Backup Automation Using Power Automate for Malaysian Vaccination Centres

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Abstract – The Covid-19 pandemic has tested the world, especially the vaccine centres when it comes to logistics, maintenance of records, and issuing of vaccination certifications. The Malaysian vaccination centres (PPVs) known as Pusat Pemberian Vaksin in Malaysia have a secure, and reliable system to maintain records of who has been vaccinated and when. No system is fully secure and reliable, thus there needs to be a backup if anything happens to the records like data loss or tampering of records. Although the information flow is simplified using the MySejahtera app and scanning of QR codes, there is no contingency prepared should the system go offline at PPVs. Therefore, this PPV Backup Automation solution was commissioned to transfer local records using spreadsheet programs from PPVs that recorded patient data manually and to feed them directly into the Malaysian Vaccination Administration Services (MyVAS) servers once they come online in batch processing mode. Microsoft's Power Automate Desktop software was used to automate this process, saving manpower time of entering information from the spreadsheet to the webform one by one. We highlight some alternative technologies for automation, discuss some challenges encountered and future work to improve the system as well.

I. INTRODUCTION

A. Background

The Covid-19 pandemic has spread all over the Earth and has changed lives of the people living in it. Governments of the world are being tested in their capability to function while safeguarding their people through vaccination. In Malaysia, vaccination centres (PPV) have been formed in schools, community centres, stadiums, and assembly halls. There are many logistical, transport, data security and privacy problems that need to be addressed for PPV centres to function well and not leak sensitive data of the people who come to be vaccinated. The collection of patient information must be easy, efficient, and simple to process the large number of people passing through PPV centres.

Information about the patients entering the PPV centres is collected through a combination of the MySejahtera application, and the onsite help provided by healthcare workers. In some places QR codes are used to enter details of the patients using their smartphones while in other places the information is collected through filling up paper forms and signed by the medical officer present there. Healthcare workers are present to review the information given by the

patients as well as help them if there is any problem. After the information is verified, the patient details are then uploaded to the server from the PPV centre.

MySejahtera is a mobile application that is developed by the Malaysian Government to be mainly used in contact tracing of Covid-19. It is also used to update people on their Covid-19 status, fill forms, fix vaccination appointments, display vaccination certificates, etc.

Google form [1] developed by the GOOGLE corporation is a free accessible tool used by the world today for creating surveys and forms. It is also being used in a wide variety of fields like in education to grade students as well get feedback from many people quickly due to the number of people owning an electronic device like smartphones and can answer them as soon as they receive it.

Robotic Process Automation (RPA) software [2] has existed for a long time but only recently has technology evolved to the point it has become popular in businesses to automate the transfer of data and information from old software to new software or just serve as a link between them. RPA software is used to automate simple tasks that traditionally have been done by humans. RPA software has recently been used as a cost-effective means in business leading to the rise of commercial RPA softwares like UIPath, AutomationEdge, Workato, Microsoft's Flow, Microsoft's Power Automate (formerly Flow), etc.

B. Problem Statement

If internet connectivity is lost for any reason in PPV centres, then the information obtained by the healthcare workers is stored in spreadsheet files. The information contained in the spreadsheet files is then manually entered into the forms which stores the date into the server. This is time-consuming, human labour intensive, and inefficient. There needs to be an alternative where the process of entering the information contained in spreadsheet files into the forms be automated.

C. Objective

There are 3 objectives for this.

1. The automation of the transfer of information present in spreadsheet files to a web form,
2. To decrease the amount of human labour required, and
3. To provide a contingency for fluid data transfer even in the absence of internet connectivity.

D. Contribution

This work serves as a proof of work case that the RPA automation software Microsoft's Power Automate Desktop can be used to automate the process of transferring information from a spreadsheet file like excel to a web form like google form. The input form used by the healthcare workers was not available due to confidential reasons so custom google form was created that has the same UI elements to match the input form. If the RPA software used works on the google form, it will most probably work on the original form used by the healthcare workers. The problems faced during the making of this work as well as the solutions discovered and used are highlighted in this paper. These are the contributions present in the paper.

The paper is organized as follows. In Section 2, the literature review of the papers related to the field of Robotic Process Automation is presented. In Section 3, the research methodology of the proposed solution is explained. In Section 4, the results obtained from this work and the discussion is presented. The conclusion is given in Section 5.

