-based approach to secure web services from SQL/XPath Injection attacks," *Proc. - 16th IEEE Pacific Rim Int. Symp. Dependable Comput. PRDC 2010*, no. May 2014, pp. 191–198, 2010.

[50] N. Antunes, N. Laranjeiro, M. Vieira, and H. Madeira, "Effective detection of SQL/XPath Injection vulnerabilities in web services," *SCC 2009 - 2009 IEEE Int. Conf. Serv. Comput.*, pp. 260–267, 2009.

[51] N. Antunes, N. Laranjeiro, M. Vieira, and H. Madeira, "Effective detection of SQL/XPath Injection vulnerabilities in web services," *SCC 2009 - 2009 IEEE Int. Conf. Serv. Comput.*, pp. 260–267, 2009.

[52] Layla Hasan, Anne Morris, and Steve Probets, 'Using Google Analytics to evaluate the usability of e-commerce site', M. Kurosu (Ed.): Human Centered Design, HCII 2009, LNCS 5619, pp. 697–706, 2009.

[53] N. Kassim and nor Asiah Abdullah, "The effect of perceived service quality dimensions on customer satisfaction, trust, and loyalty in e-commerce settings: A cross cultural analysis," *Asia Pacific J. Mark. Logist.*, vol. 22, no. 3, pp. 351–371, 2010.

[54] S. S. Srinivasan, R. Anderson, and K. Ponnavolu, "Customer loyalty in e-commerce: An exploration of its antecedents and consequences," *J. Retail.*, vol. 78, no. 1, pp. 41–50, 2002.

[55] J. Grandgirard, D. Poinsot, L. Krespi, J. P. Nénon, and A. M. Cortesero, "Costs of secondary parasitism in the facultative hyperparasitoid Pachycrepoideus dubius: Does host size matter?," *Entomol. Exp. Appl.*, vol. 103, no. 3, pp. 239–248, 2002.

[56] S. Hughes, P. Brusilovsky, and M. Lewis, "Adaptive Navigation Support in 3D E-Commerce Activities," *Hum. Factors*, pp. 132–139, 2002.

[57] Y. Zhao, Y. Cen, and S. Bhatnagar, "Chapter 5 – Recommender Systems in R," *Data Min. Appl. with R*, pp. 117–151, 2014.

[58] M. Goodarzian-Ghahfarokhi, C. Mansouri-Far, M. Saeidi, and M. Abdoli, "Different physiological and biochemical responses in maize hybrids subjected to drought stress at vegetative and reproductive stages," *Acta Biol. Szeged.*, vol. 60, no. 1, pp. 27–37, 2016.

[59] M. Bernard and X, "Usability News - 4 . 1 2002 -- Examining User Expectations for the Location of Common E-Commerce Web Objects Examining User Expectations for the Location of Common E-Commerce Web Objects Usability News - 4 . 1 2002 -- Examining User Expectations for the L," pp. 1–8, 2004.

[60] G. A., M. H.B., M. R.E., and N. M.D., "E-commerce and its impact on operations management," *Int. J. Prod. Econ.*, vol. 75, no. 1–2, pp. 185–197, 2002.

[61] A. Mittal, "E-commerce: It's Impact on consumer Behavior," *Glob. J. Manag. Bus. Stud.*, vol. 3, no. 2, pp. 131–138, 2013.

[62] F. N. Egger, "'Trust Me, I'm an Online Vendor': Towards a Model of Trust for E-Commerce System Design," *J. Pers.*, pp. 1–2, 2000.

[63] W. W. Moe and P. S. Fader, "Dynamic Conversion Behavior at E-Commerce Sites," *Manage. Sci.*, vol. 50, no. 3, pp. 326–335, 2004.

[64] R. E. Anderson and S. S. Srinivasan, "E-Satisfaction and E-Loyalty: A Contingency Framework," *Psychol. Mark.*, vol. 20, no. 2, pp. 123–138, 2003.

[65] D. J. Kim, D. L. Ferrin, and H. Raghav Rao, "Trust and satisfaction, two stepping stones for successful e-commerce relationships: A longitudinal exploration," *Inf. Syst. Res.*, vol. 20, no. 2, pp. 237–257, 2009.

