



BACS3074 ARTIFICIAL INTELLIGENCE

202205 Session, Year 2022/23

Assignment Documentation

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Programme: RDS

Tutorial Class: RDS1S3G3

Project Title: Robotic Process Automation

Module In-Charged:

LazadaSequence

LazadaAddToCart

AddDataToExcel(AddShopeeDataToExcel sequence, AddLazadaDataToExcel sequence, AddPrestoDataToExcel sequence)

Other team members' data		
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1. Introduction

1.1. Problem Background

In the twenty-first century, online shopping becomes increasingly popular as more Malaysian have started to shop online using their smartphones and the internet. Online shopping is a process of buying and selling products and services through the internet. The purpose of this project is to build a robot to automate the comparison first most relevant product on the search results page of the 3 shopping websites, which are Shopee, Lazada, and PrestoMall. The reason why we have chosen this objective is that we have discovered that most Malaysian have started to shop online since the COVID-19 pandemic and the online shopping behavior of Malaysian is considering product prices and ratings and comparing them side by side before purchasing. This is in fact time-consuming, tedious, and repetitive work, with our robot, humans will be able to utilize their time to do other more complex meaningful work that requires human logical thinking and cognitive skills instead.

1.2. Objectives/Aims

-To improve the efficiency of humans by automating the repetitive tedious tasks of browsing different shopping websites and recording product details one by one. With this robot, the human is only needed to type in the product they wished to search for and also select their choice on purchasing the cheapest or top-rated product.

-To improve the speed of getting the result of either the best price or best-rated product from 3 websites so that humans can save time and utilize the time to work on other work that required advanced problem-solving. The most current microprocessors can execute at least a

million instructions per second(Wikipedia,2022) which means the robot can work way more efficiently than a human does.

-To produce data for analysis on the cheapest product and top-rated products from each website.

-To add the best product(best price or best rated) to the receptive shopping website's cart or favorite list accurately.

-To eliminate human error, especially during data collection and data analysis on the product gotten from 3 websites

1.3. Motivation

-This project may help people to know more about robotic process automation. People might realize how they can reduce their time and effort by creating a simple robot.

- The project will give better understanding of concept of RPA to people not in IT field also, and realize how they can reduce their time and effort by creating a simple robot

-People can start to learn creating robots to automate their tasks such as daily spending or procurement activities and also sell the robot to people who need them at a high price and get earning from that

-The robot will not get tired so we can use the robot 24/7 ,it can be used as much as you want without needing to worry about the robot getting tired. Thus, it brings efficiency to heavy jobs which have multiple tasks.

-This robot somehow can reduce human error such that people might memorize the wrong product information causing an unwanted purchase. In this case, a robot can get better and more accurate information.

-Encourage people to buy online and take the most out of their time and effort

1.4. Timeline/Milestone

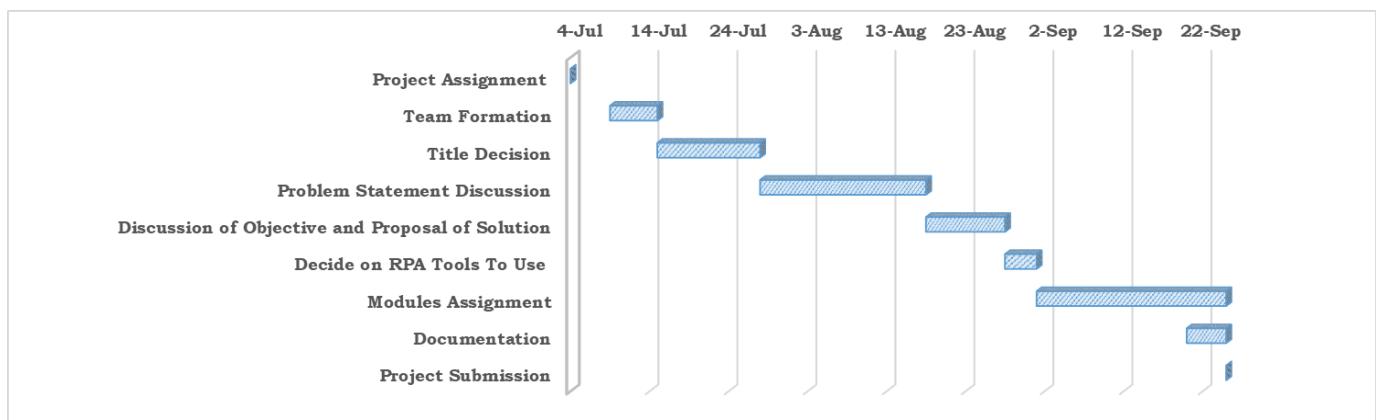


Figure 1: Gantt Chart

Table 1: Timeline Table

Event	Start date	End date
Project Assignment	4-Jul	4-Jul
Team Formation	9-Jul	15-Jul
Title Decision	15-Jul	28-Jul
Problem Statement Discussion	28-Jul	18-Aug
Discussion of Objective and Proposal of Solution	18-Aug	28-Aug
Decide on RPA Tools To Use	28-Aug	1-Sep
Modules Assignment	1-Sep	25-Sep
Documentation	20-Sep	25-Sep
Project Submission	25-Sep	25-Sep

3 Research Background

1.5. Background of the applications - Robotic Processing Automation(RPA)

Robotic Processing Automation is the use of software with the ai and machine learning capability to handle high-volume repetitive tasks that previously required humans to perform. RPA sticks to the front end of the system and carries out tasks without having to move to the back end. Some of these repetitive tedious tasks include the tracing query, making calculations, saving as records, and performing transactions. There are several misconceptions about RPA. RPA is not a humanoid robot, as it does not have a physical form and has no resemblance to humans. Also, RPA cannot replace humans or replicate human cognitive functions, as it does not have a brain itself, so it cannot perform logical or critical thinking as humans do.

The working of RPA typically includes four crucial phases: planning, development, deployment and testing, support, and maintenance. Firstly, the planning phase typically involves gathering the processes to be automated, identifying the test, and finalizing the implementation approach. Secondly, The development phase includes the creation of automation workflows as per the agreed plan. Thirdly, the deployment and testing phase is a vital phase, because it uncovers any unexpected outages and ensures a bug-free product. Lastly, the support and

maintenance phase ensures that the product is continuously updated with smooth deployment across the user base.

There are several types of RPA including unattended or autonomous RPA, attended RPA, and Hybrid RPA. Unattended RPA is ideal for reducing work like completing data processing tasks in the background. These bots can be launched using specified intervals, bot initiated, or data input. In attended RPA, the bots live on the user's machine and are triggered by the user. They can be launched using when embedded on an employee's device, auto-run based on conditions, or RPA client tools. Lastly, hybrid RPA as the name implied, it is a combination of attended and unattended bots. These bots address front and back office tasks in the enterprise

To meet the objective of RPA, tools are used, the RPA tools are software applications that configure tasks and automate them. Some of the popular RPA tools in the market are UiPath, Automation Anywhere, BluePrism, WorkFusion, Pega, and Redwood. When it comes to quality assurance. RPA ensures consistent error-free output, leading to reduce operational risks, and this in turn improves customer satisfaction. In the area of delivery, RPA can help to decrease the amount of handling time, this enhances the customer experience and ensures 24/7 business continuity. With respect to cost, according to NASSCOM, massive businesses can reduce the cost by up to 65% through RPA. It offers a higher revenue by driving positive returns within quarters as opposed to years. Other advantages of RPA include reduced training costs, minimal utilization of IT resources, and easier software migration.

Today, many domains and Industries like banking and finance, IT integration processes, human resources, insurance agencies, marketing and sales, and customer relationship management readily deployed RPA. RPA service has been showing tremendous growth since 2016 and will continue to increase beyond 2022. According to McKinsey research, the economic impact of 5 to 7 trillion dollars by the year 2025, will impact more than 230 million knowledge workers which cost 9% of the global workforce. Any company which is labor intensive where people are performing high volume and high transaction function stand the benefit the most with RPA options, boosting their capabilities and saving money and time.

1.6. Analysis of selected tool with any other relevant tools

Fill the table below and change the tools' names. You may add more columns.

Tools comparison	UiPath	Automation Anywhere	BluePrism
Type of license and open source license	-Community Edition -Automation developer -Unattended automation -Automation team -Enterprise edition	-Community Edition -Cloud Starter Pack -Advanced Pack -Enterprise A2019	-Basic -Cloud -Intelligent RPA

Year founded	2005	2003	2001
Founding company	Daniel Dines	Mihir Shukla, Neeti Mehta Shukla, Ankur Kothari, Rushabh Parmani	David Moss, Alastair Bathgate
License Pricing	<ul style="list-style-type: none"> -Free -\$420 per month -\$1380 per month -\$1930 per month -Customisable as per requirement 	<ul style="list-style-type: none"> -Free, -Start at \$750 per month -Customisable as per requirement(for both Advanced & Enterprise) 	<ul style="list-style-type: none"> -Free -Customisable as per requirement(for both Cloud & Intelligent RPA)
Supported features	<ul style="list-style-type: none"> -Business Process Control -Calendar Management -Customizable Dashboard -Data Management -Document Extraction -Graphical Workflow Editor -Mobile Access -Third Party Integrations -API -Business Process Automation -Data Capture and Transfer -Mis-Keyed Variation Detection -Move & Copy -Test Script Reviews -Web Data Extraction -Document Management -Multiple Data Sources -Parameterized Testing -Process Builder -Code-free Development -Data Retrieval -Hierarchical View -Image Capture -Task Management -Email Address Extraction -Optical Character Recognition(OCR) -Phone Number Extraction -Abbreviation Detection -Access Controls/Permissions -AI/Machine Learning -Image Extraction -Image Recognition -Reporting/Analytics -Workflow Configuration -Collaboration Tools -Integration into Third Party Applications -Attended Automation -Rules-Based Workflow -Unattended Automation -Web Services 	<ul style="list-style-type: none"> -Rules-Based Workflow -Business Process Automation -Drag & Drop -Workflow Management -Collaboration Tools -Optical Character Recognition -Process Builder -Code-free Development -Image Recognition and OCR -Reporting/Analytics -Third Party Integrations -Attended Automation -Unattended Automation -Task Editor -Report Designer -Trigger Manager -Automation Lifecycle Management -High Availability & Disaster Recovery (HA/DR) -Predictive Operational Analytics -Tray Notification with Numeric Indications - Cloud-Ready Architecture - Citrix Automation with AI-Sense -Recorders - Visualize Technology -Screen Scrapping or Web Data Extraction -Centralized Backup, Security & Disaster Recovery -Process inVision -Snap Point Icon -ROI Calculator in COE Dashboard 	<ul style="list-style-type: none"> -Secure & Accurate -Robust 24*7 Workforce -Analytics -Data Security & Abstraction -Provide Cloud Support -Execution Intelligence -Plug & Play Access -Work Queues -Digital Exchange -Dependency Tracking -Multi-Team Environments -Web API -Chrome Support -Firefox Browser Plug-in -New Outlook Email VBO -Tesseract OCR -Non-invasive Technology -Advanced Scheduler -Out of the Box API Integration
Common applications	<ul style="list-style-type: none"> -Information Technology & Services -Computer Software -Banking & financial services -Healthcare 	<ul style="list-style-type: none"> -Financial/Accounting -HR -Operations/IT -Sales -Marketing 	<ul style="list-style-type: none"> -Information Technology & Services -Retail -Computer Software -Financial Services