II. LITERATURE REVIEW

Digital automation is an old concept, the idea of automating repetitive tasks using computers has been around since the 1990s. The paper Leveson et al. [3] proposes SpecTRM-RL a CAD system to assist engineers in finding errors early in development, which include not only the requirements but also the design rationale such as safety constraints, etc. The paper Leveson et al. [3] serves as a starting point of how far digital automation systems have evolved from the 1990s.

There has been a rise in commercial vendors for RPA software starting from 2016 compared to the years before. The paper van der Aalst et al. [2] published in 2018 observes the rise of commercial RPA software in 2 years and observes based on the software available what types of tasks and processes can be automated for the field of BISE (Business and Information Systems Engineering). For traditional process automation, the number of similar cases in a given

period should be high while the different types of cases should be low. For RPA, there is a balance limit where the different types of cases shouldn't be too high with a decent number of similar cases in a given period. It formulates research questions that are key interests for the BISE community due to the rise of RPA software.

RPA is being used widely in a variety of fields that have traditionally been thought to not have been possible to use it for. The paper Moffitt et al. [4] shows how RPA software available at the year of 2018 is not ready to be used for auditing, it also goes into detail about the modules of technology used. It shows how traditional management of workers are structured in a pyramid-like structure have been replaced with a pillar-like structure due to the use of automation.

Before Microsoft Flow and Power Automate which was released in 2019 and 2021 respectively, in Issac et al. [5] published in the year 2018 compares the most popular RPA software available at the time, some of which are still popular today. The software being compared are UiPath, Automation Anywhere, and Blue Prism. These software have been compared based on their features, and technical aspects. Attended and unattended automation, script-based and visual process designer, and openness of the platform are some of the features used to compare the 3 software. Technical aspects such as Bot Development and Core Functions, Control Room, System Management, Reporting and Resilience, RPA Analytics, Architecture, Deployment, Governance, and Security were used for comparison. The future scope of the software UiPath was rated to be very high and UiPath is still the industry leader and standard for commercial RPA software.

The paper Osman [6] published in 2019 examines ten case studies of companies using RPA solutions. This analysis shows that not all processes are suitable for automation. Osman [6] proposes five criteria to be used in determining if a process or task is to be automated. The five criteria are a high volume of tasks, rule-based tasks, low complexity processes or tasks, standardized process, and mature process.

In Agostinelli et al. [7], RPA software is thoroughly tested, categorised, and four research challenges are proposed to address the ways required to integrate intelligence into current RPA technology in order for RPA to be widely adopted in the Business Process Management (BPM) area. Only ten RPA software are tested in their paper and their purpose is to provide a roadmap of the future for RPA software companies to make their software more accessible in the BPM domain.

Houy et al. [8] showed that RPA software can be used to significantly improve public administration work processes in terms of efficiency and reduce process costs. They show how their suggested cognitive RPA for automated data extraction and processing is employed in a trade tax assessment scenario utilising deep convolution neural networks (CNN) in an application example.

In Romao et al. [9], a case study from the banking industry is presented, illustrating some of the benefits and hazards associated with BPM solutions that employ AI-related agents. Although RPA software frequently claims to improve performance and save costs, critics argue that immature or properly trained models might impair productivity and increase errors as a result of ill-informed or even incorrect judgments. The flexibility, complexity, and volatility in which organisations are handled are emphasized in their paper because there is a significant opportunity to use "intelligence" in automating business process management. Due to this, Romao et al. [9] questions whether the adoption of AI in RSA technologies increase the risks more than it increases the benefits.

Kobayashi et al. [10] demonstrated some instances of consumer services for the elderly that they built using communication robots and RPA software. The effectiveness of RPA-based customer services is investigated and highly rated. They created a basic model that may be used by RPA for general consumer services, not just for the elderly.

In most industries, the Contractual Employee Management System is utilised to keep track of contractors, subcontractors, and their contractually based employees' information. Existing systems have a key flaw in that they require repetitive human updating and maintenance of records, resulting in inefficient use of time and effort. In Parchande et al. [11], a fully automated machine learning and RPA based contractual employee management system is proposed. Their system helps to maintain employee records and generate different types of reports that helps the administrative department to measure the company and employee progress. To remove the repetitious task, the RPA automates the approval process, which includes employee onboarding, leave approval, and data entry.