[66] G. Gkotsis, K. Stepanyan, A. I. Cristea, and M. Joy, 'Entropy-based automated wrapper generation for weblog data extraction', World Wide Web, vol. 17, no. 4, pp. 827–846, 2014.

[67] Baumgartner, R., Flesca, S., Gottlob, G.: Visual web information extraction with lixto. In: Proceedings of the 27th International Conference on Very Large Data Bases, VLDB '01, pp. 119–128. Morgan Kaufmann Publishers Inc., San Francisco (2001)

[68] Magestore.com. (2019). Magento Community edition features. [online] Available at: https://www.magestore.com [Accessed 20 May 2019].

[69] Yii Framework. (2019). Yii Framework. [online] Available at: https://www.yiiframework.com [Accessed 22 May 2019].

[70] Analytics.google.com. (2019). Google Analytics [online] Available at: https://analytics.google.com/analytics [Accessed 20 May 2019].

[71] WordPress.com. (2019). Features to help you publish anything, anywhere. [online] Available at: https://wordpress.com/features/ [Accessed 21 May 2019].

[72] Joomla!. (2019). Joomla Content Management System (CMS) - try it for free! [online] Available at: https://www.joomla.org/ [Accessed 21 May 2019].

[73] Herrero Crespo, A. and Rodriguez del Bosque, I. (2010). The influence of the commercial features of the Internet on the adoption of e-commerce by consumers. Electronic Commerce Research and Applications, 9(6), pp.562-575.

[74] Podlogar, M. Consumer reactions to electronic shopping on the Internet: Study in Slovenia. In Presentations at the Annual International Graduate Consortium and Educational Symposium, Otocec, Slovenia, 1998.

[75] Bakos, Y., and Brynjolfsson, E. Bundling, and competition on the Internet. Marketing Science, 19, 1, 2000, 63–82.

[76] Ajzen, I., and Fishbein, M. Understanding Attitudes and Predicting Social Behavior. Prentice Hall, Englewood Cliffs, NJ, 1980

APPENDIX A: QUESTIONAIRRE AND RESULTS

1. *SURVEY QUESTIONNAIRE*

Q 1. This tool saves my time, and I can focus on critical				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q2. This tool develops a maintainable e-commerce solution				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q 3. The taken decisions are more accurate than the other options				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q4. This tool is implemented in a manner as it is expandable				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q 5. Spending money on this actual implementation is useful				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q6 This tool automates the boring, repetitive job				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
designing a template for the tool is interesting				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q8. This tool reduces the cost of implantation				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q 9. This tool allows more e-commerce solutions to be delivered in a short time				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q10. This tool motivates to R&D on the latest trend of UI/UX				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q11. The collected competitor's e-commerce solutions provide more information about trend and domain for manual reference				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q12. Automate e-commerce maintenance is recommended				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q 13. This tool shortens the wireframe acceptance process cycle				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q14. This tool shortens the QA cycle				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q 15. This tool shortens the time to reach the market				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q16. This tool reduces post launch issues.				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q 17. This tool allows work-life balance				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q18. The tool is understandable				

1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q 19. The tool is maintainable				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree
Q20. The tool is self-describable				
1. Strongly Agree	2.Agree	3. Neutral	4. Disagree	5. Strongly Disagree

2. QUESTION VS RESULTS

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Dev1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1
Dev2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1
Dev3	1	1	1	3	1	1	1	1	1	1	1	2	1	1	1	1	1	3	1	1
Dev4	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1
Dev5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dev6	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1
Dev7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dev8	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dev9	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1
Dev10	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dev11	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dev12	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dev13	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
QA1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
QA2	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1
QA3	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
QA4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
QA5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
PM1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1
PM2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
AVG	1	1.05	1.15	1.25	1	1.05	1	1	1	1.05	1	1.1	1.05	1.05	1.05	1.05	1	1.15	1	1

