UNIVERSITY OF ECONOMICS AND LAW

FACULTY OF FINANCIAL BANKING

FINAL PROJECT REPORT

AUTOMATE GOLD PRICE UPDATES AND QUOTES VIA EMAIL WITH RPA

Subject	**Robotic Process Automation**
Course	**241CN1801**
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Group	**15**

Ho Chi Minh City, November 18, 2024

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Ho Chi Minh City, November 18, 2024

Group 15

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LIST OF ABBREVIATIONS

Abbreviation	Definition
RPA	Robotic Process Automation
PDD	Process Definition Document
SDD	Solution Design Document
UAT	User Acceptance Testing
AD	Automation Developer
PM	Project Manager
BA	Business Analyst
SA	Solution Architect
IE	Infrastructure Engineer

CHAPTER 1: PROJECT IDEAS AND PROPOSALS

1.1 Business Issues

In the context of an increasingly volatile global economy, gold prices have become one of the most important indicators reflecting the financial and economic situation of each region. As a safe haven asset, gold is considered a popular investment choice not only for individuals but also for business organizations. However, monitoring and updating gold prices in real time is still limited, especially at the regional level. Traditional methods of collecting gold price information mainly rely on manual lookups from official websites, published price lists or through media channels such as newspapers and social networks. These methods are not only time-consuming but also have the potential for errors due to human factors, such as entering incorrect data or missing important changes. This is especially disadvantageous in the context of rapidly fluctuating gold prices, where even a delay of a few minutes can cause great damage to investors and businesses.

In addition, there has not been a widely deployed automatic gold price forecasting system to support users in making quick and timely decisions. The lack of automation solutions in this field makes it impossible for many individual users or businesses to optimize their investment opportunities. In particular, for business organizations, the lack of support tools to monitor gold prices in each region leads to difficulties in building buying and selling strategies suitable for the market situation.

In addition, with the strong development of information technology and the trend of digital transformation, the need for automation in the financial and business sectors is becoming increasingly urgent. A system that can automatically update, analyze and send forecast gold price information via email by region will help to completely solve these problems, bringing outstanding value in terms of both time and business efficiency for individual users and businesses. The presence of an automated solution is not only an important step in improving work efficiency but also a useful tool to create a competitive advantage in the market.

1.2 Research objectives and scope

1.2.1 Objective

The main objective of the research is to build an automated system to collect, analyze and send gold price information via email by region, thereby supporting individual users and businesses to make timely and effective investment decisions. Specifically:

Update gold prices accurately and quickly: Automatically extract gold price data from reputable sources by region, ensuring accuracy and update time.

Send information automatically via email: Develop a system to send emails to each user with gold price information by region they are interested in, along with analysis and forecasts.

Improve investment efficiency: Support users to make more informed investment decisions through accurate and timely forecast data.

1.2.2 Scope of research

The scope of the research is to create a comprehensive solution that not only provides accurate gold price information but also helps users save time, reduce errors and increase decision-making ability in a volatile investment environment. The research will not delve into the development of complex forecasting algorithms but focus on integrating and implementing an effective automation system.

- Geographical area: Including major regions in Vietnam (Hanoi, Ho Chi Minh City, Da Nang, Southeast, Can Tho, Tay Nguyen) and can be expanded to international regions such as the Asian, European, and American gold markets if needed.

- Data source: Official Cafe F website

- Technology used: Using UiPath to automate the extraction of information from websites. Apply basic data processing algorithms (Excel, etc.) and analysis tools to calculate and selectively send system price information directly

- Send automatic emails: Use SMTP to send information to users automatically. -

Target users:

+ Individuals: Individual investors, gold buyers and sellers who regularly want to update prices in specific areas.
+ Businesses: Gold and gemstone trading companies need gold price information to develop business strategies.

- Update time: Data will be collected and sent via email at fixed time frames during the day, or as soon as there are major fluctuations in gold prices.

CHAPTER 2: PROCESS ASSESSMENT AND PLANNING

2.1 Process Assessment Tool

Process assessment tools assess the potential benefits of automation

Table 2.1. *Process Assessment Tool*

Questions	
Input types	Digital and Structured
Frequency of the process	Daily
Number of applications	5 (UiPath, Excel, Google Drive, Email, Google Chrome)
Results	
Ease of implementation	Medium Effort
Benefit/ Suitability	Medium High Benefit
Ease of development	Automating this process requires professional expertise. Submit this idea to your CoE.
Bandwidth freed (man hours/year)	115
Error reduction	53%

Main tool: UiPath Studio

UiPath is used as the main automation tool thanks to its strong integration capabilities and support for many automation functions. In this process, UiPath Studio is used to design automation steps, including: Collecting gold price data from reputable sources: Using activities in UiPath to extract data from gold price websites, CafeF website, through Data Scraping activities.

Data processing and formatting: Raw data is cleaned, processed and converted into suitable formats such as Excel tables

Automated Email Sending: UiPath integrates with Gmail or other email services via SMTP protocol to send gold price information as requested by users.

Microsoft Excel Add-in: Excel is used to store and process collected data. This is where gold prices by region are aggregated and information is formatted before being sent to users. Excel files are also used to store gold price history, support trend analysis and future forecasts.

Gmail or SMTP service: Gmail is integrated to automatically send emails to a list of recipients. Each email will contain detailed information about gold prices in each region, trends and forecasts. SMTP service allows sending mass emails quickly and securely.

2.2 Planning

2.2.1 Forming a team, roles and responsibilities

Project Manager

Responsibilities: Project Manager (PM) - The team leader will be responsible for the entire project "Automation of the process of sending email updates of gold price reports to customers", ensuring that all processes are carried out as planned and meet quality standards. The PM is responsible for planning, resource allocation and risk management. The PM organizes and conducts meetings with relevant team members to ensure requirements and expectations are met.

Role: The PM is the main liaison between team members and relevant project development members, ensuring that the "Automated Email Process for Gold Price Report Updates to Clients" system is built to suit specific needs, including data security and analysis accuracy. The PM monitors project progress, reports status, recommends solutions when issues arise, and ensures the project is completed on time with high quality.

Business Analyst

Responsibilities: Business Analyst (BA) - a member of the project analysis team, plays a key role in connecting to analyze the project development with relevant individuals. In this project, the BA analyzes the current process of collecting and processing gold price data, identifying areas for improvement and automation. The BA builds process models, flow charts to visualize the quotation system. The BA holds regular meetings with stakeholders such as the business development team and the analysis team to collect requirements, ensure that the system fully meets the needs and solves existing problems.

Role: BA is the main bridge between the business developers and the development team. BA ensures that all business requirements are accurately translated into the system

design. BA also participates in the acceptance testing (UAT) phase, working closely with stakeholders to confirm that the system meets expectations. After deployment, BA monitors system performance, collects feedback, and recommends improvements to ensure the long-term success of the gold price forecasting system.

Solution Architect

Responsibilities: The Solutions Architect (SA) is responsible for designing and implementing the technical architecture for the "Automation of the process of sending email updates of gold price reports to customers" system. The SA builds a system architecture diagram, describing components such as the UiPath bot, database, user interface, and how they interact with existing systems. The SA works with technical analysts and data analysts to gather detailed technical requirements, ensuring that the solution meets all critical requirements. The SA develops an integration test plan to ensure that the components in the system work together and that there are no compatibility issues.

Role: The SA ensures that the technical design of the system is consistent with the business requirements gathered by the BA. During the quality assurance phase, the SA reviews and adjusts the system design to maintain a high standard of quality. The SA ensures that the final solution is stable, reliable, and scalable in the future.

Automation Developer

Responsibilities: The Automation Developer (AD) performs coding of automation processes according to the design provided by the SA. The AD programs UiPath bots to automate the collection of gold price data from the website, processes and analyzes the data, and then generates reports. The AD also performs unit testing and integration testing to ensure that the automation processes are efficient and error-free.

Role: The AD is directly responsible for converting technical and business requirements into well-functioning automation processes. The AD works closely with the BA to ensure that all aspects of the automation process are implemented correctly. The AD also handles debugging and fine-tuning of the bots during testing and deployment.