When compared to other industry 4.0 technologies like as PPS, Digital Twin, and so on, RPA provides benefits such as better productivity, lower personal costs, higher customer happiness, and increased employee capabilities and

inventiveness. RPA software is compared to other industry 4.0 technologies by Axmann and Harmoko [12]. They claim that RPA development is quicker and easier than other technologies since it makes use of existing infrastructure such as networks and desktop servers.

Digital Platforms is a new service-based automation platform whose programming aims to create a set of workflows integrating different devices, provide useful functions using a graphical interface without requiring technical knowledge, automate human repetitive tasks, and provide certain decision-making capabilities. Abdou et al. [13] provided a comparison between 5 famous digital automation platforms such as Zapier, IFTTT, Integromat, Microsoft Power Automate and Parabola. They are compared through comparison metrics such as accessibility, usability, time responsiveness with the pricing model, integrability, and security risks.

Invoice processing tasks is a time consuming and labour-intensive process that is done by most companies. These tasks are perfect for the use of RPA software to save time and cost and lessen errors such as human errors. Kajrolkar et al. [14] served as a use case of using UIPath and RPA automation tool for generating invoices of customers. UIPath is used to automate 4 processes which are email automation, data scraping, comparison with database, and invoice generation.

The RPA papers published in the year 2018 examines the introduction of the software produced by commercial vendors into the workforce. The papers published in the next year 2019 focuses on how to effectively use RPA software through case studies and categorizing the software available. The papers published in the years 2020 and 2021 show the adaptation of RPA software for industry 4.0 technologies like Internet of Things (IoT).

The webform most used in the world today is the google form. The popularity of google form is not to be underestimated due to its wide use in the world by governments, companies, hospitals, and educational institutions. Simanjuntak and Limbong [1] examined why google forms are popular in classrooms. Google forms are preferred by the students due to their ease of access, colourful background, and so on. This is more so when most students own electronic devices like smartphones, tablets, and laptops. The researchers of this paper obtained the data through observation, in-depth interviews, and review of various document sources.

III. RESEARCH METHODOLOGY

A dialogue was first established with a representative from one of the PPV centres. Our representative was from the PPV centre located in Multimedia University, Cyberjaya. Through him, we were able to obtain a look at how their web form is designed, and what information from the patients they collect. A spreadsheet template was also given by him as an example of how they store patient details before filling them onto a form.

From the above information, we created a google form, that had all the UI elements shown in the form by the representative. After this, Microsoft Power Automate was chosen as the automation tool due to the software being one of the most popular software available for free in the market. Microsoft's Power automate offers 2 versions of their automation software one available online and another available to be downloaded.

We soon realized that Microsoft's Power Automate and Microsoft's Power Automate Desktop are geared towards cloud automation and local (legacy) system automation respectively, even though they are marketed as the same. Microsoft Power Automate Desktop was chosen since the information needed was stored in a local system and is not available in the cloud for security reasons.

Figure 1 above shows the order in which the Power Automate is programmed. First the prepared Google Form that is similar to the form used by the healthcare workers is opened. Second the spreadsheet file (Microsoft Excel) containing fake data is opened. The form is filled up based on the data contained in the excel file. After the form is filled up, Power Automate writes into the row of the patient information entered to indicate that this patient information has been processed as shown in Figure 2.
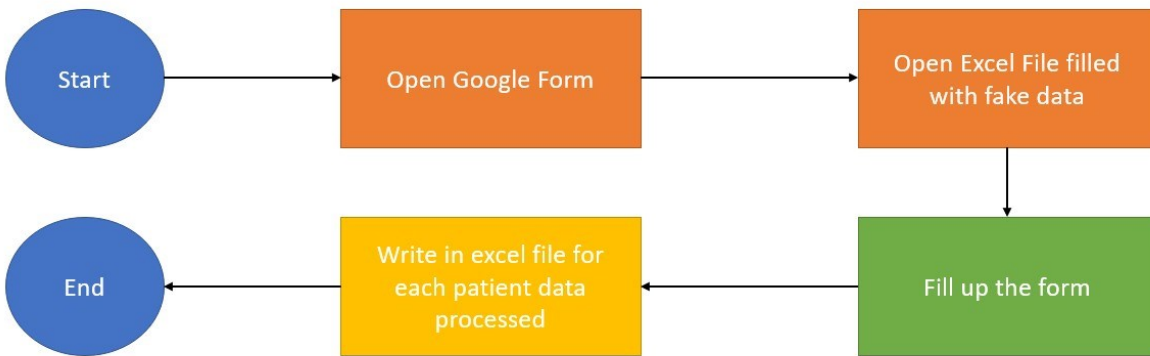
Figure 1. Flowchart of the Microsoft Automate Program