	<ul style="list-style-type: none"> -Insurance -Public sector -Manufacturing -Retail -Telecom -Higher Education -Oil & Energy 	<ul style="list-style-type: none"> -Manufacturing -Government -Healthcare -Consumer goods -Hospitality -Retail 	-Banking
Customer support	<ul style="list-style-type: none"> -Email/Help Desk -FAQs/Forum -Knowledge Base -Phone Support -Chat 	<ul style="list-style-type: none"> -Email/Help Desk -FAQs/Forum -Knowledge Base -Phone Support -24/7 (Live Rep) -Chat 	<ul style="list-style-type: none"> -Email/Help Desk -FAQs/Forum -Knowledge Base -Phone Support
Limitations	<ul style="list-style-type: none"> -People without programming knowledge might face difficulty in its use -Unable to handle huge data -Expensive 	<ul style="list-style-type: none"> -UI is complex, not suitable for beginner, only suitable for a well-trained developer. -It does not have an excellent debugger -The control room is extremely complicated to set up -It does not handle virtualized environments very well -It cannot use Optical Character Recognition (OCR) very effectively 	<ul style="list-style-type: none"> -Notably higher coding skills are required to make implementation much more time-consuming since possibilities of entirely code-free implementation is limited -Not suitable for developers without knowledge in .NET programming languages such as c#. -

1.7. Justify why the selected tool is suitable

Explain which tool is used for the development, and justify the suitability of the tool used in your project.

UI Path is the selected RPA tool used in our project. The reasons are written below:

UiPath is a GUI-based Robotic Process Automation tool whereby GUI automation is the process of simulating mouse and keyboard actions on windows and controls. It provides a complete solution for application integration and automating third-party applications. Even though the user operates the GUI at a visual level, UiPath understands the GUI at a logical level, so the GUI automation does not rely on the specific position of the elements on the screen and the resulting automation functions are independent of the screen size and resolution. This makes our program can work on whatever computer the user is using and the accuracy of clicking the correct element is very high. Since we are working with a browser in this project, and a lot of clicking, typing, and getting attributes from the UI elements are required, UiPath had eased the operation with the GUI automation functionalities offered.

In our project, some product details are extracted from the websites and saved into an excel file. UiPath provides excel automation and helps us to save the product details and sort the product in the further step. Data extracted that is saved into a data table can be easily copied into an excel file.

UiPath provides an excellent low code environment, perfect for people who are new to UiPath or RPA in general, and easily adopted. It is very user-friendly and easy to use since it uses drag and drop approach while working with activities. It makes the implementation less time-consuming and less effort is required. It streamlines the processes. Whenever a problem is faced, solutions can be found from the UiPath extensive official discussion forum easily since it has a huge number of users around the world. The discussion forums are extensively used and can be observed or interacted with to find large quantities of valuable guiding information. Further, the official documentation provided by UiPath is clear and easy to understand, it helps a lot in exploring this tool. The documentation has an extensive library explaining the functionality of the software and how it is used; for example, the page for each activity explains all properties of the activity and what inputs are needed. There is an official web portal for learning the tool, containing online courses with extensive guides on how implementation within the tool is performed. Also, UiPath handles user errors just like in a programming environment by throwing exceptions to disallow users from wrong inputs. As exceptions are thrown, no significant damage can be caused due to user errors. Also, It performs repetitive processes quickly and accurately —by collecting, consolidating, and sorting through data

There are many packages including custom packages made by other users are available for us to add to our Studio, and the activities provided in the packages are often helping in ease the task, for example, if we did not download the package and use its activities, we might have to code the same task with several steps of activities, but with the activities of another package, the task can be done in just a step. Also, the packages provided by UIPath are always updating, the syntax for the same process will only be shortened after updating their packages.

2. Methodology

2.1. Description of dataset

Describe the source of the dataset, and the data structures/data dictionary

- In our project, no dataset is required beforehand, the robot we are creating in this project is only collecting data from different websites instead, and creates a dataset instead.
- No data set is included as there is only the searching keywords are required to be inputted by the user to automate this spending process
- The product details of the first product extracted from the search results on 3 different websites are recorded into an excel sheet, therefore creating our own dataset.
- The product details listed in the excel sheet are website name, product name, price, rating, rating count, link, and image
- Data collected will be processed and another table containing the product details for lowest price product and top rated product are written in the same excel sheet too.

2.2. Applications of the algorithm(s)

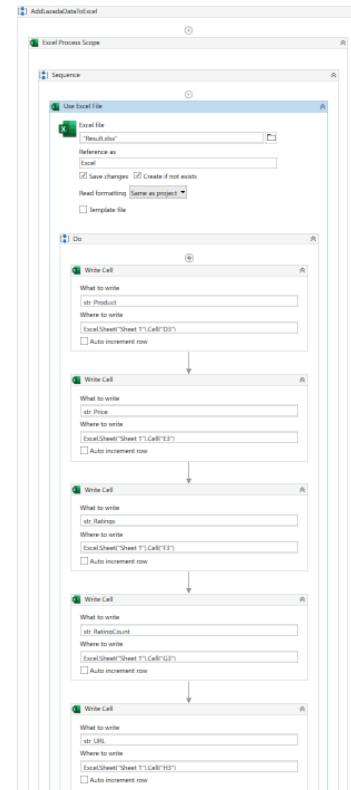
- A. LazadaSequence is to open the Lazada website using Edge browser and then search for the product(which is gotten from the user input). After clicking on the search button, the browser is directed to the page to show all the search results. Since there might be no result that can be found sometimes, we have to check whether there is a result or not. If no result is found, all the product details are assigned as null values and exit LazadaSequence. Else, the first product shown on the result page will be clicked and redirected to the product page. From the product page, product details including name, image, price, rating, rating count, and link will be extracted. Next, it will screenshot the product image e have to extract the product rating that is located in the rating section at the bottom of the page. However, we are not allowed to scroll down to the rating section directly because the rating section will not be loaded before we have reached the product description section. Therefore, the Go To Store section is scrolled to first(this is created because of the interface for the LazMall products is different from the normal products, the description section will not be loaded before we reached the Go To Store section), then we check if the description section appears or not. When it appears, it will

now be able to scroll down to the rating section and extract the rating. Finally, the product link is extracted from the product page.

- B. LazadaAddToCart module is to add the first product from the search result(extracted using LazadaSequence and saved into an excel file using main) into the cart. Firstly, the Lazada website is browsed with Edge. Then, it will check if the login button exists, if it exists it means that it is logged out, then it will insert the email address and password to log in. Else, it will have a log message telling that it is logged in. Then, it will be directed to the product link(saved in the excel file) and add the product to the cart.

C. AddDataToExcel

AddShopeeDataToExcel sequence, AddLazadaDataToExcel sequence, AddPrestoDataToExcel sequence is to write all the product details extracted from different websites into the same excel file. I wished to combine these 3 sequences and make this a module but was unable to do it since there is no global variable in UIPath and the largest scope of a variable is only inside a Sequence within a XAML file. In the sequences, a data table with name, price, rating, rating count, and link columns is created. The product details that were extracted using ShopeeSequence, LazadaSequence, and PrestoSequence are then saved into a data table. (imported from each of the website sequences during invoking them and saved to a variable inside Sequence scope). Then, the content inside the data table will be written to the excel file using Write DataTable To Excel activity . (Actually, there is another way of adding variables into excel directly without creating a data table which is using the WriteCell activities like this but the steps required are much more than what we do now, so the current way is preferred)