APPENDIX B: PSEUDO CODE

1. SQUARE DECISION

```
1    def find_squares(img, squares_path):
2        img = cv2.GaussianBlur(img, (5, 5), 0)
3        squares = []
4        square data = []
5        menu decision = ""
6        same size images set = []
7        for gray in cv2.split(img):
8            for thrs in xrange(0, 255, 26):
9                if thrs == 0:
10                   bin = cv2.Canny(gray, 0, 50, apertureSize=5)
11                   bin = cv2.dilate(bin, None)
12               else:
13                   retval, bin = cv2.threshold(gray, thrs, 255, cv2.THRESH_BINARY)
14               bin, contours, hierarchy = cv2.findContours(bin, cv2.RETR_LIST,
15    cv2.CHAIN_APPROX_SIMPLE)
16               i = 0
17               img width, img height, channels = img.shape
18               for cnt in contours:
19                   cnt_len = cv2.arcLength(cnt, True)
20                   cnt = cv2.approxPolyDP(cnt, 0.02 * cnt_len, True)
21                   if len(cnt) == 4 and cv2.contourArea(cnt) > 1000 and
22    cv2.isContourConvex(cnt):
23                       cnt = cnt.reshape(-1, 2)
24                       max_cos = np.max([angle_cos(cnt[i], cnt[(i + 1) % 4], cnt[(i + 2) %
25    4]) for i in xrange(4)])
26                       if max_cos < 0.1:
27                           squares.append(cnt)
28                           data = types.SimpleNamespace()
29                           tt = squares_path + '//' + str(i) + '.png'
30                           cv2.drawContours(img,squares,-1,(0,255,0), 3)
31                           cv2.imwrite(tt, img)
32                           data.max_x = max(cnt[0][1],cnt[1][1],cnt[2][1], cnt[2][1])
33                           data.min_x = min(cnt[0][1], cnt[1][1],cnt[2][1], cnt[2][1])
34                           data.width = data.max x - data.min x
35                           data.max_y=max(cnt[0][0],cnt[1][0], cnt[2][0],cnt[2][0])
36                           data.min_y=min(cnt[0][0], cnt[1][0], cnt[2][0], cnt[2][0])
37                           data.height = data.max_y - data.min_y
38                           if data.min_x <= 100:
39                               if data.width >= img width * 0.75 and img width <
40    data.width:
41
42                                   if img_width > img_height:
43                                       logging.info("top menu")
44                                       menu_decision = "top menu"
45                               elif data.width == img width:
46                                   menu_decision = "full screen top menu"
47                           square_data.append(data)
48                           try:
49                               if len(same size images set) > 0:
50                                   for kk, arr in enumerate(same size images set):
51
52                                       if arr[0].height == data.height and arr[0].width ==
53    data.width:
54                                           arr.append(data)
55                                           same_size_images_set[kk] = arr
56                                           break
57                                       elif kk == len(same size images set) - 1:
58
59    same_size_images_set.append([data])
60                                           break
61                               else:
62                                   same size images set.append([data])
63                           except Exception as e:
64                               logging.exception(e)
65                   i = i + 1
66           max len = 0
```

```
67          for arrr in same size images set:
68              if max len < len(arrr):
69                  max_len = len(arrr)
70                  product_size = arrr
71          product_per_row = int(img_width / product_size[0].width)- 1
72          product per column=int(img height/product size[0].height)-1
73          temp = {}
74          for square in square data:
75              if temp != {}:
76                  if temp.width<square.width and square.height<img_height *.70:
77                      temp = square
78              else:
79                  square.width = 0
80                  temp = square
81          if temp.width == 0:
82              if menu_decision == "":
83                  menu_decision = "side menu"
84          elif temp.width >= img width - 10:
85              menu decision = "full screen top menu"
86          else:
87              menu_decision = 'top menu'
88      return squares, product_per_column, product_per_row, menu_decision
```