Figure 2. Snapshot of Spreadsheet used

IV. RESULTS AND DISCUSSIONS

A google form was created based on the web form shown by the representative from the PPV centre to be used in web browsers such as Chrome and Edge. Figures 3 and 4 shows snapshots of the created google form.

Figure 3. Google Form Snapshot 1

Figure 4. Google Form Snapshot 2

Figure 3 shows that the form contains UI elements such as a text box and a drop-down list. Figure 4 shows radio buttons, a drop-down lists, and checkboxes. These 2 figures show the different types of UI elements present in the form making it necessary to program appropriately for each type of UI element. These type of UI elements are present in the form used by the healthcare workers.

Figure 5 shows the Excel file containing information that is used to fill the google form. Patient information such as Name, Passport or IC number, User ID, etc is simulated for this work. For this, we created the patient information for 5 people.

Figure 5. Snapshot of the data filled Excel file

Figure 6 shows the workflow that is used to automate the task of filling the google form. The Excel file that contains the information to be used is launched first and then the google form is launched through the Chrome web browser. Microsoft's Power Automate Desktop software then fills the information contained in the Excel file to the google form as programmed.

Figure 6. Screenshot of Microsoft Power Automate

Figure 7 shows the google form being filled by the Power Automate Desktop software. The data is read row by row and the information contained in the columns is extracted by the software and filled accordingly into the google form. In the Excel file containing the information used, a column is created to signify whether the patient's information has been processed or not. In Figure 7 the information of the patient in the first row has already been completed and the software is entering the patient information contained in the second row of the Excel file. This is done to pinpoint which patient information is the automation process is processing. Thus, if the software stops for any reason like errors or human interface, we would know till which patient has the information been filled.
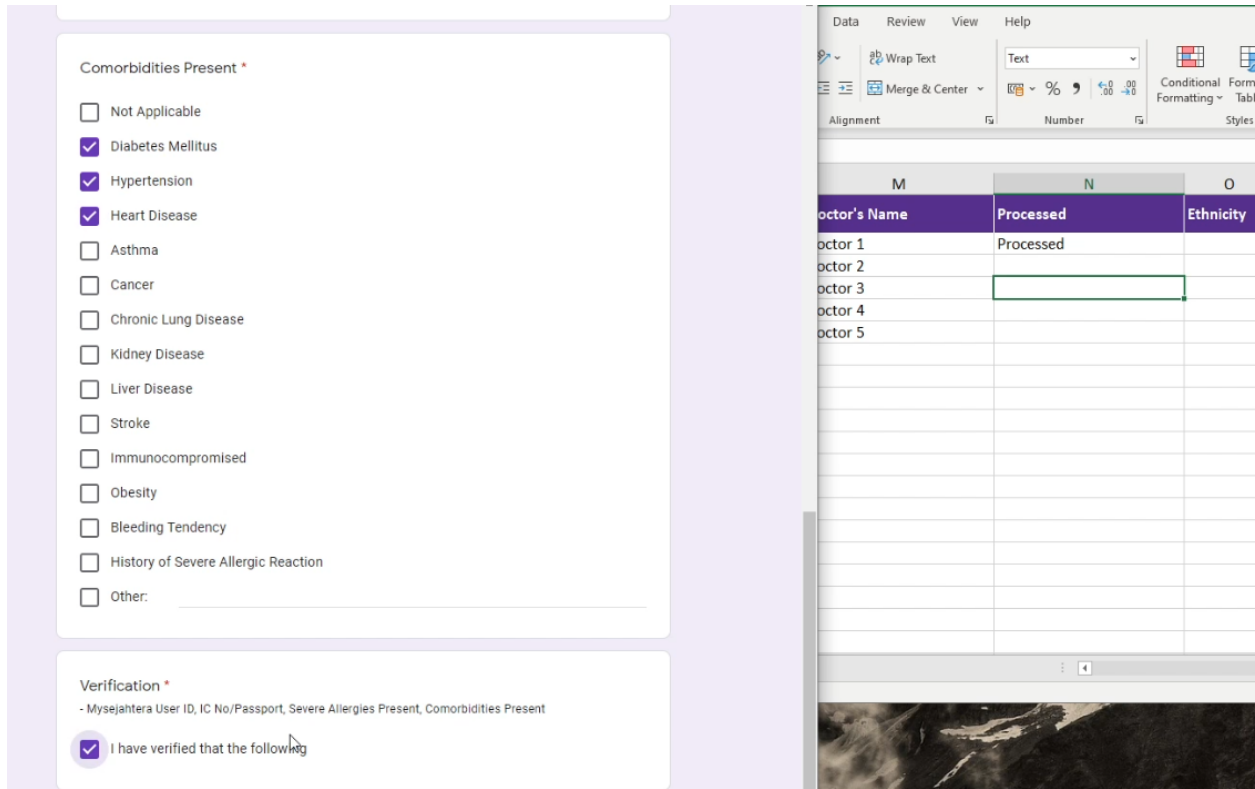
Figure 7. Snapshot of filled Google form and Excel file