System flowchart/activity diagram

Draw a simple diagram to illustrate the system design/data flow

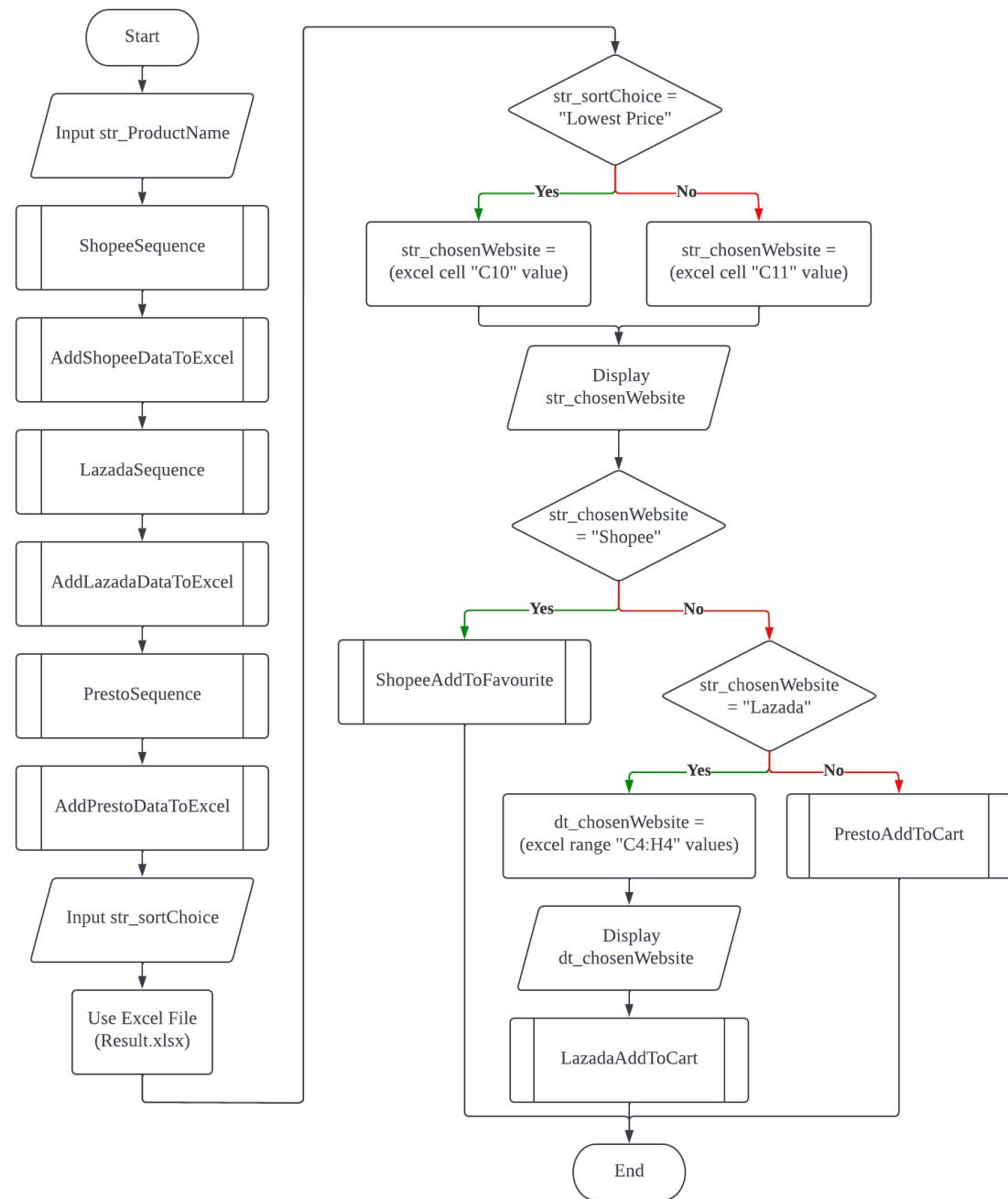


Figure 2: Overall UiPath robot system flowchart

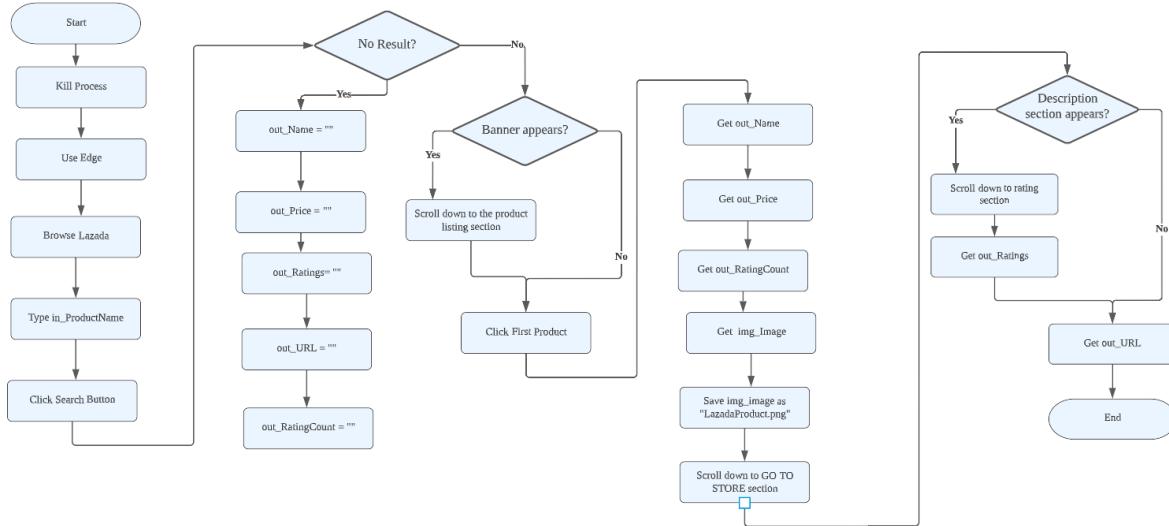


Figure 3: Lazada Sequence flowchart

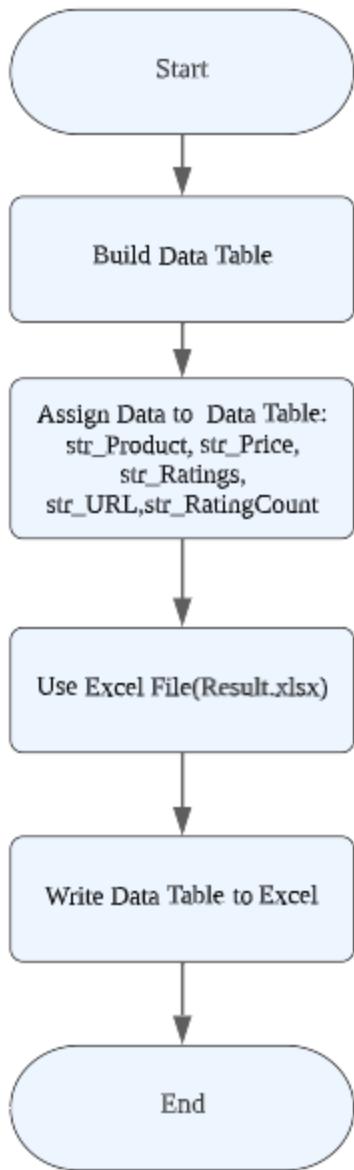


Figure 4: AddLazadaDataToExcel flowchart

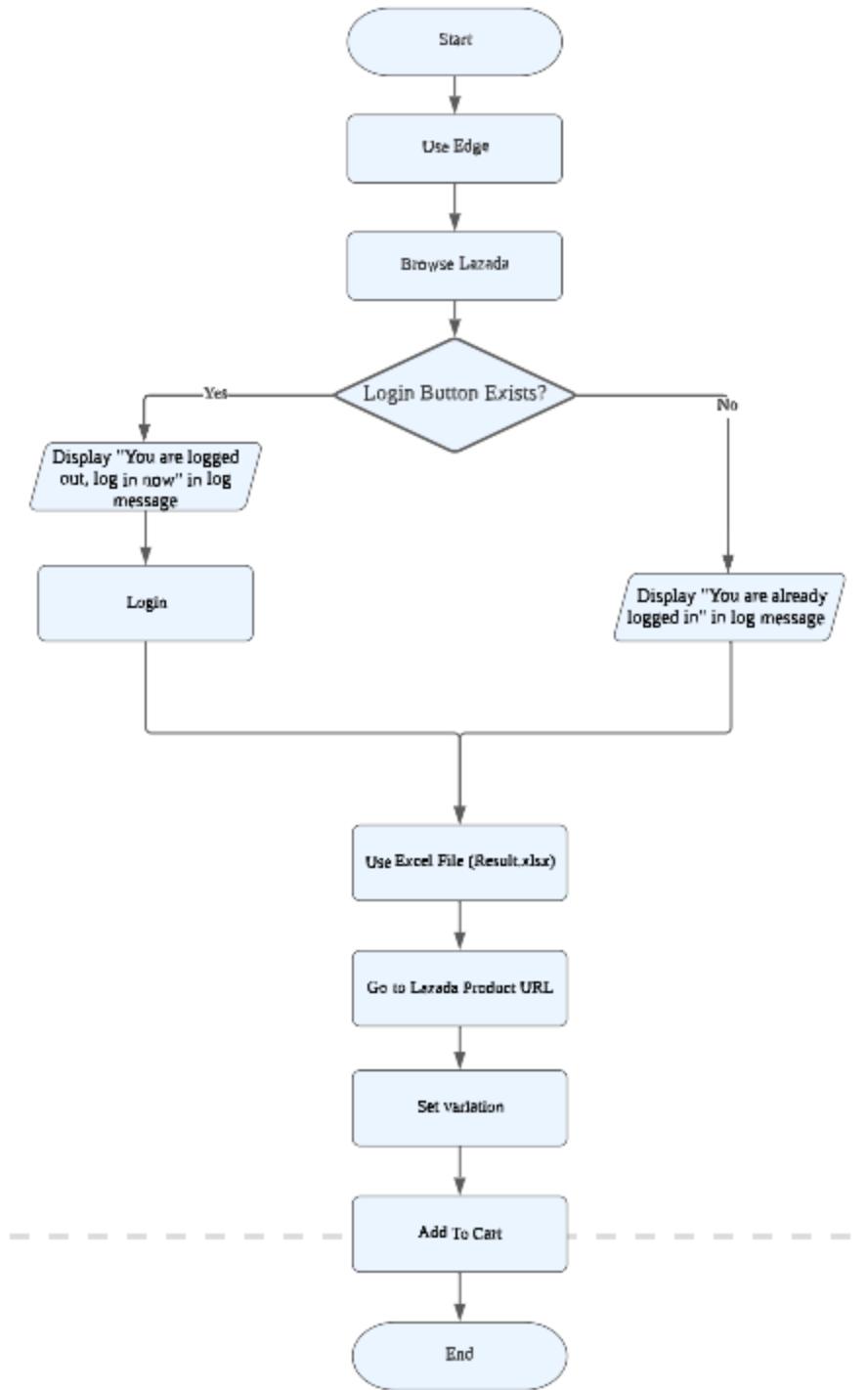


Figure 5: LazadaAddToCart flowchart

2.3. Proposed test plan/hypothesis

Overall project

- To get the product with the lowest price or product with the highest rating after comparing three different e-commerce websites.
- To sort the 3 products gotten from the 3 websites using price or rating(based on user choice)
- To add the product with the lowest price or product with the highest rating into the cart (for Lazada & PrestoMall) or favorite list (for Shopee)

Search products from 3 e-commerce websites ➤ Obtain the product details ➤ Build a table of comparisons ➤ Sort the 3 products with price or rating(user choice) ➤ Add selected product to cart or favourite list

LazadaSequence

- To search the product on Lazada
- To collect the data of the product details for future comparison with Shopee & PrestoMall. If Lazada's product is the best product(either lowest price or highest rating, which is to be chosen by the user)

LazadaAddToCart

- To add the best product into the cart

AddLazadaDataToExcel

- To insert the product details extracted from Lazada into an excel file.