Infrastructure Engineer

Responsibilities: The Infrastructure Engineer (IE) is responsible for establishing and maintaining the technical foundation for the system. The IE begins by installing and configuring the physical or virtual servers, databases, and network services required for

the system to function effectively. The IE ensures that the UiPath platform is properly installed and integrated with the relevant applications and databases. Additionally, the IE implements data security measures such as encryption and access control to protect sensitive information.

Role: IE ensures the technical foundation of the system is stable and secure. IE performs final pre-deployment testing to verify that all components are properly configured and ready for operation. After deployment, IE continues to monitor and maintain the system to ensure the continuity and efficiency of the gold quote system.

2.2.2 Stages

Table 2.2. *Stages*

Stages	Roles involved	Tasks	Outcomes
Kickoff	PM, BA, SA, IE, Stakeholders	- Conduct initial project meetings - Define project goals, scope, roles and responsibilities - Plan resources, timelines and milestones	- Kick-off meeting minutes: Documented agreements on project goals, scope, and team roles. - Project plan: Initial high-level project plan outlining milestones and timelines
Business analysis and technical validation	PM, BA, SA, IE, Stakeholders	- All requirements from stakeholders are collected, analyzed and documented in detail. During this phase, requirements for gold price data by region, forecast frequency, and email delivery method are determined.	- The engineering team conducts testing to ensure that these requirements can be implemented using the UiPath solution.

Process analysis	BA, SA, PM, SME Process	- Map current and future processes - Identify automation opportunities and inefficient processes - Validate process changes with stakeholders	- Detailed Process Flow Diagram: Visual and documented flow diagram of current and future processes. - Process Analysis Report: Identify key pain points and areas for improvement.
Solution design	SA, BA, PM, IE, AD	- Develop detailed system architecture - Define workflows, specifications, and integration points - Create test and deployment plans	- Solution Design Document (SDD): A comprehensive blueprint detailing the system architecture, workflows, and technical requirements. - Test Plan: A detailed plan for drafting strategic, logical, and UAT units. - Declarative Development Plan: A structured follow-up approach to developing a declarative solution in a live environment.
Development & Testing	AD, SA, IE, BA	- Automation processes are built in UiPath based on the defined design. UiPath bot is developed to collect gold price data from trusted sources, analyze the data and generate reports.	- Functional UiPath Workflow: Completed automation scripts ready for testing. - Test Report: Documentation of test results, identifying any issues and their solutions. - Code Repository: Version-controlled storage of all project code and related documentation.

Acceptance testing	BA, AD, SA, PM, stakeholders	- Execute test cases with real data - Collect feedback from end users - Resolve any identified bugs or issues	- UAT Plan: A detailed plan that outlines the scope, objectives, and acceptance criteria for testing. - UAT Feedback Report: Documents feedback, issues encountered, and corrective actions taken. - Signed UAT Report: Formal approval from stakeholders confirming that the system meets all business requirements.
Deployment and support	PM, IE, SA, AD, BA	- The system is officially deployed for use. During this phase, the support team is ready to immediately handle any issues that arise.	- Gold price reports are sent via email to users on a pre-set schedule, ensuring continuous and efficient operations.
Project Closure	PM, BA, SA, IE, Stakeholders	- The project ends with the compilation and finalization of relevant documents.	- Project Completion Report: A comprehensive document summarizing project results, challenges, and lessons learned. - Finalization Documentation: All project-related documentation is completed, reviewed, and archived for future reference. - Project Retrospective: A detailed analysis of what worked and what could be improved for future projects.

2.2.3 Assessment plan

For this particular process, the tool indicates a Medium Effort level. This indicates that automating a user email gold quote system involves a complex workflow, high volatility, or multiple dependent systems that require a lot of effort and expertise.

Despite the effort required, the benefits of automation are large, with a 53% fit score. This high score implies that automating the process would significantly improve efficiency, accuracy, and resource utilization, however there is still room for improvement regarding external influences that affect the daily gold quote, such as politics, purchasing power, and individual demand.

In terms of impact, automating this process is expected to free up 115 hours of work per year, allowing employees to focus on more strategic tasks rather than repetitive administrative work.

Additionally, it will result in a 53% reduction in errors, significantly improving the reliability and consistency of the user email gold quote system.

2.3 Technical requirements

We will need the following hardware and software for this project:

- *Software requirements:*

+ Automation software: UiPath Studio | version 2024.10.6

+ Database management software: Excel 2019

- *UiPath's Dependencies requirements:*

+ UiPath.Excel.Activities: Version 2.24.3 used for automating tasks related to Excel.

+ UiPath.Mail.Activities: Version 1.23.11 used for automating email-related processes, such as sending and receiving emails.

+ UiPath.System.Activities: Version 24.11.0-preview Provides core functionalities for automation, such as data manipulation and application interaction.

+ UiPath.Testing.Activities: Version 24.10.3 used for automation testing tasks, including unit tests and workflow tests.

+ UiPath.UIAutomation.Activities: Version 24.11.1-preview Focused on automating user interface interactions with applications.

CHAPTER 3: IMPLEMENTATION OF THE PROJECT

3.1 Project overview

This project implements an automated solution to streamline the dissemination of gold price information to customers by utilizing UiPath Studio. The primary objective is to integrate data extraction, visualization, and notification functionalities into a unified workflow. The automation focuses on extracting gold price data from the CafeF website, generating reports, and delivering personalized updates to customers via email. This solution reduces manual effort, ensures timely communication, and provides an accurate representation of market trends.

The automation process involves several stages, ensuring a robust and systematic approach to data management and customer notification. The key steps include data extraction, chart capture, data mapping, and email dispatch. The bot integrates with web platforms and office productivity tools to facilitate this workflow efficiently. Below is a high-level outline of the workflow:

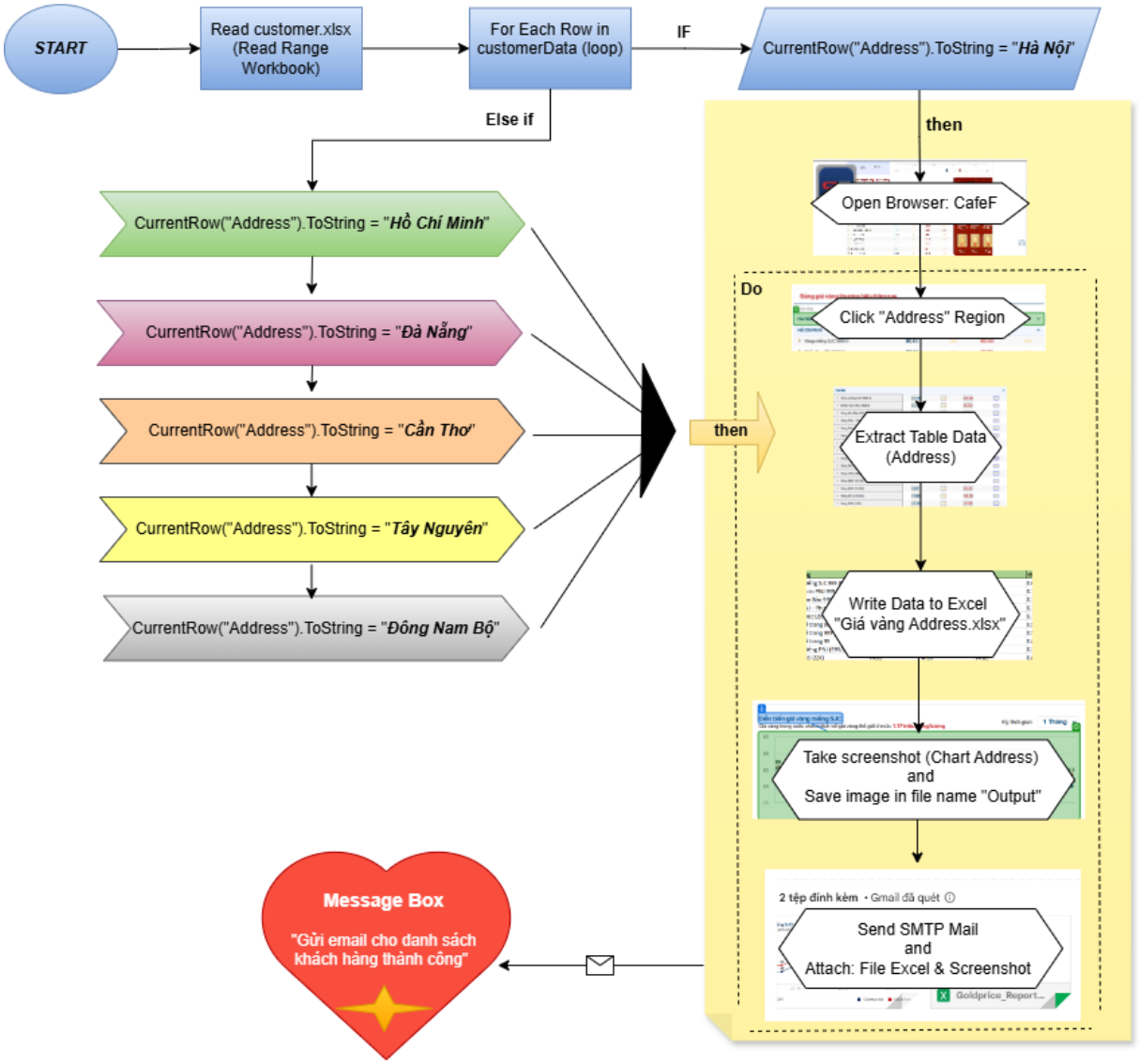


Figure 2.1. Project graphic diagram

This project aims to automate the process of sending daily gold price reports to customers based on their region. The automation workflow is designed using UiPath Studio, involving several steps that run sequentially. The process begins by reading file customer data from an Excel file that contains customer details such as email, and address.

For each customer, the automation identifies their region (e.g., Hanoi, Ho Chi Minh City, Da Nang, etc.) and navigates to the corresponding gold price page on the Cafef website. Based on the region specified in the customer's data, the robot selects the appropriate region (e.g., Hanoi), extracts the current gold prices from the website, and saves this data into a new Excel file under name Gold price + Your address.

Additionally, the robot captures a screenshot of the chart of gold price change trends in the last 1 month for the selected region and saves it as an image file Output. After

gathering all the required information, using UiPath’s email automation tools, the robot composes an email for each customer, attaching both the gold price report (Excel file) and the screenshot (file Output) as attachments. The email is then sent to the customer's email address, providing them with the gold price report for that day and a visual comparison of the price trends.

This automated workflow ensures that customers receive accurate and timely gold price updates based on their specific region, enhancing both efficiency and customer satisfaction. The entire process runs autonomously with minimal user intervention, making it a powerful automation solution for daily reporting tasks.

3.2 Project details

This project is structured using modular workflows within UiPath Studio to ensure maintainability, scalability, and clear interaction between different components. The automation process is orchestrated by a primary workflow (Main.xaml) which is optimized for modular and efficient execution. The Main.xaml workflow firstly will extract real-time gold price data from the CafeF website. This data will include pricing, percentage changes, and timestamps, which will then be saved in an Excel file called example Gia vang Ha Noi.xlsx.

Next, the workflow will capture a screenshot of the gold price trend chart from this website and save it as an image file named Chênh_lệch_giá_vàng miếng SJC_YYYY-MM-DD.png in the Output folder. The captured image will be used as a visual aid in the customer notifications. Subsequently, the Main.xaml workflow will go through the file to match the extracted gold price data with customer information stored in an Excel file named Customer.xlsx. This process creates a dataset where each customer's location is mapped to relevant gold price information. The dataset will be used to personalize email notifications.

Finally, the process of sending personalized emails to customers will be implemented. This workflow loops through the customer dataset, composes an email for each recipient, and attaches both the gold price report and the chart image. The emails are dispatched using UiPath’s email activities, and a log file is created to track the status of each email.

Now, let's start stepping through each of the workflows in detail, starting with the main workflow.

As with any UiPath project, we will start by opening UiPath Studio and creating a new project. Perform the following steps:

- Open UiPath Studio and choose the New Blank Process option on the initial screen.

- In the main workflow, let's start by adding a sequence called Main Sequence.

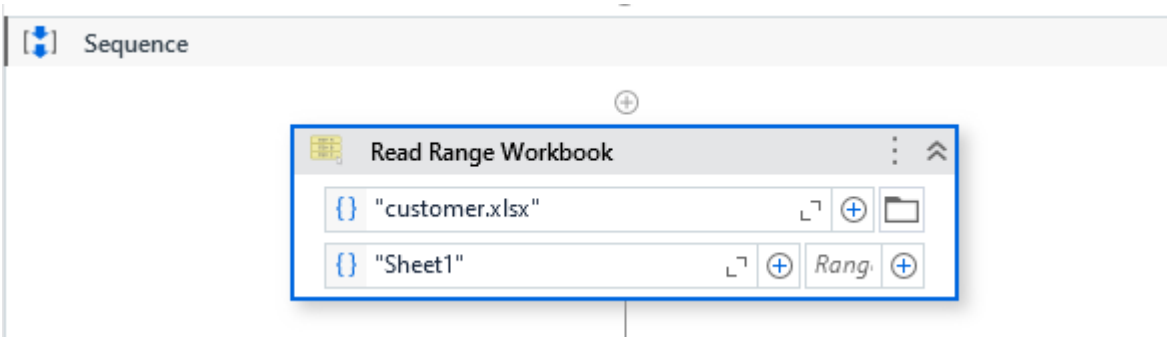


Figure 2.2. Read Customer Data from Excel file

- Next, we'll add a Read Range Workbook activity to read file “customer” in Sheet1 into a DataTable (customerData). Each row contains customer details such as: Name, Email Address (used to determine location).

	A	B	C
1	Email	Address	
2	huuhp21414@st.uel.edu.vn	Hà Nội	
3	uyenntt21414@st.uel.edu.vn	Hồ Chí Minh	
4	huongnth21414@st.uel.edu.vn	Đà Nẵng	
5	phuongnm21414@st.uel.edu.vn	Cần Thơ	
6	nguyenphuongduyen25102003@gmail.cor	Tây Nguyên	
7	hophamhuu111@gmail.com	Đông Nam Bộ	
8			
9			

- In the properties for the Read Range activities, add an Output variable to store the data table. Use Ctrl + K to add the customerData variable within the DataTable property.

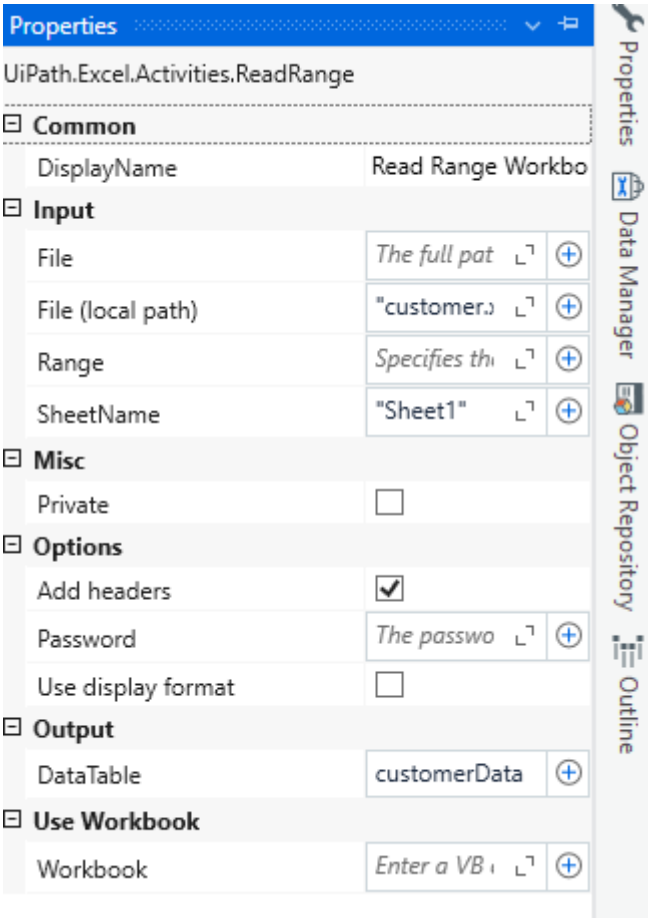


Figure 2.3. Properties Panel

- Below, the Body of a sequence refers to the collection of activities or steps that are executed in order within the sequence. A Sequence is one of the fundamental building blocks in UiPath workflows, designed to execute activities linearly from top to bottom. In our Body, we mainly use condition statements to go through each activity and repeatedly for another Else If condition.