One of the first problems faced in programming using Microsoft's Power Automate is the selection of UI elements. There are multiple boxes which encompass the UI element in the form that are used to select the UI element in the google form. These boxes are hard to differentiate and are also difficult to know whether you have selected the UI element or not. We had to use a trial basis method for most UI elements to figure out if we selected the right UI element.

Although each of the UI elements present in the form had a specific tool offered by Power Automate Desktop, some of them did not work as expected thus alternative methods had to be found and used. The solution found online is to use the recorder function or manually select the code for the dropdown list. Although the recorder proved useful for selecting radio buttons and checkboxes, it did not function as needed for dropdown lists. The current hypothesis is that Power Automate Desktop is designed for the automation of legacy systems and has not been designed for modern HTML forms which are more complex due to the JavaScript code used in them.

Figures 8 to 13 show examples of the UI elements used in the form.

Figure 8. Example of Text Field

Figure 9. Example of Drop-down List

Figure 10. Example of Radio Button.

Figure 11. Example of Checkbox

Figure 12. Example of Checkbox with Text Field
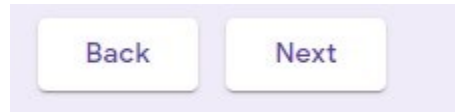
Figure 13. Example of Button

Figure 14 and Figure 15 shows the tools offered by Microsoft Power Automate to fill these UI elements.
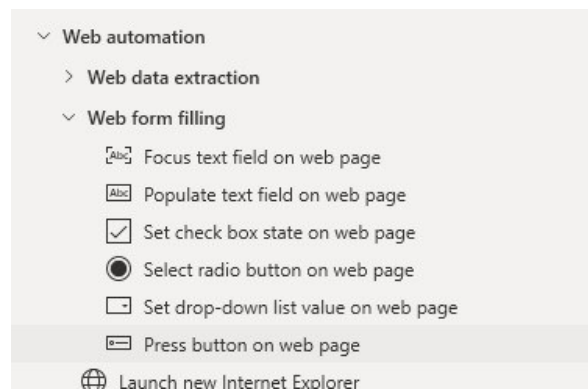
Figure 14. Snapshot of Web form filling in Power Automate Desktop
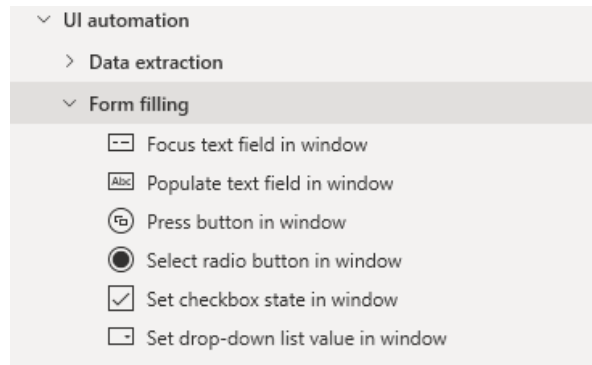
Figure 15. Snapshot of UI automation form filling in Power Automate Desktop

Populate text field on web page in Figure 14 and populate text field in window perform as expected for text field UI elements shown in Figure 8. The same goes for radio buttons in Figure 10 and checkboxes in Figure 11. The press button tools and set drop-down list value tools do not work as expected thus we used alternative means to achieve the needed result.

