Review for an Information Management System for Automation the Covid-19 Vaccination Programme in Sri Lanka

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Abstract: The COVID-19 epidemic has swept the globe. Early in 2020, the epidemic began in Sri Lanka, and it is presently in control of the Indian Ocean's pearl. Vaccines that have been created all around the world are currently being used in Sri Lanka as well. To prevent many individuals from congregating in one location, the vaccination procedure is carried out in batches on several days. The divisional secretariat offices of Sri Lanka maintain the information of the immunized using a manual, paper-based information management system. The whole procedure, from the collecting of forms to the tally of the total number immunized, is carried out manually. Through the conversion of the manual paper-based information management system to an automated information management system, this research intends to identify the challenges that this manual paper-based system faces and how to fix them. This study is predominantly designed as positivism paradigm based on survey data. Further, the findings of the study draw conclusions on the issues with the present system and the features and functions that ought to be added to the automated COVID-19 vaccine information management system using published research papers, scholarly articles, web articles, questionnaires, and interviews. The result of the study indicates that the manual system is not viable to carry on the task and it should be converted to an automated system.

Keywords: COVID-19 Vaccination Information Management, Manual Information Management Systems, Automated Information Management Systems

1. Introduction

The World Health Organization issued a public health emergency over the COVID-19 virus on January 30, 2020. Over time, the virus evolved into a pandemic and is currently spreading around the world. The first COVID case in Sri Lanka was recorded on March 11 of this year, and as of now, there have been 486,000 cases and 11,296 fatalities. There are several vaccinations that have been produced to combat this hazard. In Sri Lanka, several of these vaccines have been used, including Moderna, Sputnik V, Sinopharm, Pfizer, and Covid Shield.

The maintenance of vaccination records in the pertinent divisions of Sri Lanka is under the control of the Divisional Secretariat Offices. A manual paper-based information management system is used to manage the data. The folks who are about to receive a vaccine must fill out a form and provide it to the staff at the vaccination site. The divisional secretariat of the region receives the forms when they are collected. These forms, which are delivered in boxes, are laid out in the sun to dry for two days, after which the authorities physically inspect and tally the information.

This research is intended to solve the issue that the manual vaccination information management system has several deadly defects. The boxes containing the forms are spread out to dry in the sun as the first stage in the procedure. This is done as a precaution to get rid of any bacteria that could be on the forms. In comparison to the forms at the bottom of the box, those at the top of the box receive good sunshine. The information contained in a form is permanently lost if it is impressed by the wind. After the drying process is finished, the authorities personally collect each form and compare the information to the electoral role list to ensure that the information is correct. Finally, a hand count of the totals is performed. The total productivity and efficacy of this system are quite poor.

The main emphasis of this study is on how to create an automated information management system to handle COVID-19 immunization data in order to address the challenges that the current manual paper-based COVID-19 information management system faces.

Due to how sophisticated technology is now, automation is one of the most highly appreciated parts of the information management process. Automation outperforms manual systems in terms of production and efficiency by a wide margin. Due to how sophisticated technology is now, automation is one of the most highly appreciated parts of the information management process. Automation outperforms manual systems in terms of production and efficiency by a wide margin.

2. Literature Review

All researchers working to automate manual-based processes and improve existing information management systems can greatly benefit from the findings of this study. In other countries, there are several automated information management systems, some vaccine management systems,

and very few COVID-19 vaccine information management systems, however Sri Lanka currently has none of them. Only an online gateway is available for those aged 20 to 29 to register for the immunization. The COVID-19 vaccine is presently the most crucial component. not only in Sri Lanka, but everywhere else in the world. The whole world is uniting to combat this epidemic. The management of colleges and universities has entered the information management era as a result of the quick growth of contemporary computer network technology. For many academics, improving the information quality of the student status file management system using contemporary network and database technology has been a hot subject. Every university must maintain its student status information archives, and each institution places a high value on the information contained in these archives. As a result, it's important to create a management system for student status archives that can give university officials access to correct information and efficient search tools. The manual administration of Student Status Archives in the past can be made simpler by this approach. (ZHANG, 2019)

The following is from an information management system designed to manage the data of students, "The man-machine interface is friendly, the operation is simple, and has good stability, security and expansibility. Make the university student information management work more standardized, functional management personnel, counselors, students and other different role information exchange ability, and in the whole school to achieve the sharing of information resources to achieve a variety of student information data, making the university students management work more efficient, reasonable and orderly." (Hu, 2016)

A particular number of doses of a vaccine are required for an individual and are given over a range of times. Therefore, it is important to maintain the individual's data well, especially the precise data that indicates the number of dosages taken.