- Within the sequence, add a new activity called For Each Row. This is where we will add the activities related to reading in values from the customerData. For each customer row, the robot identifies the location (Address column) and navigates to the corresponding gold price section on the CafeF website. Referring to inputting "Current Row" in a field, such as a field in UiPath where you want to access specific data during an iteration, it typically means you want to dynamically use data from the current row being processed in your workflow.

Before we configure our main workflow further, let's do some groundwork that's required for the project.

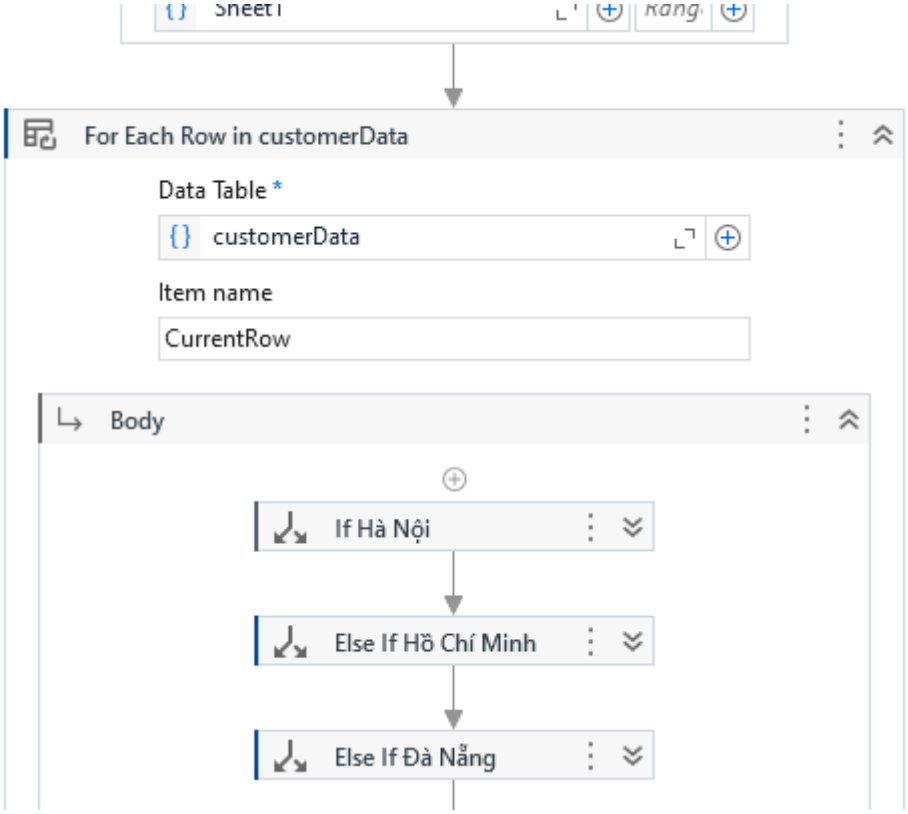


Figure 2.4. For Each Row Activity

Project groundwork

We will create an Excel configuration file that the administrator can use to specify the parameters to be used by the bot. And also create an Output folder to store capture of chart in this CafeF website.

Output: The bot will place the file with the pictures results in this folder.

As we read each row, we'll need to make sure that customers are associated with different locations, and the gold price data needs to be retrieved based on their location. The statements allow the workflow to "branch" into different paths depending on the customer's location, ensuring that each customer gets relevant data.

	A	B	C	D	E
1	Loại vàng	Giá Mua	Thay đổi giá mua	Giá Bán	Thay đổi giá bán
2					
3					
4					
5					
6					

Figure 2.5. Gold price file

To do that, we need to add an If control activity and add a condition stating

CurrentRow("Address").ToString = "Hà Nội". This is what I am introducing based on customers with addresses in Hanoi. Based on the Address field in the customer data, the workflow determines which location-specific gold price data to scrape. Each If condition checks if the customer's address matches a specific location (e.g., "Hà Nội") and Else if condition is used for other places when we loop through the customer information,. For example when the condition is met, , the robot navigates to the appropriate section on the CafeF website to scrape the gold prices for that location in Then activity. All main activity with If condition will execute within Then activity and we continuously repeat it for all over locations.

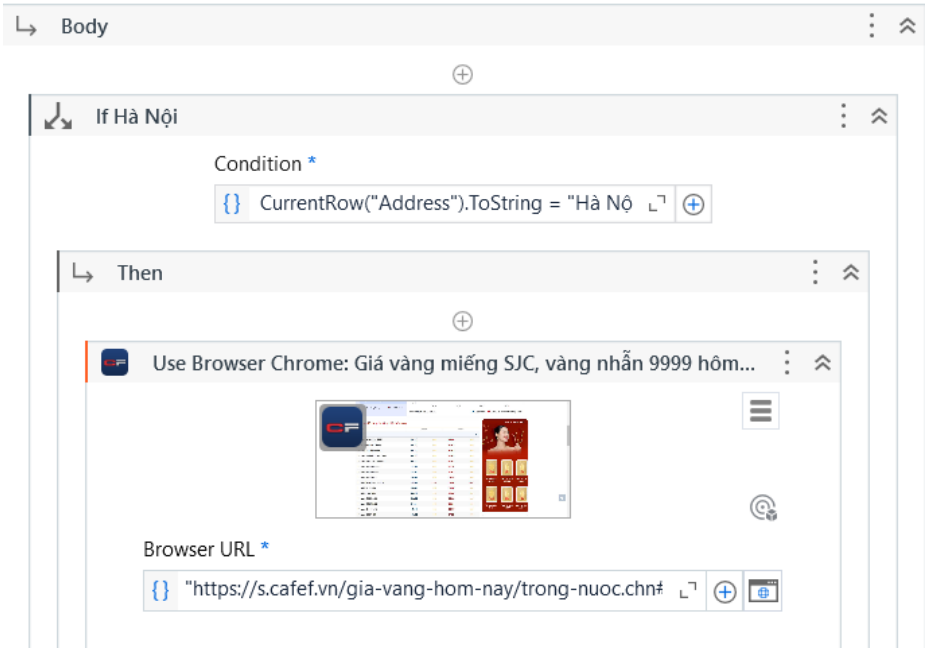


Figure 2.6. If Activity and Use Browser Chrome

In our workflow, the step to extract gold prices from the CafeF website involves several activities and actions. Here's a detailed breakdown of what is being done at this step:

3.2.1 Navigating to the Target Web Page

- *Activity Used*: Use Browser or Open Browser

Open the CafeF website or the specific gold price page. The browser is directed to the appropriate section of the website, which contains gold prices. After considering some aspects like friendly interface, easy understanding… we determine to use CafeF as a source of infomation.

- *Actions:*

Input the URL of the CafeF gold price page into the browser.

Ensure the page loads completely before proceeding to the next step.

This is done to ensure the data is visible and accessible for extraction.

3.2.2 Selecting the Desired Location

- *Activity Used*: Click

- *Purpose*:

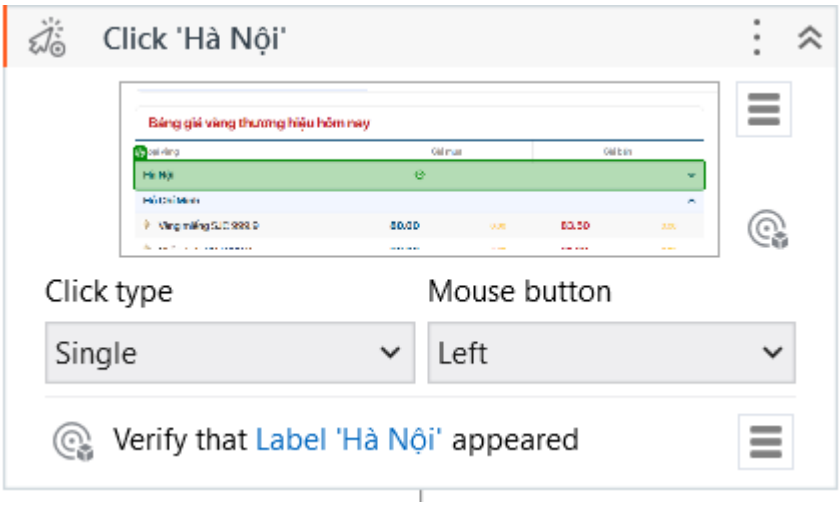


Figure 2.7. Click Activity

Identify and click on the location tab (e.g., "Hà Nội", "Hồ Chí Minh") that corresponds to the current customer's address. The Click Type property determines the kind of mouse interaction to perform. These options include: Single (Simulates a single mouse click), used for selecting items or interacting with buttons and links. And The Mouse Button property specifies which mouse button to use during the click. Options include Left which is the default mouse button used for general interactions like selecting items or clicking buttons.