3. Result

3.1. Results

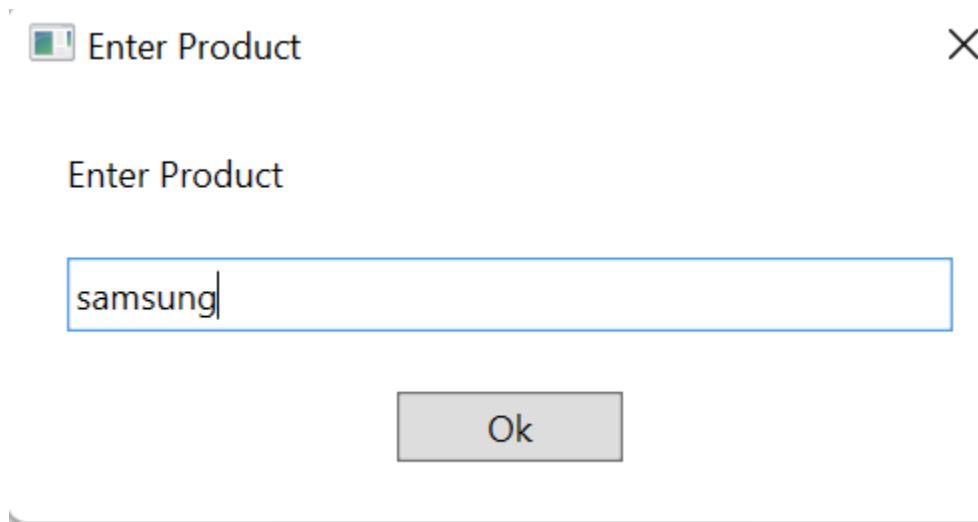


Figure 6: Window to prompt for search keyword

A screenshot of the Shopee website search results for 'samsung'. The search bar at the top has 'samsung' typed into it. Below the search bar is a red banner for the Electronics Zone, featuring 'EXCLUSIVE VOUCHERS', '100% AUTHENTIC', and 'UP TO 20% CASHBACK'. On the left, there is a 'SEARCH FILTER' sidebar with sections for 'Shipped From' (Local, Overseas, West Malaysia, East Malaysia), 'Shop Type' (Shopee Mall, Shopee Preferred, Shopee Preferred+), and 'Price Range' (RM MIN, RM MAX). The main search results show a listing for 'Samsung Malaysia Official' with 19 products, a rating of 4.9, and a response rate of 95%. Below the listing is a note: 'Search result for 'samsung''. At the bottom of the page, there are buttons for 'Sort by' (Relevance, Latest, Top Sales, Price), a page number '1/50', and a 'Chat' button with a notification count of 13.

Figure 7: UIPath robot searching for 'samsung' on Shopee

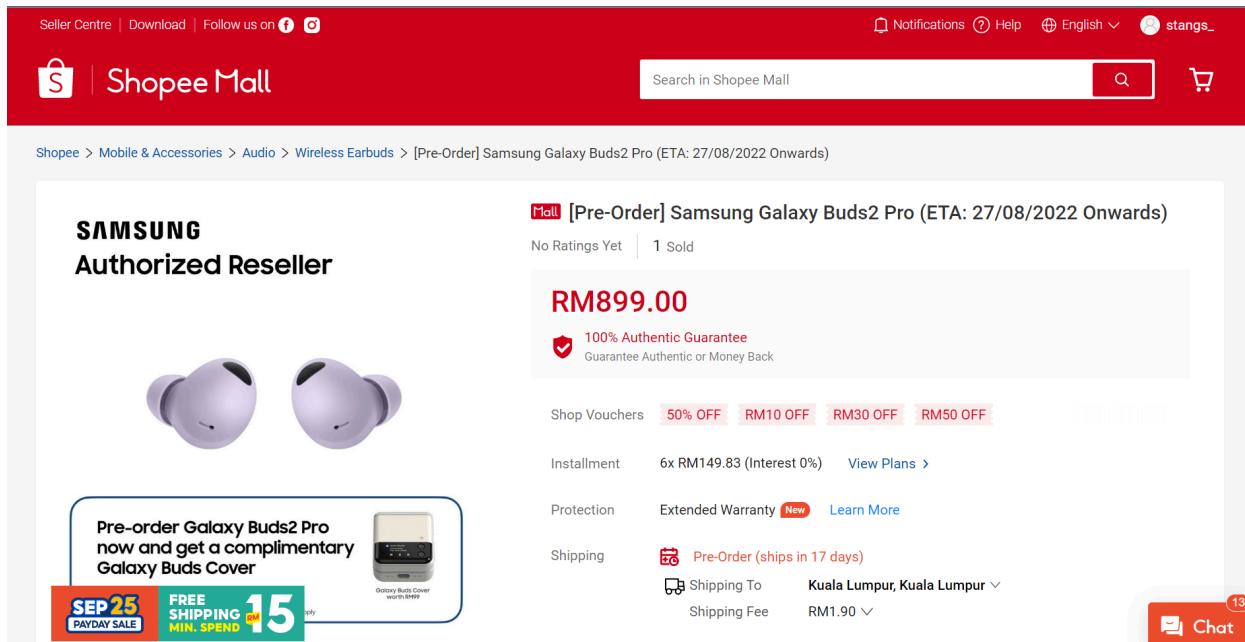


Figure 8: The product page of the first product on the search result page of Shopee