2. ADD SUB CATEGORY

```
1   def add sub category(driver, category dto):
2       try:
3           driver.execute_script("window.scrollTo(0, 0)")
4           time.sleep(3)
5           elem =
6   driver.find element by xpath('//*[@id="add subcategory button"]')
7           elem.click()
8           driver.execute script("window.scrollTo(0, 0)")
9           time.sleep(3)
10          elem = driver.find_element_by_name('name')
11          elem.clear()
12          elem.send keys(category dto.category name)
13          logging.info("add sub category name filled")
14          try:
15              driver.execute_script("window.scrollTo(0, 400);")
16              elem = driver.find_element_by_xpath
17  ('//*[@id="container"]/div/div[1]/div[2]/div[5]/div[1]')
18          except TimeoutException as e:
19              logging.exception(e)
20          elem.click()
21          time.sleep(2)
22          for product_dto in category_dto.product_list:
23              elem = driver.find element by xpath
24  ('//*[@id="catalog category products filter name"]')
25              elem.clear()
26              elem.send_keys(product_dto.product_name)
27              elem =  driver.find_element_by_xpath
28  ('//*[@id="catalog_category_products_filter_price_from"]')
29              elem.clear()
30              elem.send keys(str(product dto.price))
31              elem = driver.find element by xpath
32  ('//*[@id="catalog_category_products_filter_price_to"]')
33              elem.clear()
34              elem.send_keys(str(product_dto.price))
35              elem = driver.find element by xpath
36  ('//*[@id="catalog category products"]/div[1]/div[2]/div[1]/button[1]')
37              elem.click()
38              time.sleep(4)
39              elem = driver.find_element_by_xpath
40  ('//*[@id="catalog category products table"]/thead/tr[1]/th[1]/input')
41              elem.click()
42              elem = driver.find_element_by_xpath
43  ('//*[@id="catalog_category_products"]/div[1]/div[2]/div[1]/button[2]')
44              elem.click()
```

```
45              time.sleep(2)
46              elem = driver.find element by xpath('//*[@id="save"]')
47              elem.click()
48              time.sleep(6)
49          except NoSuchElementException as e:
50              driver.refresh()
51              add sub category(driver, category dto)
52          except Exception as e:
53              logging.exception(e)
```

3. *ADD PRODUCT*

```
1   def add_product(product_dto, driver):
2       try:
3           navigate new product(driver)
4           driver.execute script("window.scrollTo(0, 0)")
5           time.sleep(3)
6           elem = driver.find_element_by_name('product[name]')
7           elem.clear()
8           elem.send keys(product dto.product name)
9           elem = driver.find element by name('product[sku]')
10          elem.clear()
11          elem.send keys(product dto.product name)
12          elem = driver.find_element_by_name('product[price]')
13          elem.clear()
14          elem.send keys(str(product dto.price))
15          elem=driver.find element by name('product[quantity and stock status][qty]')
16          elem.clear()
17          elem.send_keys(str(product_dto.quantity))
18          elem =
19   driver.find_element_by_xpath('//*[@id="container"]/div/div[2]/div[8]/div[1]')
20          elem.click()
21          time.sleep(4)
22          driver.execute script("window.scrollTo(0, 400)")
23          parent_elem = driver.find_element_by_xpath
24   ('//*[@id="container"]/div/div[2]/div[8]/div[2]/fieldset/div[1]/div')
25          for item in parent elem.find elements by class name("admin  control-
26   checkbox"):
27              if item.is selected():
28                  item.click()
29          elem = driver.find_element_by_xpath('//*[@id="save-button"]')
30          elem.click()
31          time.sleep(15)
32          try:
33              element = WebDriverWait(driver, 10).until(
34                  EC.presence of element located((By.XPATH,
35   '//*[@id="messages"]/div/div')))
36          except Exception as e:
37              logging.exception(e)
38      except NoSuchElementException as e:
39          driver.refresh()
40          add_product(product_dto, driver)
41      except Exception as e:
42          logging.exception(e)
```