- *Actions:*

Before clicking on a place (e.g., Hà Nội), you need to ensure the web page is fully loaded and the target element is available. This is the reason why we should add Do Activities that might be included:

Delay: To wait for a few seconds if the webpage is slow to load.

Element Exists: To confirm that the clickable element is present before trying to interact with it.

Highlight: For debugging purposes, to ensure the correct element is being selected.

Next, In the Do sequence, use the Click activity to select the tab or button for the appropriate location on the CafeF website.

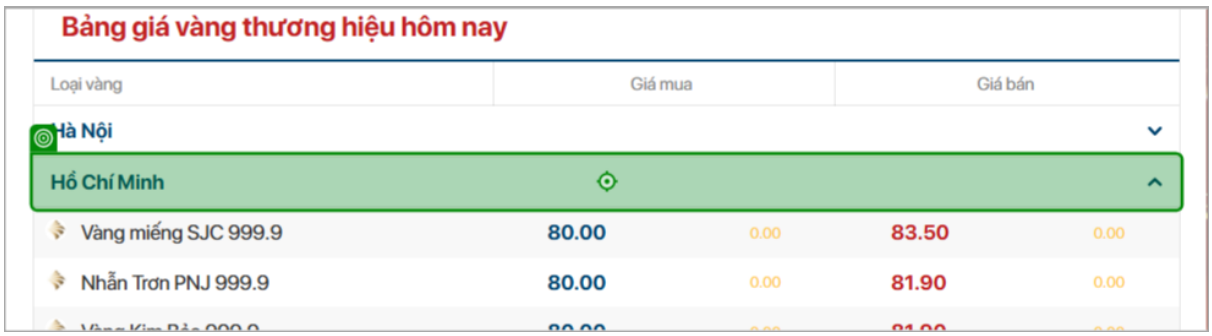


Figure 2.8. Click to get Target Element

Ensure the click action is successful by verifying that the target element (e.g., "Hà Nội label") appears on the screen after the click.

3.2.3 Extracting Gold Price Data

- *Activity Used*: Extract Table Data

- *Purpose:*

Extract structured data (e.g., rows and columns of gold prices, types of gold, buying and selling prices) from the website's table.

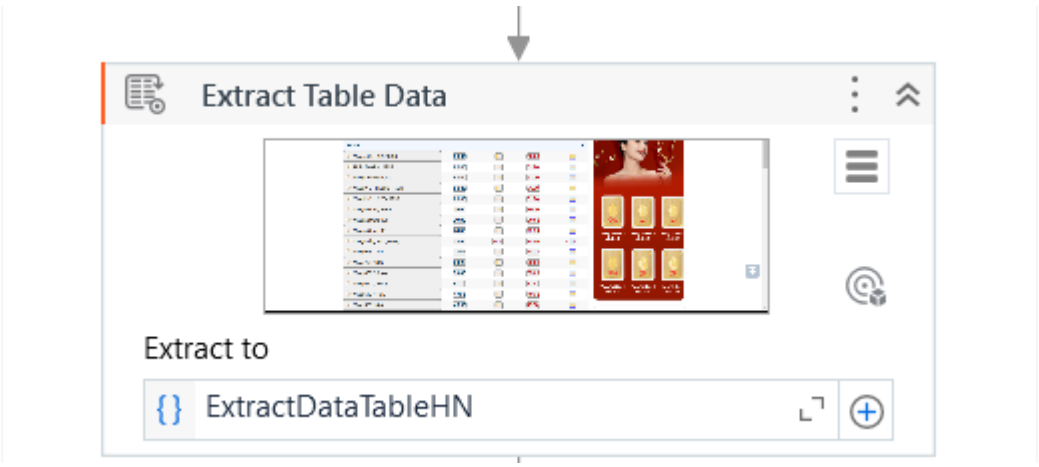
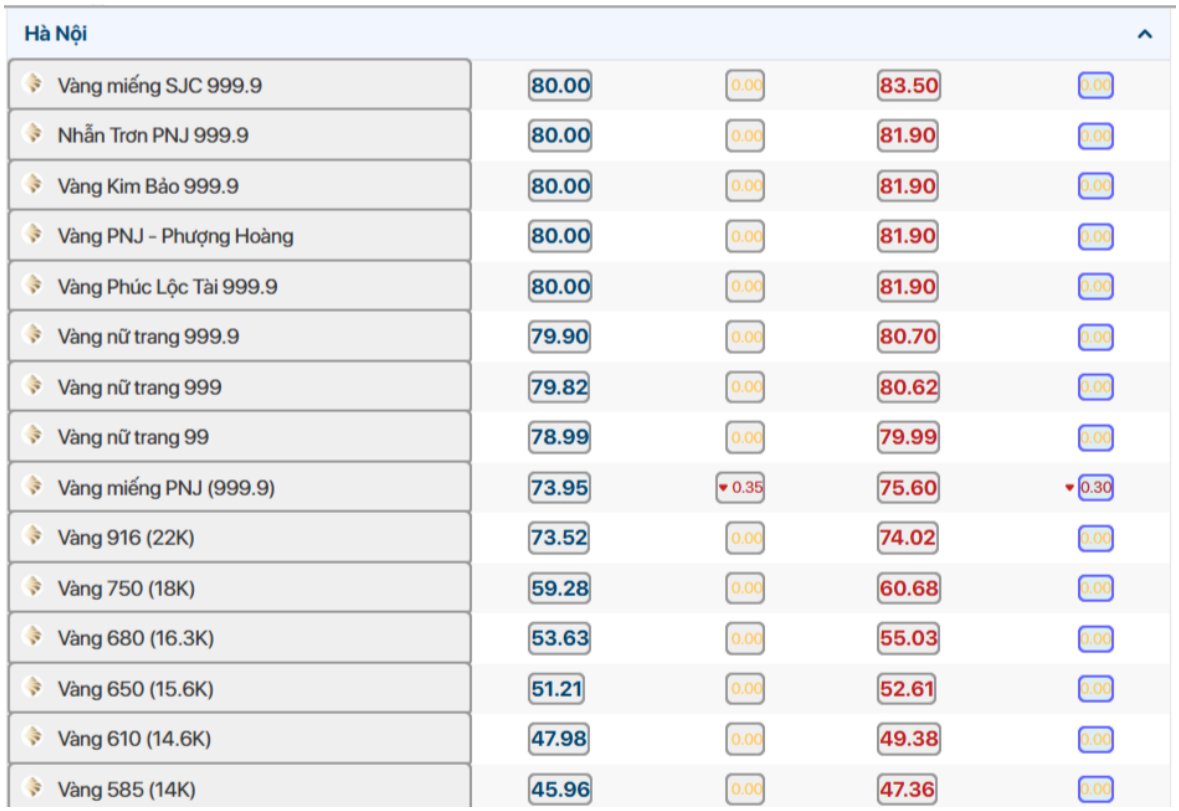


Figure 2.9. Extract Table Data Activity

- *Actions:*

Use the Data Scraping Wizard to define the table or section containing the gold prices:

To extract a data table from a webpage (e.g., a gold price table) using UiPath, start by dragging and dropping the Extract Table Data activity into your sequence. Select the browser window displaying the data, then click the Open Data Scraping Wizard option. Hover over the webpage and highlight the data table, identifying rows and columns.