For buttons, as shown in Figure 13, the solution was simply to use the Click link on web page tool instead of the suggested tool as shown in Figure 16.
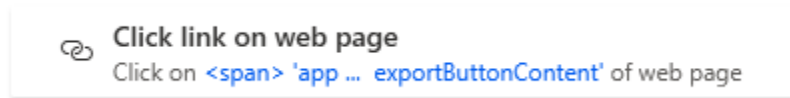
Figure 16. Snapshot of Click link on web page in Power Automate Desktop

The drop-down list shown in Figure 9 proved to be the most difficult problem to solve. The first suggested solution was to use a combination of if-else statements and UI elements such that each option present in the drop-down list is selected manually. This solution could only be feasible for drop-down lists containing a small number of options like in Figure 17, but for drop-down lists containing a list of countries like in Figure 18, it is not feasible.
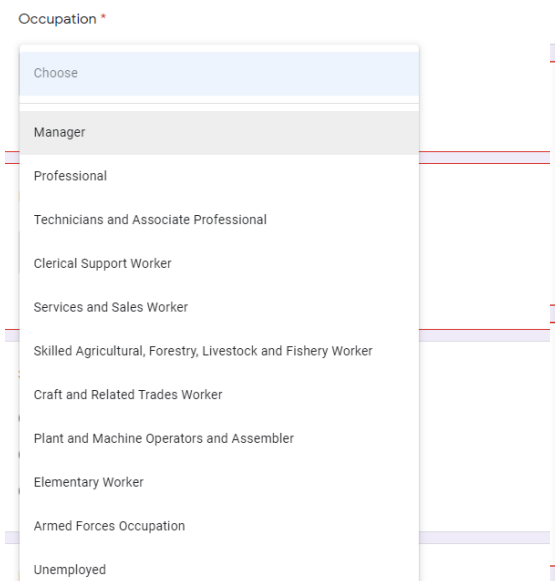
Figure 17. Drop-down list for Occupation   Figure 18. Drop-down list for Nationality
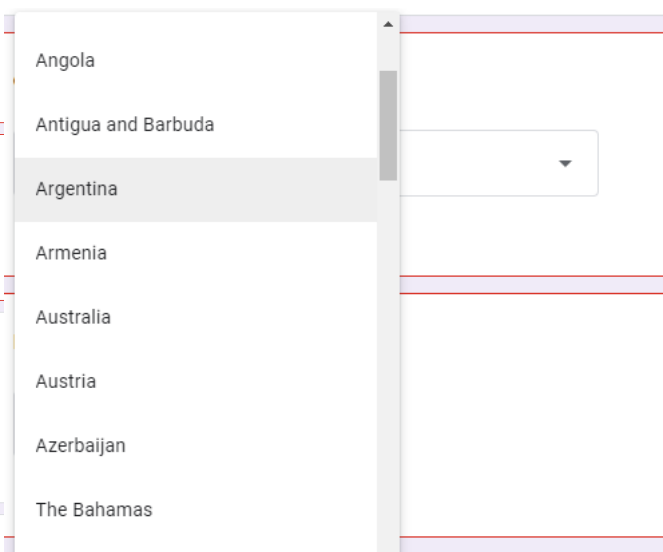
The next suggested solution was to type in the option after selecting the drop-down list and then press enter. This solution did not work because the Power Automate typed too quickly before the google form could react to the initial click. For this reason, we added a 2-second delay before Power Automate types in the text. The solution is shown in Figure 19.
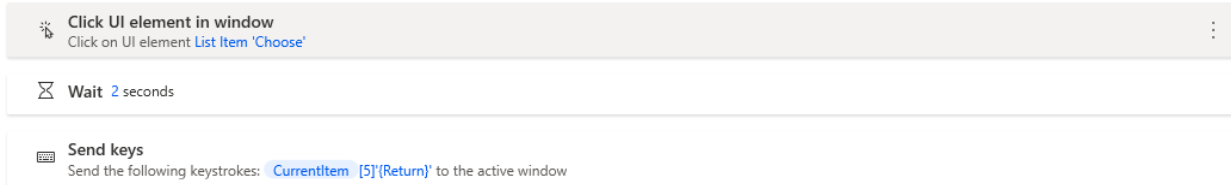
Figure 19. Drop-down list Solution in Power Automate