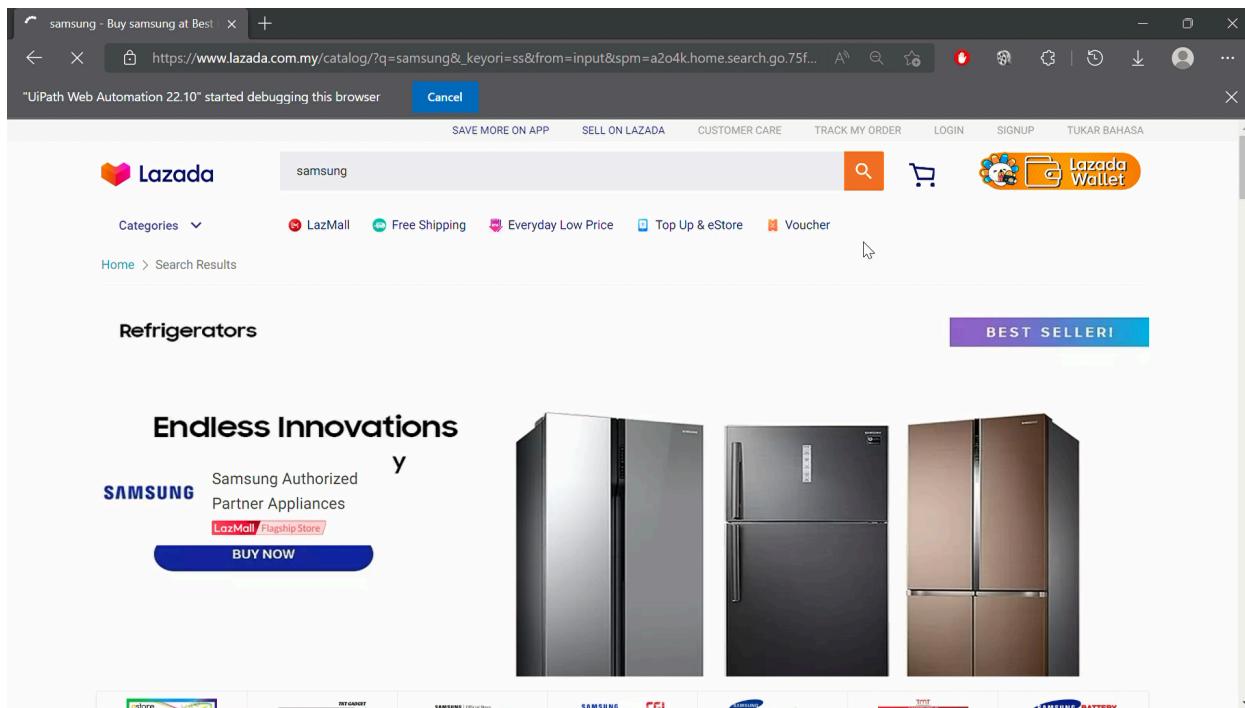


Figure 9: Robot typed in 'samsung' into the Lazada search bar

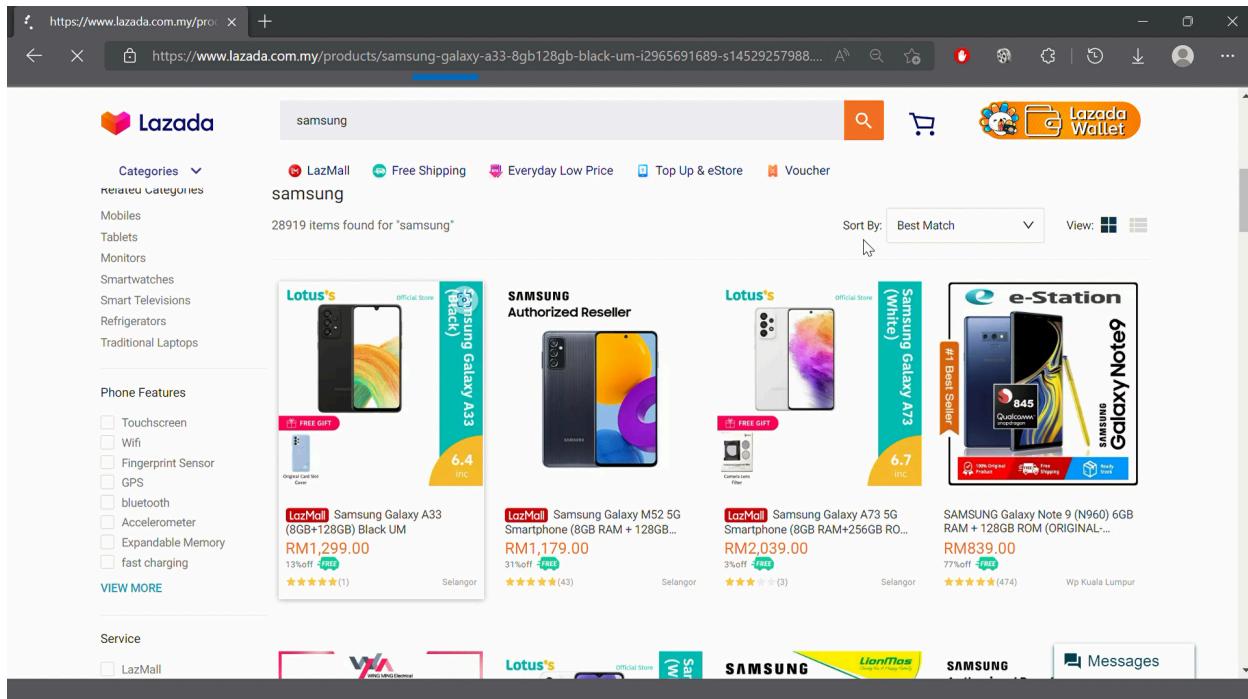


Figure 10: Search result page of 'samsung' on Lazada

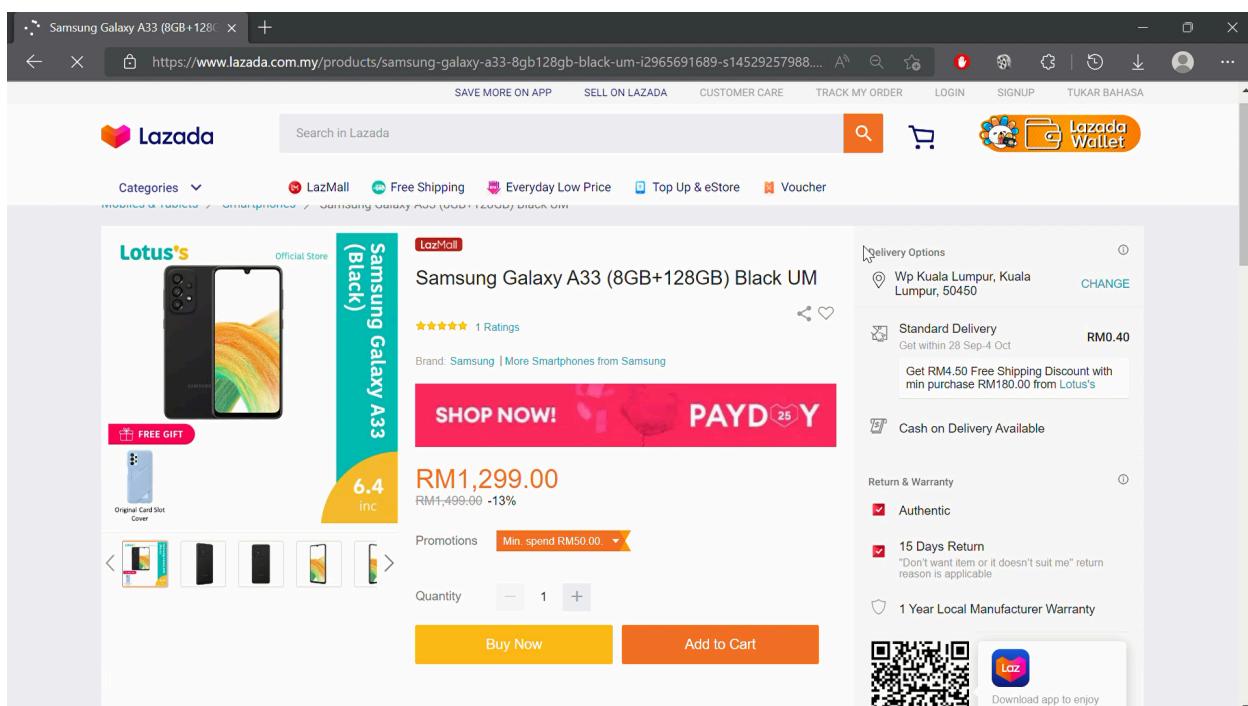


Figure 11: The product page of the first product on the search result page of Lazada
Then, the robot is scrolling down the webpage until it finds the GO TO STORE section as shown in figure 12

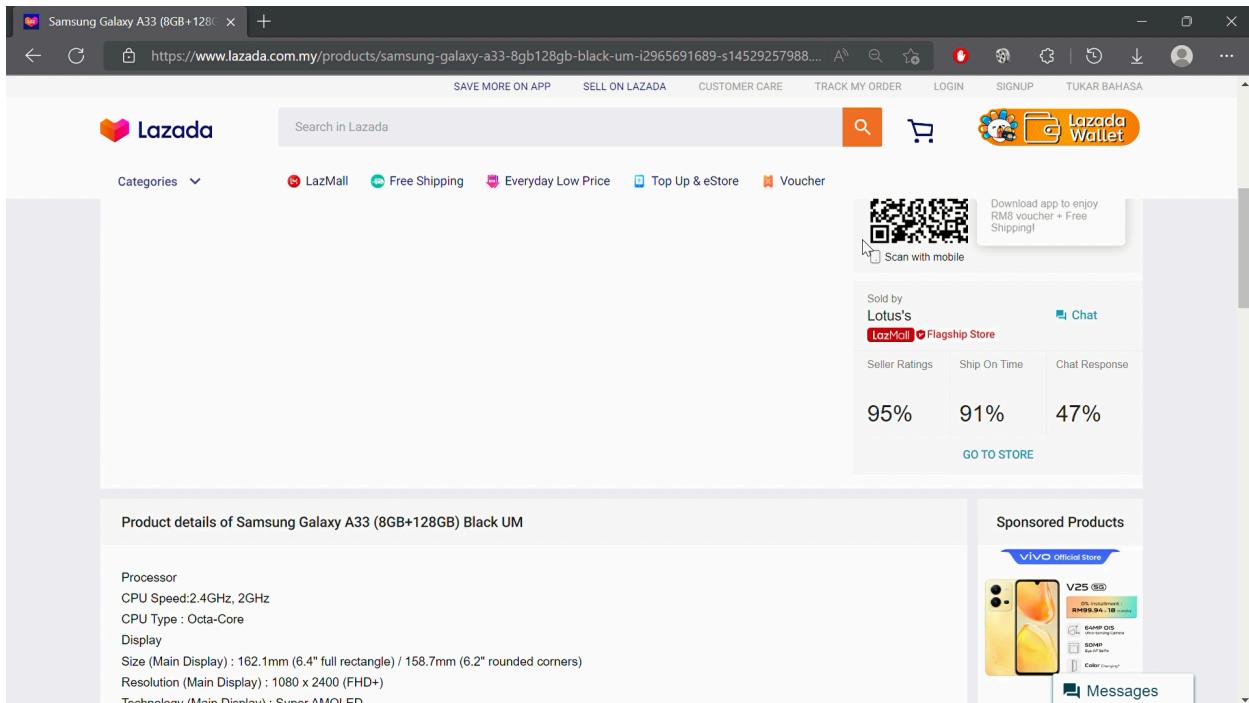


Figure 12: The robot scrolls down the webpage until GO TO STORE appears

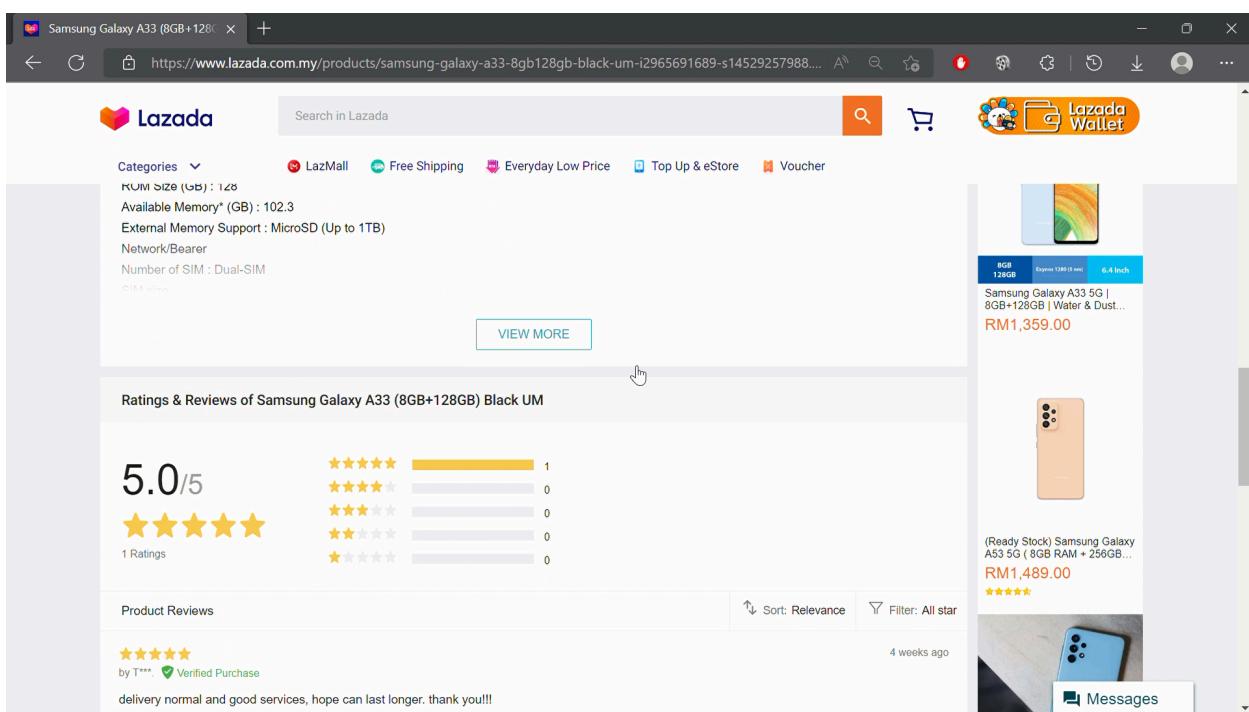


Figure 13: Robot scrolls down until the rating section.