Hà Nội				
Vàng miếng SJC 999.9	80.00	0.00	83.50	0.00
Nhẫn Trơn PNJ 999.9	80.00	0.00	81.90	0.00
Vàng Kim Bảo 999.9	80.00	0.00	81.90	0.00
Vàng PNJ - Phượng Hoàng	80.00	0.00	81.90	0.00
Vàng Phúc Lộc Tài 999.9	80.00	0.00	81.90	0.00
Vàng nữ trang 999.9	79.90	0.00	80.70	0.00
Vàng nữ trang 999	79.82	0.00	80.62	0.00
Vàng nữ trang 99	78.99	0.00	79.99	0.00
Vàng miếng PNJ (999.9)	73.95	▼ 0.35	75.60	▼ 0.30
Vàng 916 (22K)	73.52	0.00	74.02	0.00
Vàng 750 (18K)	59.28	0.00	60.68	0.00
Vàng 680 (16.3K)	53.63	0.00	55.03	0.00
Vàng 650 (15.6K)	51.21	0.00	52.61	0.00
Vàng 610 (14.6K)	47.98	0.00	49.38	0.00
Vàng 585 (14K)	45.96	0.00	47.36	0.00

Figure 2.10. Extracted Data from Website

Click on the first element (e.g., the name of a gold type like "SJC Gold") and then click on a similar element in the second row (e.g., the next type of gold). The wizard will recognize the repeating pattern and automatically detect the table. Click on each column header or a sample cell to select the data, and provide meaningful names for the columns, such as GoldType, BuyingPrice, and SellingPrice. Finally, use the Preview button to view a sample of the extracted data and ensure accuracy before proceeding.

The extracted data is automatically stored in a DataTable variable (e.g., ExtractDataTableHN for Hà Nội).

3.2.4 Saving Data to an Excel File

- *Activity Used*: Write Range Workbook

- *Purpose:*

Save the extracted gold price data into an Excel sheet for later use.

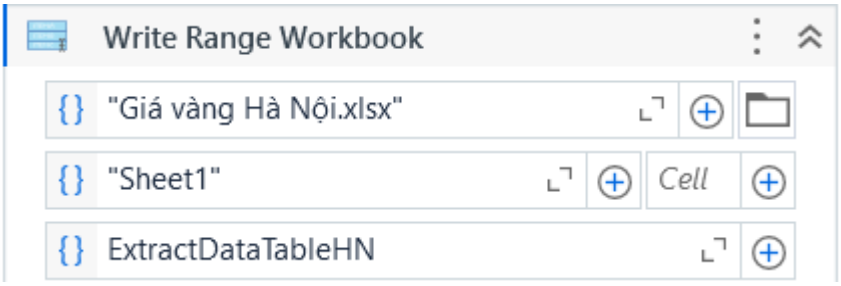


Figure 2.11. Write Range Workbook Activity

- *Actions:*

To write data to an Excel file using UiPath, drag and drop the Write Range Workbook activity into your workflow. In the File Path field, specify the full path of the Excel file (e.g., Giá vàng Hà Nội.xlsx). If the file does not exist, the activity will automatically create a new one. Enter the desired sheet name (e.g., Sheet1), and if the sheet doesn't exist, it will also be created automatically. Set the Starting Cell field (e.g., A1) to indicate where the data writing should begin. Assign the DataTable variable (e.g.,ExtractDataTableHN) to the Input Data Table property. By default, the Write Range Workbook activity overwrites all existing content in the specified sheet starting from the given cell. If you need to preserve the existing data in the sheet, use the Append Range Workbook activity instead.

Name	Variable type	Scope	Default
screenchart	Image	Do	*Enter a VB expression*
customerData	DataTable	Sequence	*Enter a VB expression*
ExtractDataTableHN	DataTable	Main Sequence	New System.Data.DataTable

Figure 2.12. Variable Panel

3.2.5 Take screenshot the chart

- *Activities used:* Take Screenshot

- *Purpose:*

To provide a visual representation of the gold price trends or comparisons for the selected region. Including this visual element in the email enhances the clarity and understanding of the data for the recipient. It allows customers to easily interpret the changes in gold prices over time or compare different metrics without needing to analyze raw data. This added visual aids in making the report more professional, engaging, and informative for the customer.

- *Actions:*

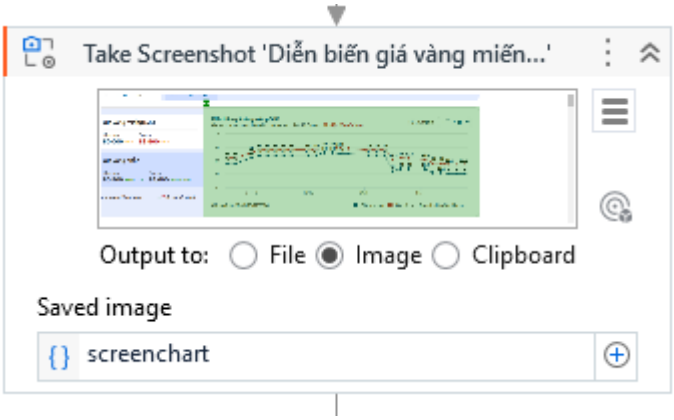
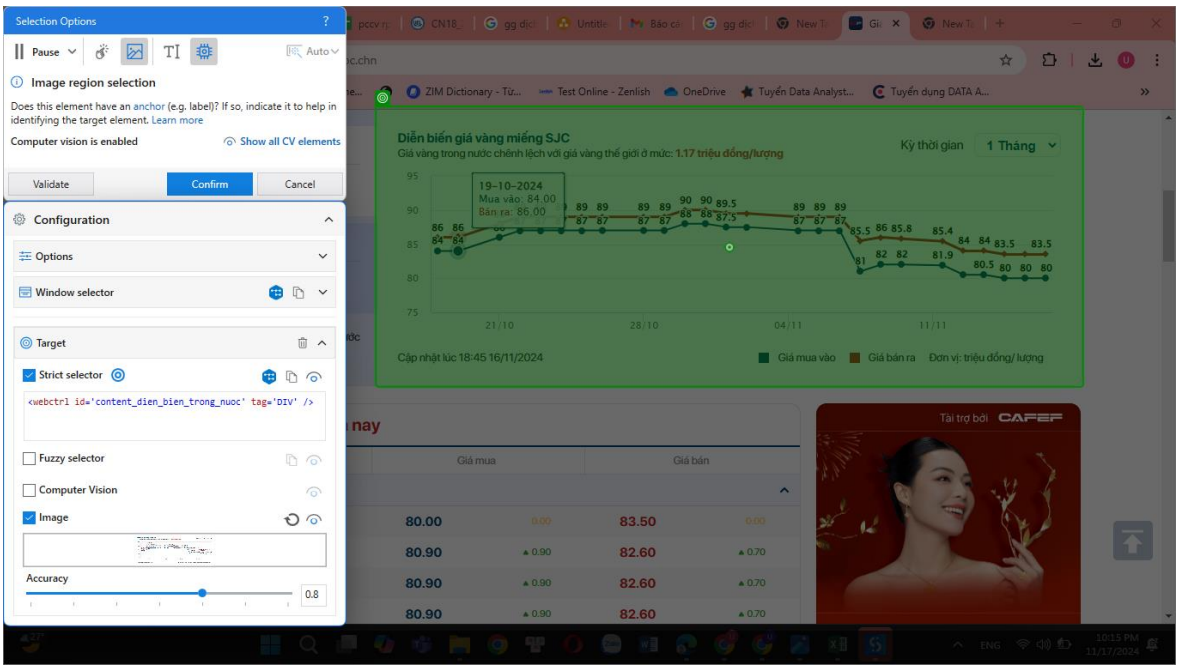


Figure 2.13. Take Screenshot Activity

+ Drag and drop a **Take Screenshot** activity under the **Do** section of the **Use Application/Browser** activity.
+ Configure the **Indicate on Screen** option to select the chart on the web page.



In Target sector choose "**strict selector"** allows to precisely identify the chart as the target for taking the screenshot, ensuring UiPath doesn't mistakenly capture other parts of the web page (e.g., buttons, tables, or irrelevant areas). For example, if the page contains multiple charts or regions, a strict selector ensures only the relevant chart for the selected region (e.g., Hà Nội) is captured. We also choose to tick the **"Image"** box ensures that the bot accurately captures the visual chart (e.g., gold price trends) and uses it for further processing, such as attaching it to emails for reporting purposes. This makes the workflow both robust and user-friendly.