A key role in the management of information is the management of data as a resource. The quality and applicability of the data supplied determine the value of the information. Because computerized database management systems (DBMS) make it possible to handle data quickly and easily, the conventional technique of keeping files by hand and on paper is ineffective. (Martiz, 2003) There are many steps in the administration of COVID-19 immunization data. Application for the vaccination, transmission of the application to the relevant authorities, receipt of the data by the authorities, validation of the data through comparison with a document containing precise information, updating of the individual's vaccination status and doses, total number of people in the area who have received vaccinations, and the next scheduled vaccination date for that group.

A fundamental function of an information management system is the collecting and administration of data kept in various forms while enabling simple retrieval for those who need it. An information management system centralizes data, preventing duplication in several locations or in multiple forms. This feature stops unrelated individuals from accessing the information.(Weedmark, 2019) A management information system gathers and processes data (information) and makes it available to managers at all levels for use in decision-making, planning, program implementation, and control. The divisional secretariat can be viewed as the managers of this vaccination information management process. The MIS has a variety of tasks to complete, including the functions of decision support, performance monitoring, and functional support. (Nayak, 2007) A computerized record-keeping system is known as a database management system. It serves as a collecting point or container for computerized data files. The general goal of DBMS is to give users the ability to define, save, retrieve, and change the data in the database as needed. Anything that is important to a person, or an organization might be considered information. (Kahl, 2015)

For ease of access between the divisional secretariat, the MOH, and the vaccination clinics, the information management system for the COVID-19 vaccine should be a web-based information management system. The foundation of every business process integration is its information systems, whose main objective is to support decision-makers by providing accurate and timely data that enables them to make the best decisions possible in a chaotic environment.(Hakimpoor and Khairabadi, 2018) The new Web-based system exhibits considerable performance improvement in production rate and accuracy while reducing coding cost with a greater speed. Additionally, it makes practical usage easier by providing a simple Web user interface.(Jung et al., 2008)

The following is a sample instance of where a web-based information management solved a conundrum of applying for leave manually. Though the circumstances differ the concept behind it which is saving time,reducing fatigue and automating the processes are more or less similar to the conundrum being addressed in this study.

The time-consuming manual process of requesting leave has been replaced with the Web-based Leave Management System. It makes it easier for employees to submit a leave request online and receive higher-ups' approval. Additionally, the system's automation helps shorten the time it takes to submit requests and do away with paper work. The Web-based Leave Management System is now a great resource for employees to apply for leaves, check

on their status, and produce leave reports. It also makes it easy for administrators to fill up staff profiles, establish leave kinds, create departments, and fill out leave reports. When a person applies for leave or updates their leave status, the system notifies higher authorities.(Ramanan, 2021)

Additionally, the system should be web-based to avoid negative effects like duplication of operations across all units, duplication of database entries, higher expenses for maintaining and protecting the database, and increased costs for maintaining and managing each unit. This demonstrates how crucial it is to have an interoperable system that enables management of all units from a single place.(Oluwatofunmi, S. and A., 2018) Additionally, a web-based information management system is equipped to manage enormous volumes of data from a single place. A collection of Web pages is not the same as a web-based information system. Workflow is facilitated by the latter, which is frequently closely linked to non-WIS systems like databases and transaction processing systems.(Bieber and Vitali, 1998)

Man can influence his surroundings by manipulating matter and energy through information handling systems. Information is produced as a result of the detection and identification of events in that particular environment. After then, this data is sent, analyzed, and displayed. Decisions that will produce the desired outcome are made possible by these three functions.(Vazsonyi, 1995)

In terms of contemporary technology and society, automation is regarded as one of the most valuable things. The highest productivity in automation is regarded as an extremely high valued achievement. The external needs and changes occurring around the operation are the straightforward mechanism for automation. factors that are internal, with strong organizational and human resource connections to the previously listed component. a system with clearly defined flexibility and human interaction as a tool for utilization, both of which are viewed as flexible and cognitive resources.(Mishev, 2006)

3. Methodology

This study's goal is to automate the divisional secretariat offices in Sri Lanka's manual, paper-based COVID-19 vaccination information management system. The purpose of the study was to pinpoint the current issues with the manual method that is in use. The divisional secretariat offices in Sri Lanka are the subject of the research. The responders to the study are the staff members of the divisional secretariat offices.