The screenshot shows the PrestoMall website interface. At the top, there are links for 'Download Presto App', 'Seller Service', 'Login', 'Sign Up', 'My Page', 'Cart 0', and 'Customer Service'. The PrestoMall logo is on the left, and a search bar contains the query 'samsung'. To the right of the search bar is a promotional banner for '9.9 Let It Shine Day & Night'. Below the search bar, there are navigation links for 'All Categories', 'Official Stores', 'Madness Sale', 'Hot Selling', and 'Promotions', along with a 'Browsing History' section.

Categories

- All Categories
- Mobile & Tablets (1103)
- Computer & Laptop (356)
- Audio & Gaming (3)
- Automotive (2)
- Camera (2)
- Sports (1)

Filters

Shipping

- Free Shipping
- Conditional Free Shipping

Ship From

- ALL
- Malaysia

Search Results

1,467 results for **samsung**

Sort by: Best Match | View: Grid | 60 items per page

Samsung J4 2GB Ram+16GB Rom(Original Malaysia Set) RM 599.00

Sold by: GSTPhone_Online_Store | Power Seller

Samsung A6 3GB Ram+32GB Rom(Original Malaysia Set) RM 999.00

Figure 14: Robot typed in 'samsung' into PrestoMall search bar, search result page of 'samsung' on PrestoMall

The screenshot shows the Lazada product page for the Samsung J4 2GB Ram+16GB Rom(Original Malaysia Set). The page includes the product title, price (RM 599.00), a 'BonusLink Points 2,995' badge, a color selection dropdown, an 'Add to Cart' button, seller information (GSTPhone_Online_Store, Power Seller, 0.5 rating), and shipping details (West Malaysia: RM 0, Sabah: RM 15.00, Sarawak: RM 15.00). The URL in the browser shows the product's path from the homepage through categories like Mobile & Tablets, Smartphones, and Samsung.

Figure 15: The product page of the first product on the search result page of Lazada

Data Table					
		Website Name	Price	Rating	Rating Count Link
3		Shopee [Pre-Order] Samsung Galaxy Buds2 Pro (ETA: 27/08/2022 Onwards)	RM899.00	0	0 https://shopee.com.my/-ShopeeProduct.png
4		Lazada Samsung Galaxy A33 (8GB+128GB) Black UM	RM1,299.00	5 1 Ratings	https://www.lazada.com/LazadaProduct.png
5		Presto Samsung J4 2GB Ram+16GB Rom(Original Malaysia Set)	RM599.00	No rating	0 https://www.prestomall.PrestoProduct.png
6					
7					
8	Best Product by Price and Rating				
9	Best	Value	Website Name	Price	Rating
10	Price	599	Presto Samsung J4 2GB Ram+16GB Rom(Original Malaysia Set)	599	0
11	Rating	5	Lazada Samsung Galaxy A33 (8GB+128GB) Black UM	1299	5 1 Ratings
12					
13					
14					
15	Processed Data for VLOOKUP				
16	Rating	Price	Website Name	Price	Rating
17	0	899	Shopee [Pre-Order] Samsung Galaxy Buds2 Pro (ETA: 27/08/2022 Onwards)	899	0
18	5	1299	Lazada Samsung Galaxy A33 (8GB+128GB) Black UM	1299	5 1 Ratings
19	0	599	Presto Samsung J4 2GB Ram+16GB Rom(Original Malaysia Set)	599	0
20				Best:	599
					5

Figure 16: Excel file that saved product details from 3 websites

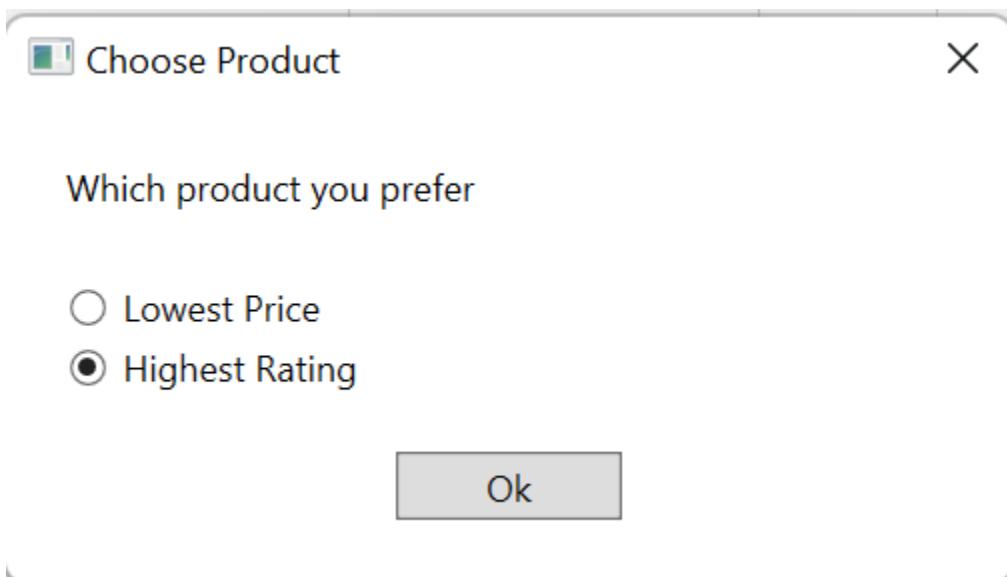


Figure 17: Window prompt for user choice on product



Figure 18: Message box displayed the best choice based on the users preference on best rating or best price

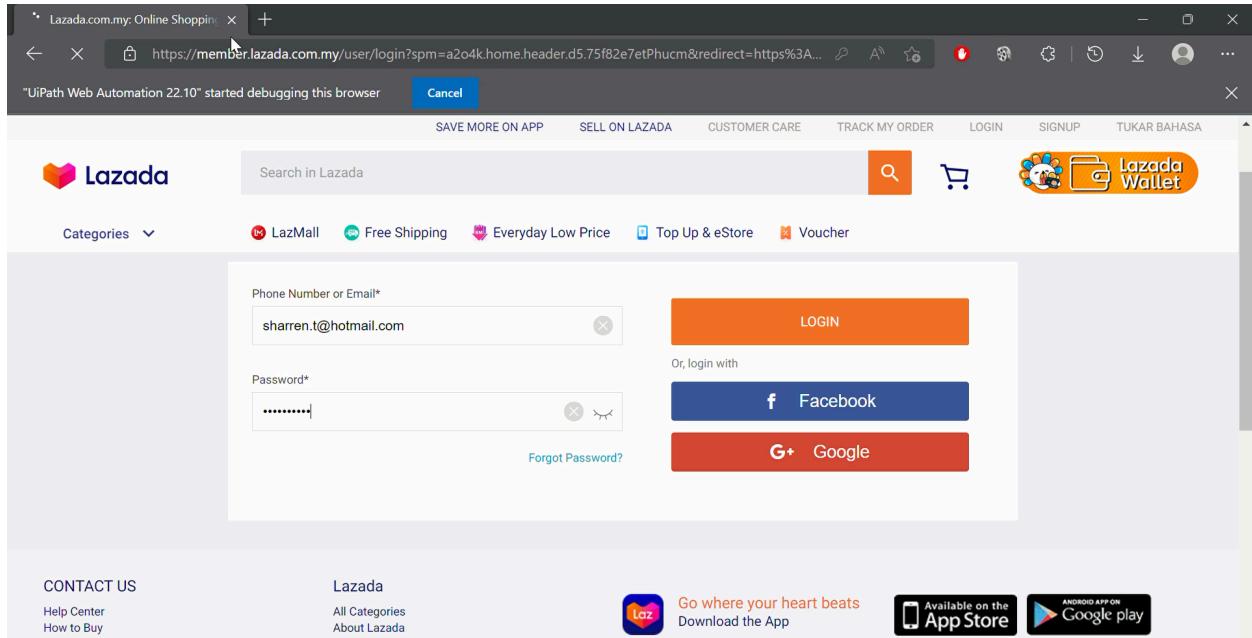


Figure 19: Robot logging into Lazada.

It will be redirected to the best product page(the link is also saved into the excel sheet) as shown in figure 20