+ Store the output in a variable name "screenchart" of type UiPath.Core.Image.

Name	Variable type	Scope	Default
FormattedExtractDataTableHN	DataTable	Do	*Enter a VB expression*
screenchart	Image	Do	*Enter a VB expression*

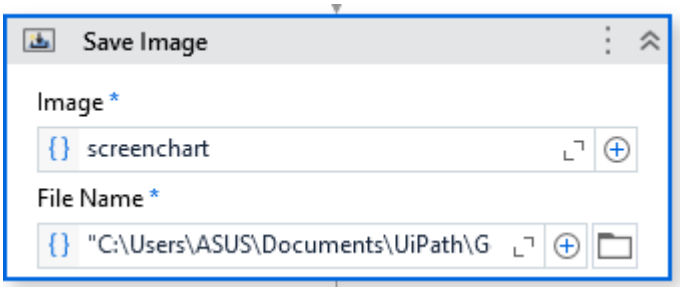
3.2.6 Save image

- *Activities used:* Save Image

- *Purpose*:

This step saves the captured screenshot to an Output folder defined only with a file named Gold Price Difference and timestamped.

- *Actions:*



Add a **Save Image** activity, input the variable “screenchart” in the **Image** field and specify the file path in the **File Name** field, e.g. "C:\Users\ASUS\Documents\UiPath\GoldPriceScraper\Output\GoldPrice_" + DateTime.Now.ToString("yyyyMMdd_HHmm") + ".png"

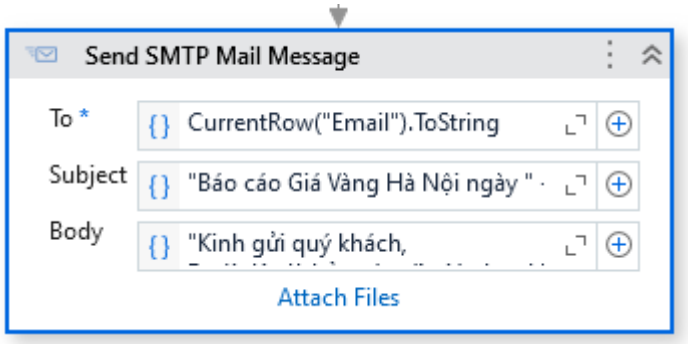
3.2.7 Send an Email

- *Activities used:* Send SMTP Mail Message

- *Purpose*:

In this step, we are automating the process of sending an email to each customer with a report on the gold price in Ha Noi, along with two attached files: an Excel report and a chart image.

- *Actions:*



- ***"To" Field:***

- Value: CurrentRow("Email").ToString
- Explanation:
    - The "To" field dynamically gets the recipient's email address from the current row of the data table (CurrentRow) in the loop.
    - CurrentRow("Email") extracts the email address from the "Email" column of the customer data table.
    - .ToString ensures that the value is converted into a string format, which is required for the "To" field.

- ***"Subject" Field:***

- Value: "Báo cáo giá vàng Hà Nội ngày " + Now.ToString("dd/MM/yyyy")
- Explanation:
    - This creates a dynamic subject line for the email.
    - "Báo cáo Giá Vàng Hà Nội ngày " is the static text.
    - Now.ToString("dd/MM/yyyy") dynamically inserts the current date in the format day/month/year, ensuring the subject is specific to the day the email is sent.
    - Example: "Báo cáo Giá Vàng Hà Nội ngày 17/11/2024"

- ***"Body" Field:***

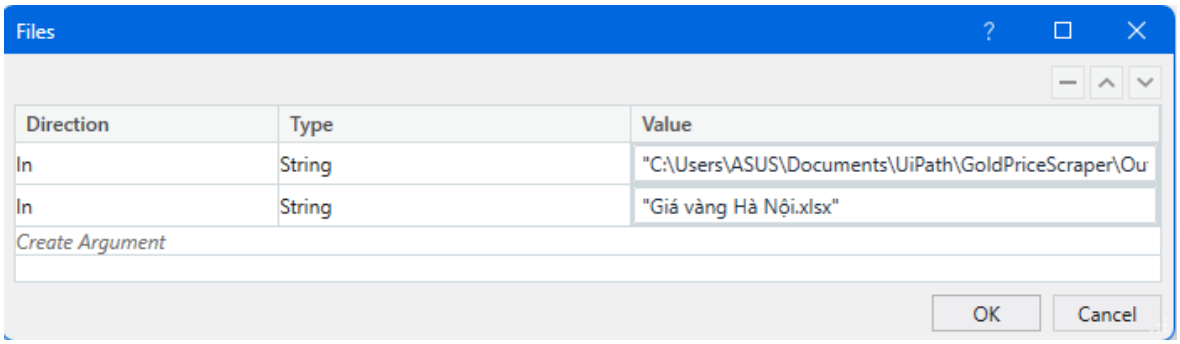
  This creates the email body, formatted as follows:

  + A formal salutation: "Kính gửi quý khách,"
  + A brief introduction: "Dưới đây là báo cáo về giá vàng Hà Nội ngày " + Now.ToString("dd/MM/yyyy"), including the current date dynamically inserted.

+ An explanation of the attached files: "Quý khách cũng có thể tham khảo thêm biểu đồ so sánh chênh lệch giá vàng miếng SJC mua vào và bán ra (kỳ 1 tháng), được minh hoạ trong ảnh đính kèm."

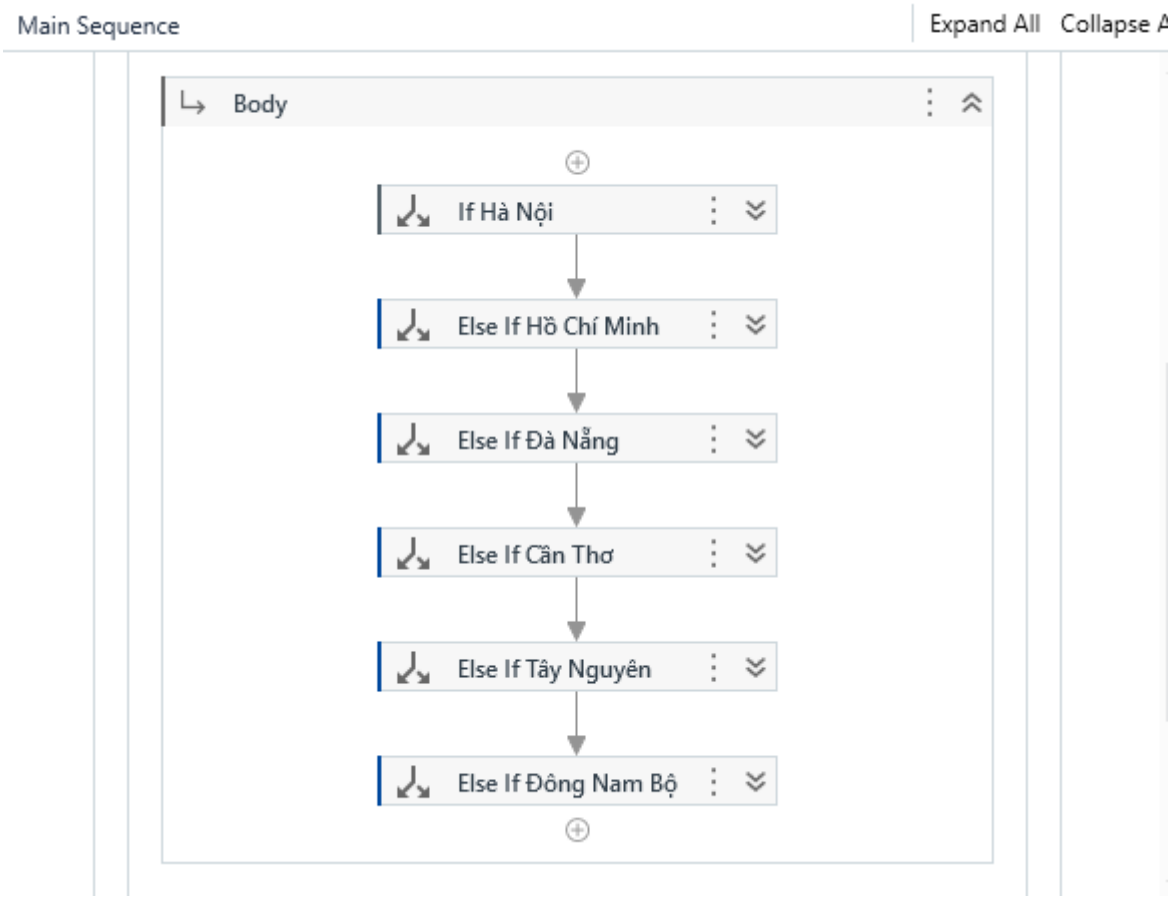
The content is structured to be formal, informative, and customer-friendly.