A. Collection of Sample
The population of this research were the officials of the divisional secretariat offices in Sri Lanka. For the ease of gathering data samples were taken from the divisional secretariat offices of Wattegama.

B. Collection of Data
The The tools used for the collection of the data required for this research were questionnaire and interview and published research journals and scholarly web articles on automation of information management systems, automation, and conversion from manual paper-based information management systems to automated information management systems. The questionnaires were distributed online, and interviews were conducted to further enforce this study.

From conducting this research, the following factors surfaced. The divisional secretariat is in charge of managing the information of those who have been vaccinated against COVID-19 and their manual paper-based system is struggling in aspects like proper securing of data, the validation of the data, the input of the data into the system, the efficient management of data and the calculation of the data records.

The preliminary step taken in this research is the identification of the focus of this research which is the improvement of the manual paper-based COVID-19 information management system through automation and the features required for the automated information management system. The secondary step was the recognition of the required content through the perusing of published research journals and scholarly web articles. The tertiary step was the preparation of questionnaires and the conduction of interviews with the related parties. Next came the analyzing and categorizing of the functions and features required for the automated COVID-19 vaccine information management system. Finally, the results of the analysis were interpreted, and the results of the research are presented.

C. The Development of The System
The development of the system will do using the Rapid Application Development methodology. The system will be developed using the Laravel web framework and PHP MySQL will used for the database.

4. Analysis

The current COVID-19 vaccine information management system, which is manual and paper-based, is in trouble. This study recommends a computer-based automated COVID-19 vaccination information management system as a remedy for the problems the present system is currently experiencing. The creation of an automated information management system with modern features is a very effective technique to handle massive amounts of data.

Today, the majority of nations are fully digitalized, and Sri Lanka is making progress in this area as well. The majority of the information in Sri Lanka is maintained using outdated information management techniques, which include a large number of shelves and enormous quantities of files and paper.

The secretarial staff receives the information about the immunized on paper forms. Large quantities of paper are sent in boxes, and it takes a lot of time to go through them all, cross-check each form, and validate it. On the site of the vaccination, there are inspectors who verify the people getting vaccinated by looking at their national identification cards and the information on the form. The divisional secretariat can easily access these files via the system which will be connected via the internet and continue the vaccination program using the automated system if these officials could enter those details into a computerized COVID-19 vaccination information management system with an up-to-date database which will store them.

By comparing the form to the electoral role list and ensuring that this particular person is authentic and has had vaccinations, the divisional secretariat verifies those who have received vaccinations. This list can be entered into the COVID-19 vaccination information management system, and after the officials at the vaccination site enter the details of the people present at the site, the validation can be done by the system itself with absolutely no human intervention, and as a precaution, the divisional secretariat officials can monitor the system's operation, saving time and effort, not to mention the fact that there won't be any errors because there aren't any physical forms present.

The procedure of counting persons who have received vaccinations in the region begins when the validation process has been successfully completed. The present approach requires authorities to manually count each form, which is a tiresome operation with a chance that the count may be erroneous. The automated COVID-19 immunization information management system makes it very simple and quick to handle the counting process.

5. Results and Discussion

In this portion of the study, the analysis's findings are presented. For this study, more than 20 academic online articles and research papers on information management systems and automation were examined. A group of 40 individuals received a closed-ended questionnaire, and 10 system-related employees were interviewed.

The results of the analysis are as follows. The outcome made it quite evident that the manual paper-based COVID-19 vaccine information management system has issues and

is in no way time-saving or effective. The results of the questionnaire were crucial in helping to clearly define the issues and what has to be done to complete the output. The qualities and attributes that must exist for the result to be the conclusive response to the assumptions are also included in this output.

This COVID-19 epidemic is affecting the entire world, and Sri Lanka, which is still growing, is feeling the effects to a significant degree. Anywhere in the globe, the COVID-19 immunization program is essential, making efficient information management a top priority. The management of the information regarding the immunized is the responsibility of the divisional secretariat, and it is a manual procedure.

The questionnaire was based on close-ended questions and the interview was conducted with both close-ended and open-ended questions to gain more knowledge on the matter.

The highest responses were received for the following questions,

    a.   What is the current system in place for managing information of COVID-19 Vaccination?