4. CREATE WEBSITE

```
1   def create website(driver, activemq resource):
2       try:
3           website name = activemq resource.domain
4           website_code = activemq_resource.domain.replace(" ", "_")
5           navigate_store(driver)
6           elem = driver.find element by xpath('//*[@id="add"]')
7           elem.click()
8           time.sleep(4)
9           elem = driver.find element by xpath('//*[@id="website name"]')
10          elem.clear()
11          elem.send_keys(website_name)
12          elem = driver.find element by xpath('//*[@id="website code"]')
13          elem.clear()
14          elem.send keys(website code)
15          elem = driver.find_element_by_xpath('//*[@id="save"]')
16          elem.click()
17          time.sleep(15)
18          extract excel(activemq resource, driver, website name, website code)
19          append default store(driver, activemq resource)
20      except NoSuchElementException as e:
21          driver.refresh()
22          create_website(driver, activemq_resource)
23      except Exception as e:
24          logging.exception(e)
```

5. *CREATE STORE*

```
1   def create store(driver, website name, website code, activemq resource, country list,
2   product list):
3       try:
4           for item in product_list:
5               add_product(item, driver)
6           time.sleep(6)
7           for country dto in country list:
8               store name = website name+" "+ country dto.country name
9               store_code = website_code+"_"+ country_dto.country_name
10              navigate_store(driver)
11              elem= driver.find element by xpath(
12  '//*[@id="add group"]')
13              elem.click()
14              time.sleep(4)
15              select_element = Select(driver.find_element_by_xpath(
16  '//*[@id="group_website_id"]'))
17              select element.select by visible text(website name)
18              time.sleep(2)
19              elem = driver.find element by xpath(
20  '//*[@id="group_name"]')
21              elem.clear()
22              elem.send_keys(store_name)
23              time.sleep(2)
24              elem = driver.find element by xpath('//*[@id="group code"]')
25              elem.clear()
26              elem.send_keys(store_code)
27              time.sleep(2)
28              isChangeCurrencyDisplayed =
29  driver.find element by xpath('//*[@id="group root category id"]').is displayed()
30              if not isChangeCurrencyDisplayed:
31                  one = WebDriverWait(driver,
32  10).until(EC.element_to_be_clickable((By.XPATH,
33  '//*[@id="group_root_category_id"]')))
34                  one.click()
35              select element = WebDriverWait(driver,
36  10).until(EC.visibility of element located((By.XPATH,
37  '//*[@id="group_root_category_id"]')))
38              select = Select(select_element)
39              select.select_by_visible_text(root_category)
```

```
40          time.sleep(4)
41          elem = driver.find element by xpath('//*[@id="save"]')
42          elem.click()
43          time.sleep(26)
44          create_store_view(driver, store_name, store_name, store_code,
45  activemq resource)
46      except NoSuchElementException as e:
47          driver.refresh()
48          create_store(driver, website_name, website_code, activemq_resource,
49  country_list, product_list)
50      except Exception as e:
51          logging.exception(e)
```

6. *CREATE STOREVIEW*

```
1   def create store view(driver, store name, store view name, store view code,
2   activemq resource):
3       try:
4           navigate_store(driver)
5           elem = driver.find element by xpath('//*[@id="add store"]')
6           elem.click()
7           time.sleep(4)
8           select element =
9   Select(driver.find_element_by_xpath('//*[@id="store_group_id"]'))
10          select_element.select_by_visible_text(store_name)
11          time.sleep(2)
12          elem = driver.find element by xpath('//*[@id="store name"]')
13          elem.clear()
14          elem.send_keys(store_view_name)
15          time.sleep(2)
16          elem = driver.find_element_by_xpath('//*[@id="store_code"]')
17          elem.clear()
18          elem.send keys(store view code)
19          time.sleep(2)
20          select_element =
21  Select(driver.find_element_by_xpath('//*[@id="store_is_active"]'))
22          select element.select by visible text('Enabled')
23          time.sleep(2)
24          elem = driver.find element by xpath('//*[@id="save"]')
25          elem.click()
26          time.sleep(4)
27          elem = driver.find_element_by_xpath('//*[@id="html-
28  body"]/div[4]/aside/div[2]/footer/button[2]')
29          elem.click()
30          time.sleep(20)
31      except NoSuchElementException as e:
32          driver.refresh()
33          logging.exception(e)
34          create store view(driver, store name, store view name,
35  store view code, activemq resource)
36      except Exception as e:
37          logging.exception(e)
```