- ***Attachments:*** we attach 2 files including an excel file about gold prices and a chart image file showing the price difference so customers can have a more intuitive view.



That's the whole process of automatically determining if the first customer's address is in Hanoi and sending them gold prices in that area. The next step is to repeat that process with the next customers at each address according to their area.

After completing the If with the condition for the customer in "Hanoi", we in turn add an Else If checking the address "Ho Chi Minh", “Da Nang”, “Can Tho”, “Tay Nguyen”, “Dong Nam Bo” with the steps are similar to those in Ha Noi.



- Set the condition for the process to: CurrentRow("Address").ToString = "Ho Chi Minh". In turn, behind the equal sign are the addresses of the customers in the input excel file named “customer.xlsx”. Then:

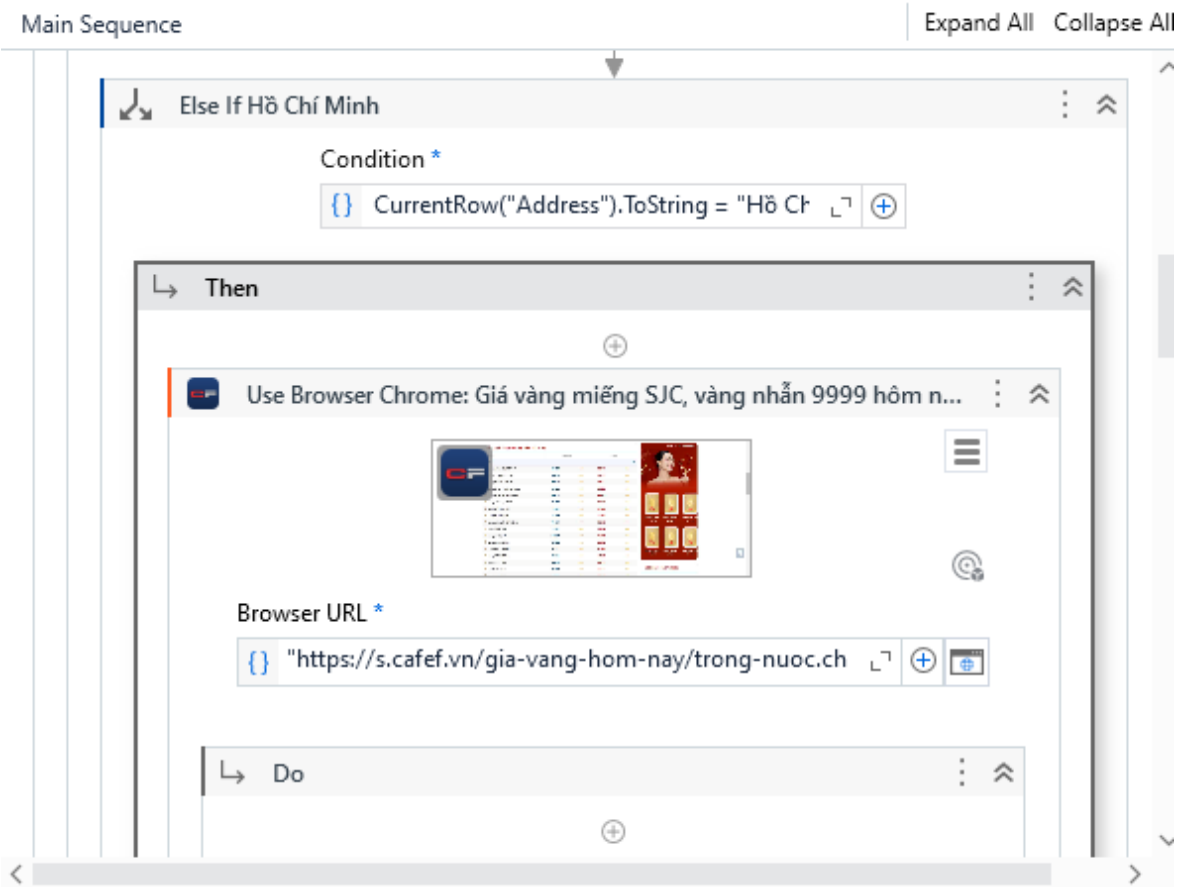
- Open a browser and visit the website. After that, use “Do” activities for steps below:

- Click on the "Address" area on the website.

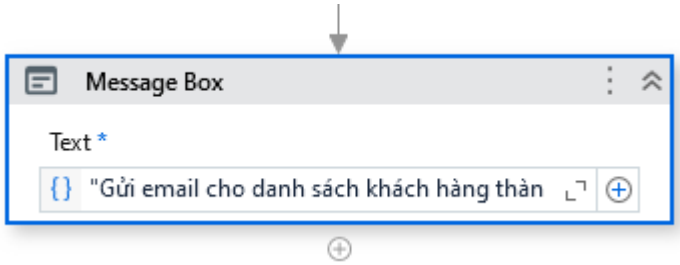
- Extract gold price data and save data to excel file

- Take a screenshot of the chart that shows gold price difference and save image in the Output folder.

- Create email content and send emails to customers in that areas.



After the bot completes the loop for sending emails to all customers, it displays a **Message Box** with the text: "Gửi email cho danh sách khách hàng thành công"



Purpose of the Message Box:

- Confirmation of Task Completion: The Message Box acts as a notification to the user that all emails in the list have been successfully sent. It signifies the end of the process without any errors.

- User-Friendly Experience: It provides a simple and clear indication to the user that the bot has completed its task, especially in scenarios where the bot runs unattended.

Why It Is Placed Outside the Loop:

- The Message Box is placed outside the loop because it is designed to execute only once, **after the bot finishes sending emails to all recipients**.

- If it were placed inside the loop, the message box would appear after every email, interrupting the automation and requiring user interaction each time.

CHAPTER 4: CONCLUSION

4.1 Evaluation

By using partial unattended model, this project successfully automates the process of sending personalized gold price reports to customers based on their region. By integrating data extraction, screenshot capturing, and dynamic email generation, the workflow ensures that each customer receives a detailed and professional email containing the latest gold price trends, including an attached Excel report and a visual chart. The automation leverages UiPath's capabilities for efficient data handling, web interaction, and email distribution, saving significant time and reducing manual effort. The final notification confirms the successful execution, making the process both reliable and user-friendly. This project not only highlights the practical capabilities of UiPath but also provides a template for scalable, real-time automation solutions in the financial services domain.

4.2 Future development

To enhance the gold price automation project, the following developments can significantly improve functionality, scalability, and user value that our team is thinking about and will plan to develop further:

- *Multi-Region Support:* Expanding the workflow to accommodate multiple regions will enable customers to receive a consolidated email with gold price data for all regions they are interested in. By dynamically handling multiple locations in one run, the process becomes more user-friendly and efficient, particularly for customers managing operations across various geographical areas.

- *Scheduled Automation:* Implementing a scheduling mechanism, such as UiPath Orchestrator or a time-based trigger, will allow the process to operate autonomously on a daily or weekly basis. This eliminates the need for manual intervention, ensuring timely and consistent delivery of gold price reports to customers. It also improves reliability and reduces operational workload.

- *Data Analysis and Insights*: Extending the project to incorporate predictive analytics, such as using LSTM models for price forecasting, will provide deeper insights for customers. By leveraging historical gold price data and advanced machine learning algorithms, the system can generate forecasts and share valuable predictions. This enhancement transforms the project into a decision-support tool, helping customers plan their investments and operations more effectively.

These advancements will not only improve the project's functionality but also increase its value proposition for users, positioning it as a comprehensive solution for gold price monitoring and insights.

CHAPTER 5: DEMO VIDEO

Link video: Nhấp chuột vào đây