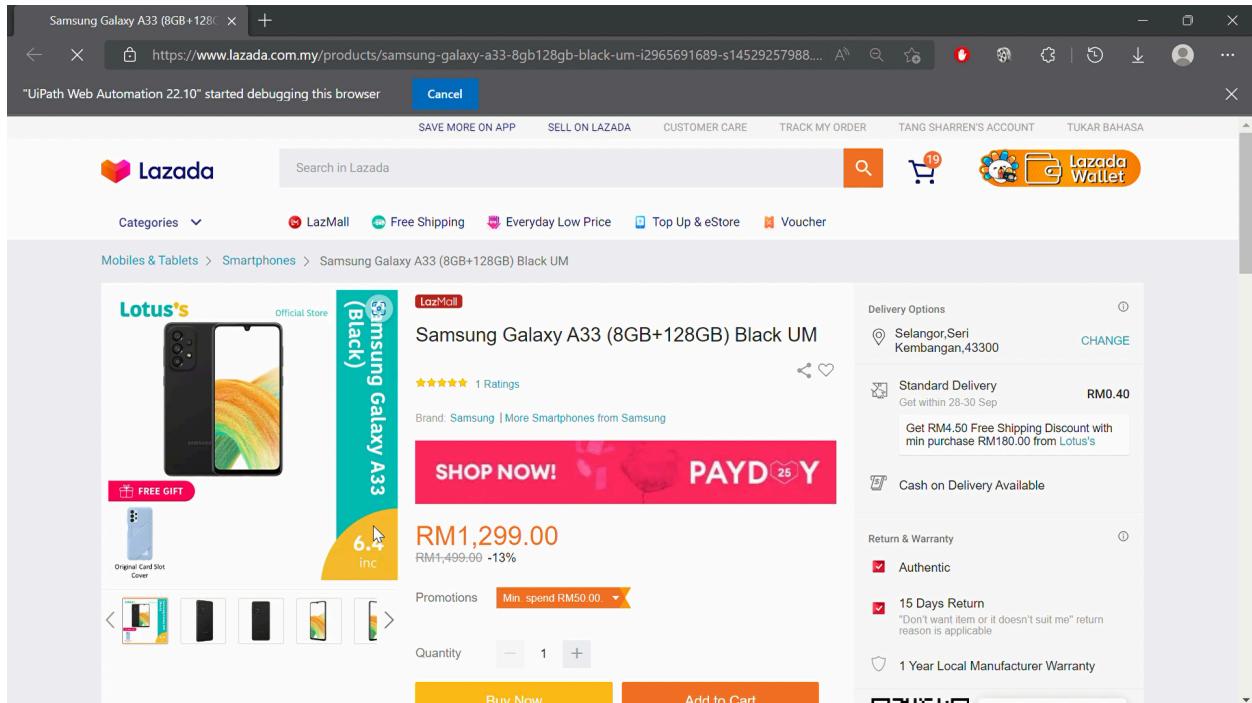


Figure 20: Product page of the best product

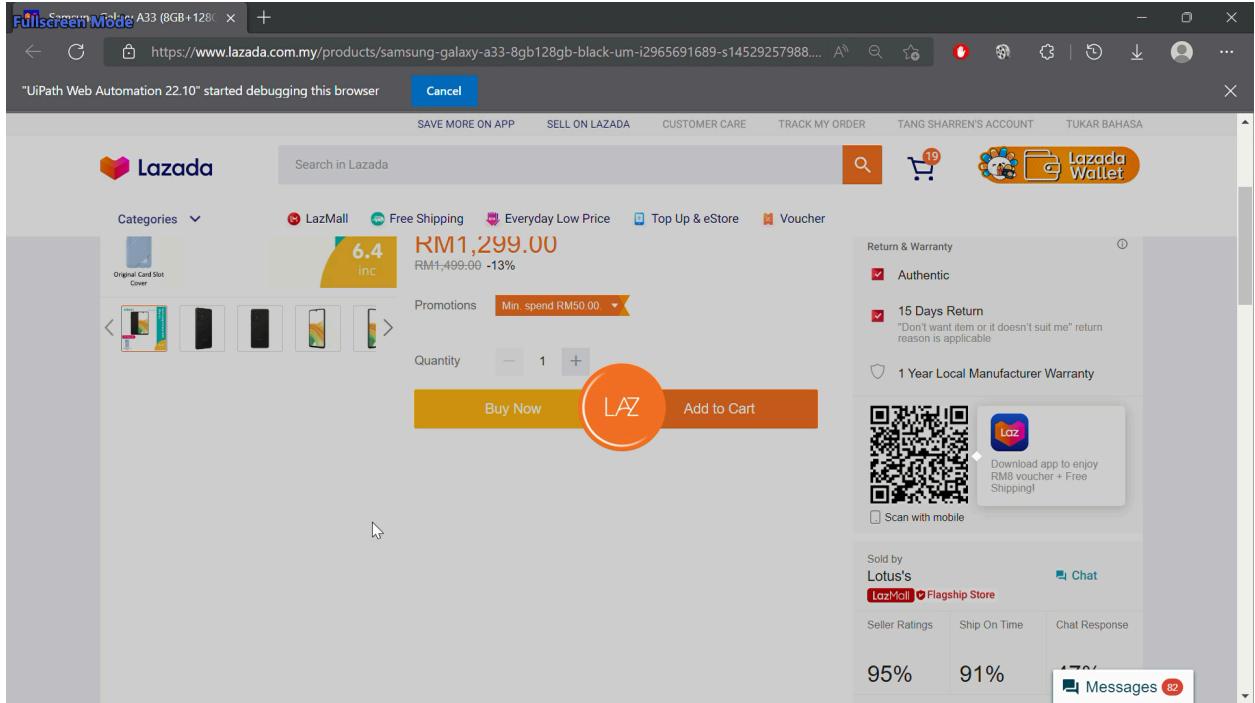


Figure 21: Best product is adding to the cart

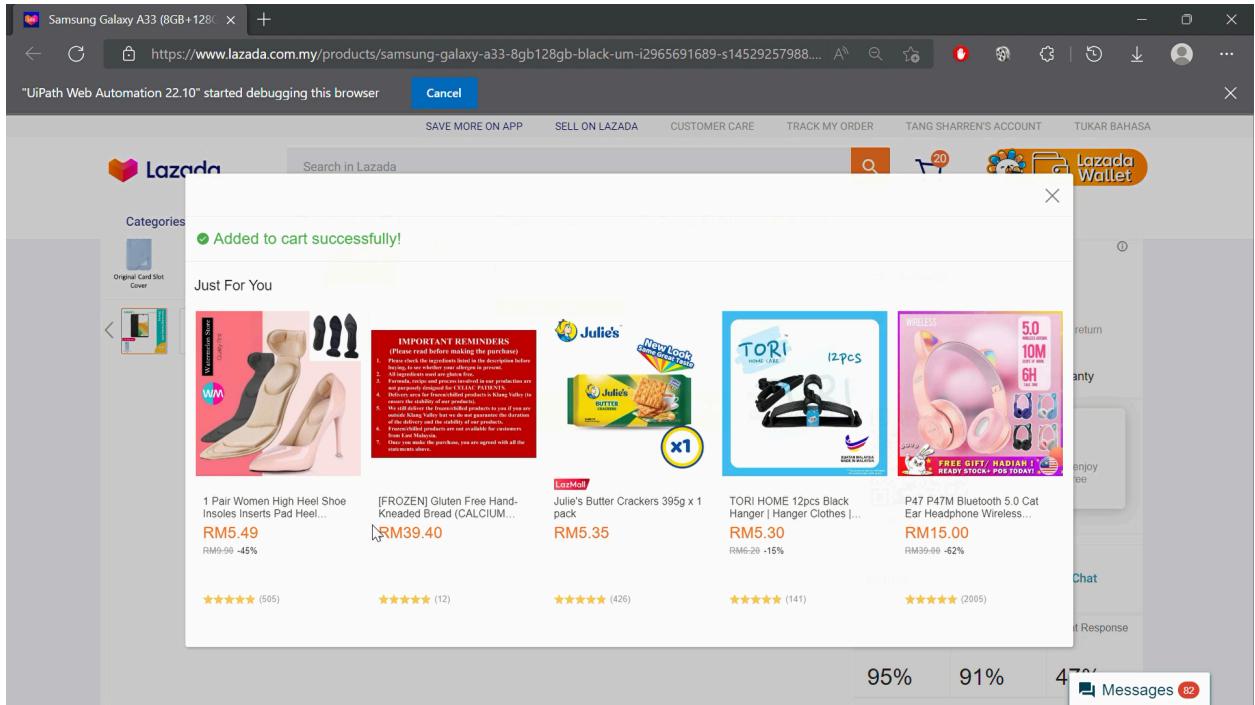


Figure 22: Best product have added to the cart successfully.

3.2. Discussion/Interpretation

At the beginning of the program, it will prompt user input for the product they wished to search as shown in figure 6. Then, it will first start to search for the product on Shopee as shown in figure

7.The browser will be redirected to the first product page after the robot clicking the first product image on result page as shown in figure 8. The product details extracted from here will be saved into an excel file named as “Result”.

After that, it searches with the same word on Lazada as shown in figure 9. After clicking on the search button, the result page will be displayed as shown in figure 10. Then the first product will be clicked. The browser redirected to the first product page as shown in figure 11. And it will continue to scroll down until it reaches the rating section to extract the data about rating as shown in figure 13. The product details extracted from here will be saved into an excel file named as “Result”

Finally, it will search the product on the PrestoMall website as shown in figure 14. It will click into the first product and go to its product page as shown in figure 15. The product details extracted from here will be saved into an excel file named “Result”. The product details from 3 websites are listed in the excel file as shown in figure 16. As I have mentioned in 3.2C AddDataToExcel, the data extracted from websites will be saved into a data table first, then only written into the excel file. On figure 16, the table on lines 2 - 5 displays the data table where we saved all the product details, table on lines 9-11 displays the best product among websites according to their price(line 10) and rating(line11), where the best price and highest rating are highlighted on this table. Another table from lines 16-19 contains the processed data for VLookup, this table is used to sort the product and pick 2 products which are either the best price or best rating product. Robot will ask for user choice if they want to find the best price or best rating product. From the excel, the robot will be able to tell that the product with the highest rating is from Lazada as shown in figure 18

Finally, the robot will browse to Lazada again and check if it is logged in, if it is not logged in it will login to the Lazada account using credential as shown in figure 19. Robot clicked on the Add To Cart button and the page is loading as shown in figure 21. And successfully added to cart as shown in figure 22

.Discussion and Conclusion

3.3. Achievements

-The robot can successfully obtain the details of the first relevant product based on the search keyword entered by the user.

-The robot can successfully compare the details obtained in the Excel file by price or ratings, and list the product with best price and top rated

-The robot can reduce the time taken for the automation process.

-The robot can reduce the effort needed from the user.

-The robot will only select the correct element

-The robot will add the item best product either at top rated or lowest price to the cart or to the favourite list

-The robot can work and automate task faster than human speed especially when the number of products needed to be searched is many.

-The achievements above fulfilled all the objectives.

3.4. Limitations and Future Works

Discuss the limitations of the project and what improvements can be done in the future

-Unable to create global scope variable in UI path since the largest scope of a variable in UI Path is only inside a Sequence within a XAML file.

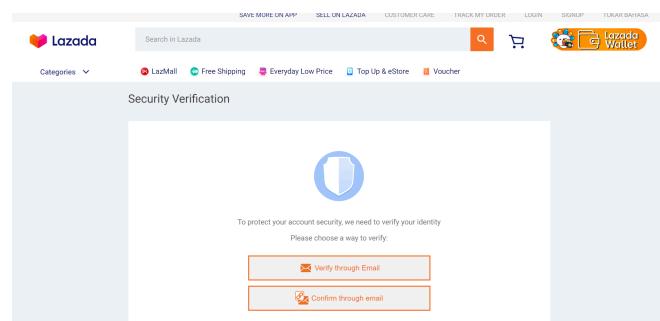
-Chinese searching keywords are not allowed. In future works, we can check the current keyboard language used by the user before proceeding to the search product step.

-Sequence related to Lazada website perform slower than Shopee and PrestoMall especially before the Check App State activities. In the future, we should set WaitForReady to none instead.