Figure 1. What is the current system?
Source: Survey Data (2022)

According to the output data, 100% of the sample population stated that the prevailing system to manage the COVID-19 vaccination information is a manual paper-based information management system. This confirms that the current COVID-19 vaccination information management system is a manual paper-based system. Further, this has been cconsistent with Suarez et al. (2021), manual systems have many challenges and patients may hesitate to get their vaccination.

    b.   Is the current system working properly and efficiently for managing the information?
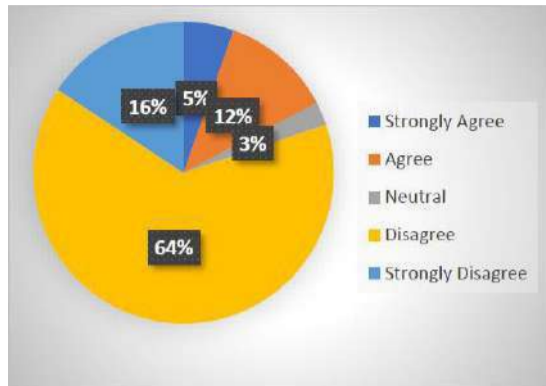
Figure 2. Efficiency of the current system
Source: Survey Data (2022)

The replies about the efficiency of the current paper-based COVID-19 vaccine information management system in terms of completing the necessary tasks for managing the information are shown in the chart. The existing COVID-19 vaccine information management system, which is manual and paper-based, is unsatisfactory to 73.9% of the sample population. The details of the immunized, including their names, addresses, phone numbers, and—most importantly—the day they were immunized, the number of doses they received, and the next date for the second dose—are kept on paper. Massive amounts of paper are used, and the entire process—from receiving the information to validating it and obtaining a count—is carried out by hand. The major reason the system is failing is that everything is being done manually and by hand, which is an extremely time-consuming and ineffective approach to handling enormous amounts of data. To effectively manage and cope with the vaccination information management process, this manual paper-based COVID-19 vaccination information management system should be replaced with a computerized automated COVID-19 vaccination information management system.

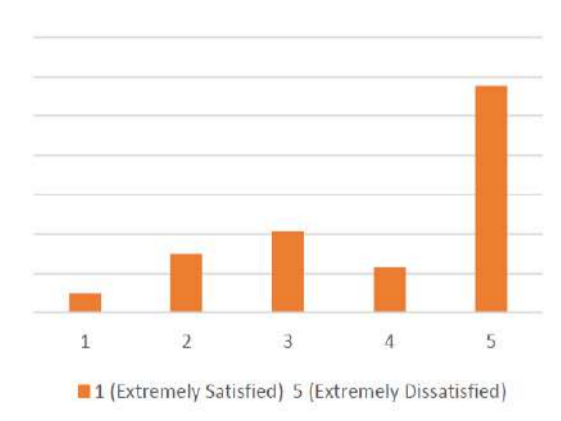c. On scale of 1-5 what is your satisfaction level about current system?

Figure 3. Satisfactory level of the current system
Source: Survey Data (2022)

The figure 3 depicts the satisfactory level of the sample population with the prevailing manual paper-based system. 57.6% have a very low satisfactory level with the current system.

d. Would you like to integrate with an updated computerized automated COVID-19 vaccination information management system?
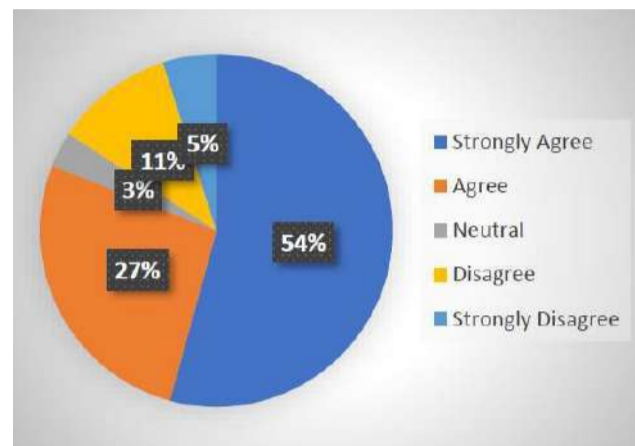

Figure 4. Willingness to use an automated information management system
Source: Survey Data (2022)

In order to handle the information for the COVID-19 immunization program, the following evaluation shows the desire to integrate with a computerized automated information management system. 81 percent of people are open to integrating with a COVID-19 vaccine information management system that is automated.

6. Conclusion

The Corona virus, often referred to as COVID-19, has infected Sri Lanka and the rest of the world. The most crucial factor now is undoubtedly immunization against this terrible virus. Consequently, effective information management is equally crucial. Particularly because this information reveals who has received vaccinations and who has not. This is important because if any one person is not vaccinated, receives too many doses, or receives just one dose, it could result in a variety of issues, including the spread of a deadly virus and health issues from receiving too many doses.