Another problem is that Power Automate is not able to scroll down to the next UI element in the form that was to be filled. This was solved by running a JavaScript code to manually scroll after filling the UI elements present in the screen. Figure 20 shows the tool used.
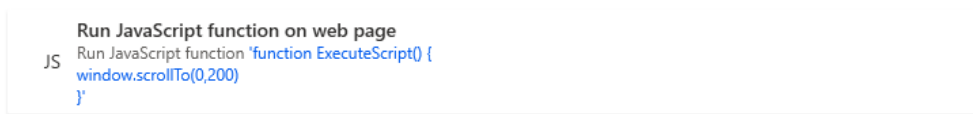
Figure 20. Scroll down tool used in Microsoft Power Automate

A suggestion for the Microsoft Power Automate Desktop software is to be able to select multiple checkboxes or radio buttons and select the ones necessary. This is because for a few options using if-else statements is easy to do like in Figure 21, but with many options like in Figure 11, we would need to program multiple if-else statements which involve selecting each UI element making it tedious as shown in Figure 22. Another suggestion for the Power Automate software is to be designed for Google Forms as it is widely used and can serve as a standard for modern HTML forms with JavaScript code.
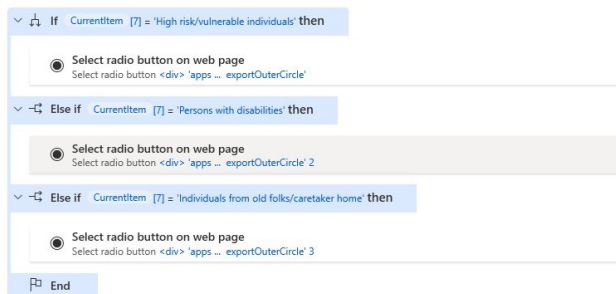
Figure 21. If else statements for Radio Buttons
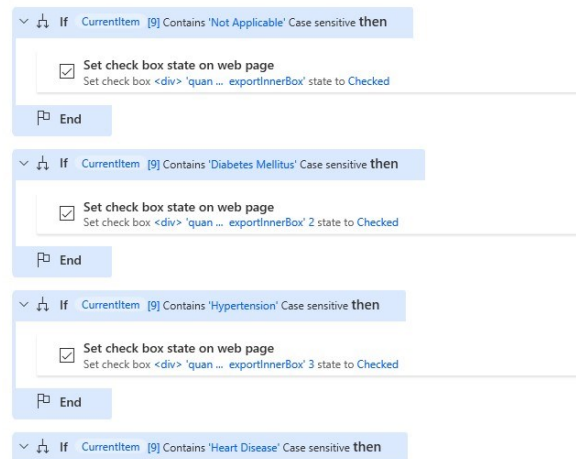
Figure 22. If else statements for Checkboxes

Figure 23 below is a screenshot of the Power Automate Desktop workflow in text form. It is not practical to code in this form compared to Graphical User Interface (GUI) form. The figure below shows the length of code in text form compared to the Graphical User Interface (GUI) form shown in Figure 6.

Figure 23. Screenshot of Power Automate Desktop workflow in text form.

The link to the demo for this work is "https://youtu.be/dedX08BtWCY"

V. CONCLUSION

The solution created serves as a proof of work concept for the form used by health care workers. If the internet connectivity in the PPV system is unavailable for any reason, our solution is available to be used to automate the data to the system instead of manually entering it. The proposed solution is faster as the software takes around 45 seconds to complete a form while a human takes around 1 min 10 seconds to fill up a form which our solution time efficient and has less probability of human error. A template of the form used in by the healthcare workers in the PPV centres is needed to program the automation tool specifically for it.

Looking at Microsoft's Power Automate, the problems faced while making our solution is mainly in the UI elements not being identified by the software and the tools provided not being compatible with the form used. It is expected that the form used by the healthcare workers will not be as complex as the Google form making it easier to program for. If the original form used, is more compatible with the tools offered by Microsoft Power Automate then the software is expected to take less time to complete a form than our proposed solution.

From the results obtained, this work serves as a valid solution to enter the backup data to their secure servers. It also serves as a use case for automation using RPA software.

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