-Unable to read or write the excel file using in our project, if it is opened beforehand. In the future, we should only create the excel file when it is needed in the processes

-User cannot move the cursor during mouse scroll activity is executing. This is the drawback of UIPath cursor motion property, if the cursor motion is set, if cursor motion is not set the cursor will not move by default.

-There is the main limitation which is the shopping websites might identify that the process is automated by a robot and request user for authentication. We have tried to automate the login process for the Shopee website but it needs verification from the account email or phone number which we cannot automate it. This might happen due to the high process speed and maybe because login to the same account for many times in the short period of time since we are testing the program



-Thus, to easily solve the problem, users must make sure the websites are logged in, otherwise some searching process and adding items to the cart process will be interrupted. An improvement that can be done is to slow down the searching process, especially for the part of inserting the product name into the search bar, and clicking the search button can be slightly slower just like how a human does.

-Other than that, when there is no result found based on the searching keyword, the automation process will not continue. Therefore, to improve, validations such as if-else activities can be used to end the process normally to avoid errors.

-There is another disadvantage that the number of products taken from each website is only restricted to 1. Thus, in future works, the number of products to be compared can be increased.

-This project does not include a data visualization process. For further improvement, the results in an excel file can be processed and displayed in a more visualized and beautiful way.

Reference & Source

Provide the sources of the dataset and tool(s) used for development

List the articles or other references you have cited in the text using the Harvard Referencing system.

www.youtube.com. (n.d.). *Build a Shopping Robot | UiPath | Step by Step | Mini Project | Extract and Compare | RPA Use Case*. [online] Available at:

<https://www.youtube.com/watch?v=zXBCKqZ7UhU> [Accessed 23 Sep. 2022].

UiPath Community Forum. (2021). *Data Scraping and Screen Scraping gone?* [online] Available at:

<https://forum.uipath.com/t/data-scraping-and-screen-scraping-gone/297745/3> [Accessed 23 Sep. 2022].

UiPath Community Forum. (2020). *How to scrape stars(rating) in a website*. [online] Available at:

<https://forum.uipath.com/t/how-to-scrape-stars-rating-in-a-website/158378/4> [Accessed 23 Sep. 2022].

UiPath Community Forum. (2020). *How to get img src attribute from web page?* [online] Available at:

<https://forum.uipath.com/t/how-to-get-img-src-attribute-from-web-page/210345/8> [Accessed 23 Sep. 2022].

UiPath Community Forum. (2018). *Finding and clicking on the text takes too long.*

[online] Available at:

<https://forum.uipath.com/t/finding-and-clicking-on-the-text-takes-too-long/51724/8>

[Accessed 23 Sep. 2022].

www.youtube.com. (n.d.). *SPEED UP your UiPath RPA AUTOMATIONS in TWO STEPS.*

[online] Available at:

https://www.youtube.com/watch?v=vOABUc844IE&ab_channel=MarceloCruz

[Accessed 23 Sep. 2022].

UiPath Community Forum. (2020). *How save image.* [online] Available at:

<https://forum.uipath.com/t/how-save-image/183663/6> [Accessed 23 Sep. 2022].

UiPath Activities. (n.d.). *Displaying Images.* [online] Available at:

<https://docs.uipath.com/activities/docs/displaying-images> [Accessed 23 Sep. 2022].

UiPath Community Forum. (2019). *How to add variable values to data table columns.*

[online] Available at:

<https://forum.uipath.com/t/how-to-add-variable-values-to-data-table-columns/173667/7> [Accessed 23 Sep. 2022].

UiPath Community Forum. (2021). *How do I wait for the Browser to finish loading the page.* [online] Available at:

<https://forum.uipath.com/t/how-do-i-wait-for-the-browser-to-finish-loading-the-page/311739/4> [Accessed 23 Sep. 2022].

UiPath Community Forum. (2022). *How to write variables into the data table.* [online]

Available at:

<https://forum.uipath.com/t/how-to-write-variables-into-the-data-table/408746/5> [Accessed 23 Sep. 2022].

www.youtube.com. (n.d.). *UiPath Tutorial || Day 43 : Add Data Column to Data Table || Add Data Column Example.* [online] Available at:

https://www.youtube.com/watch?v=IK4TYq658JE&t=349s&ab_channel=LearningRPA
Technologies [Accessed 23 Sep. 2022].

UiPath Community Forum. (2019). *How to add variables to a Excel sheet*. [online]
Available at:

<https://forum.uipath.com/t/how-to-add-variables-to-a-excel-sheet/112037/2>
[Accessed 23 Sep. 2022].

UiPath StudioX. (n.d.). *Sort Range*. [online] Available at:
<https://docs.uipath.com/studiox/v2019/docs/sort-x#section-in-the-body-of-the-activity> [Accessed 23 Sep. 2022].

[www.youtube.com. \(n.d.\). *UiPath Check String is Null or Empty | String Null or Empty / String Null or White Space | RPA*](https://www.youtube.com/watch?v=RJcqfsFndmw). [online] Available at:

<https://www.youtube.com/watch?v=RJcqfsFndmw> [Accessed 23 Sep. 2022].

UiPath Community Forum. (2021). *Multiple choice in input dialog box*. [online]
Available at:

<https://forum.uipath.com/t/multiple-choice-in-input-dialog-box/179199/8> [Accessed 23 Sep. 2022].

[www.youtube.com. \(n.d.\). *UIPath - RPA Example - Ordering Domino's Pizza*](https://www.youtube.com/watch?v=U82s1pXKfmw&ab_channel=CMDZ). [online]
Available at: https://www.youtube.com/watch?v=U82s1pXKfmw&ab_channel=CMDZ
[Accessed 23 Sep. 2022].

[www.youtube.com. \(n.d.\). *Exception Handling - Part 4 | Use of Terminate Workflow in Exception Handling | UiPath*](https://www.youtube.com/watch?v=sqGFYX7_Rdw&ab_channel=AutomatewithAnmolhttps://www.youtube.com/watch?v=sqGFYX7_Rdw&ab_channel=AutomatewithAnmol). [online] Available at:

https://www.youtube.com/watch?v=sqGFYX7_Rdw&ab_channel=AutomatewithAnmolhttps://www.youtube.com/watch?v=sqGFYX7_Rdw&ab_channel=AutomatewithAnmol [Accessed 23 Sep. 2022].

[www.youtube.com. \(n.d.\). *Exception Handling - Part 4 | Use of Terminate Workflow in Exception Handling | UiPath*](https://www.youtube.com/watch?v=sqGFYX7_Rdw&ab_channel=AutomatewithAnmolhttps://www.youtube.com/watch?v=sqGFYX7_Rdw&ab_channel=AutomatewithAnmol). [online] Available at:

https://www.youtube.com/watch?v=sqGFYX7_Rdw&ab_channel=AutomatewithAnmol
https://www.youtube.com/watch?v=sqGFYX7_Rdw&ab_channel=AutomatewithAnmol [Accessed 23 Sep. 2022].

UiPath Activities. (n.d.). *Retry Scope*. [online] Available at:

<https://docs.uipath.com/activities/docs/retry-scope> [Accessed 23 Sep. 2022].

www.youtube.com. (n.d.). *Retry Scope in UiPath | How to Use Retry Scope Activity in UiPath*. [online] Available at:

https://www.youtube.com/watch?v=Lt6IKJ6FgSU&ab_channel=AutomatewithRakesh [Accessed 23 Sep. 2022].

Bornegrim, L., & Holmquist, G. (n.d.). *DEPARTMENT OF INFORMATICS AND MEDIA Robotic process automation-An evaluative model for comparing RPA-tools*.

Inc, U. (n.d.). *GUI Automation: Key to Automating Interfaces | UiPath*. [online]

www.uipath.com. Available at:

<https://www.uipath.com/blog/rpa/gui-automation-key-to-automating-interfaces> [Accessed 25 Sep. 2022].

Wikipedia. (2022). *Automation Anywhere*. [online] Available at:

https://en.wikipedia.org/wiki/Automation_Anywhere [Accessed 25 Sep. 2022].

www.capterra.com. (n.d.). *Automation Anywhere Enterprise Reviews and Pricing - 2020*. [online] Available at:

<https://www.capterra.com/p/124575/Web-Data-Extraction/>.

Automation Anywhere. (n.d.). *Community Edition | Free RPA*. [online] Available at:

<https://www.automationanywhere.com/products/enterprise/community-edition> [Accessed 25 Sep. 2022].

www.capterra.com. (n.d.). *UiPath Pricing, Alternatives & More 2022 - Capterra*. [online] Available at:

<https://www.capterra.com/p/135186/UiPath-Robotic-Process-Automation/#features> [Accessed 25 Sep. 2022].

Wikipedia. (2022). *Blue Prism*. [online] Available at:
https://en.wikipedia.org/wiki/Blue_Prism.

Technologies, M. (2021). *UiPath vs Automation Anywhere - Key Differences and Comparison*. [online] Mindmajix. Available at:
<https://mindmajix.com/uipath-vs-automation-anywhere> [Accessed 25 Sep. 2022].

Sureka, A. (n.d.). *Important Features of Automation Anywhere: A Complete Overview*. [online] www.clariontech.com. Available at:
<https://www.clariontech.com/platform-blog/important-features-of-automation-anywhere-a-complete-overview> [Accessed 25 Sep. 2022].

Wikipedia. (2022). *Instructions per second*. [online] Available at:
[https://en.wikipedia.org/wiki/Instructions_per_second#:~:text=Thousands%20instructions%20per%20second%20\(TIPS%2FkIPS\)](https://en.wikipedia.org/wiki/Instructions_per_second#:~:text=Thousands%20instructions%20per%20second%20(TIPS%2FkIPS)) [Accessed 25 Sep. 2022].

Tools used for development

Microsoft Corporation, 2018. *Microsoft Excel*. Available at: <https://office.microsoft.com/excel>.

Lazada, 2022. *Lazada Malaysia*. Viewed 24 September 2022. Available at: [Lazada.com.my: Best Online Shopping in Malaysia](https://lazada.com.my)

UiPath Incorporation, 2022. *Automation Platform - Leading RPA Company | UiPath*. Viewed 25 September 2022. Available at: [https://www.uipath.com/.](https://www.uipath.com/)