Today's technology is highly developed and has given us a lot of methods to simplify our lives, but we must be careful to utilize it properly. particularly with information management. The link between Sri Lanka and technology has not grown at all. But this little country is gradually catching up with technology, and today, compared to later years, Sri Lanka is in a fairly good technological situation. The usage of technology has significantly grown, particularly because of the epidemic and individuals being stranded at home.

Manual information management systems in general require a lot of human effort and labor and has a very low accuracy and efficiency rate which is why they have to be replaced by automated systems. The COVID-19 vaccination information management is being handle by such a manual system where the officials of the divisional secretariat office are handling all the information manually.

The main goal of this study is to update the manual paper-based COVID-19 vaccine information management system to an automated one in order to address the issues it had. It can be said without a doubt that updating the current manual system to an automated system will not only solve the problems that are being faced, but it will also greatly enhance the accuracy and effectiveness of the information management process for the COVID-19 vaccination program. This research thoroughly analyzed the prevailing problems as well as the assumed solution.

Technology is in the shape it is in today thanks to the efforts of many brilliant minds. Why not employ technology as we are now in its golden era. Let us employ technology to resolve issues like the one this study article focuses on. We Sri Lankans are a proud people, therefore let's employ technology ethically and go ahead into the future.

References

Bieber, M. and Vitali, F. (1998) *Communication of the ACM, COMMUNICATIONS OF THE ACM.*

Hakimpoor, H. and Khairabadi, M. (2018) 'Management Information Systems, Conceptual Dimensions of Information Quality and Quality of Managerial Decisions: Modelling Artificial Neural Networks', *Universal Journal of Management*, 6(4), pp. 127–133. Available at: https://doi.org/10.13189/ujm.2018.060403.

Hu, G. (2016) 'Research into College Student Information Management System based on Web', *Proceedings of the 2016 International Conference on Education, Management, Computer and Society*, 37(Emcs), pp. 770–773. Available at: https://doi.org/10.2991/emcs-16.2016.188.

Jung, Y. *et al.* (2008) 'A web-based automated system for industry and occupation coding', *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 5175 LNCS(September), pp. 443–457. Available at: https://doi.org/10.1007/978-3-540-85481-4_33.

Kahl, G. (2015) 'G enomic s ingle s equence d ata b ase (dbGSS)', in *The Dictionary of Genomics, Transcriptomics and Proteomics*, pp. 1–1.

Martiz, S.G. (2003) *Data management : managing data as an organisational resource | Acta Commercii, https://hdl.handle.net/10520/EJC16945.* Available at: https://journals.co.za/doi/abs/10.10520/EJC16945 (Accessed: 22 September 2021).

Mishev, G. (2006) 'Analysis of the Automation and the Human Worker , Connection between the Levels of Automation and

Different Automation Concepts', *Industrial Engineering and Management*, 1(22), pp. 1–69.

Nayak, M.K. (2007) 'Advantages and Disadvantages of eLearning Management System', *International Conference on E-Learning for Knowledge Based Society*, pp. 1–7.

Oluwatofunmi, A., S., I. and A., I. (2018) 'Web-based Information System (WBIS) Framework: Facilitating Interoperability within Business Ventures', *International Journal of Computer Applications*, 180(26), pp. 7–12. Available at: https://doi.org/10.5120/ijca2018916595.

Ramanan, M. (2021) 'Web Based Leave Management System for University College of Jaffna', *Web Based Leave Management System for University College of Jaffna*, 2(3), pp. 106–113.

Suarez, M., Botwinick, A., Akkiraju, R., Pebanco, G., Franceschi, G., Ruiz, J., Reis, D., Weiss, R. E., (2021) Automation of mass vaccination against COVID-19 at an academic health center, JAMIA Open, Volume 4, Issue 4,

Vazsonyi, A. (1995) *Automated Information Systems in Planning, Control and Command on JSTOR.* Available at: https://www.jstor.org/stable/2628008 (Accessed: 22 September 2021).

Weedmark, D. (2019) *The Features of an Information Management System | Small Business - Chron.com.* Available at: https://smallbusiness.chron.com/features-information-management-system-2114.html (Accessed: 22 September 2021).

ZHANG, H. (2019) 'Research on the Information Management System of University Student Status Archives', 96(Icemse), pp. 60–63. Available at: https://doi.org/10.2991/icemse-19.2019.13.

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