

TRACKING UTILITY FOR KNOWLEDGE INTEGRATION
AND BENCHMARKING (TUKIB): AN INTEGRATED
AUTOMATION SYSTEM FOR THE UNIVERSITY OF THE
PHILIPPINES VISAYAS - REGIONAL RESEARCH
CENTER

A Special Problem

Presented to

the Faculty of the Division of Physical Sciences and Mathematics

College of Arts and Sciences

University of the Philippines Visayas

Miag-ao, Iloilo

In Partial Fulfillment

of the Requirements for the Degree of

Bachelor of Science in Computer Science by

Betonio, Sheryl

Manejo, Kzlyr Shaira

Mayagma, Rainer

Francis DIMZON, Ph.D.

Adviser

May 12, 2025

Approval Sheet

The Division of Physical Sciences and Mathematics, College of Arts and
Sciences, University of the Philippines Visayas

certifies that this is the approved version of the following special problem:

THIS IS THE TITLE OF YOUR SPECIAL PROBLEM

Approved by:

Name	Signature	Date
Francis D. Dimzon, Ph.D. (Adviser)	_____	_____
Ara Abigail E. Ambita (Panel Member)	_____	_____
Christi Florence C. Cala-or (Panel Member)	_____	_____
Kent Christian A. Castor (Division Chair)	_____	_____

Division of Physical Sciences and Mathematics

College of Arts and Sciences

University of the Philippines Visayas

Declaration

We, Sheryl Betonio, Kzlyr Shaira Manejo, and Rainer Mayagma, hereby certify that this Special Problem has been written by us and is the record of work carried out by us. Any significant borrowings have been properly acknowledged and referred.

Name

Signature

Date

Student Name 1 _____

(Student)

Student Name 2 _____

(Student)

Student Name 3 _____

(Student)

Dedication

“Hello, world.”

Acknowledgment

“Hello, world.”

Abstract

Manual service flow and data management remain two of the most common challenges faced by many businesses and institutions, even in today's digital age. One such institution is the University of the Philippines Visayas – Regional Research Center (RRC), which relies on manual and semi-automated processes using Google Apps throughout its service delivery. While functional, this system is inefficient and limits the RRC's potential, creating challenges for both staff and clients. This study aims to develop a centralized system, aptly named TUKIB, to automate the service flow and data management processes of the UPV RRC. It also explores the development and integration of a chatbot using the Rasa framework. The project adopted an Agile methodology, emphasizing iterative development and regular feedback to ensure the system addressed evolving user needs. The resulting system significantly reduced manual tasks, improved data management, enhanced client support, and streamlined operations, ultimately increasing the overall efficiency of the UPV RRC.

Keywords: Workflow Automation, Chatbot, Rasa, Data Management,
Service Flow

Contents

1	Introduction	1
1.1	Overview of the Current State of Technology	1
1.2	Problem Statement	3
1.3	Problem Statement	4
1.4	Research Objectives	5
1.4.1	General Objective	5
1.4.2	Specific Objectives	5
1.5	Scope and Limitations of the Research	6
1.6	Significance of the Research	7
2	Review of Related Literature	11
2.1	Theme 1 Title	12

2.2	Theme 2 Title	13
2.3	Chapter Summary	13
3	Research Methodology	15
3.1	Research Activities	15
4	Results and Discussions	17
5	Conclusion	19
6	References	21
A	Code Snippets	23
B	Resource Persons	25

List of Figures

List of Tables

Chapter 1

Introduction

1.1 Overview of the Current State of Technology

In the era of digital transformation, efficient data management and optimized service workflows are crucial for the success of any business or institution. Perhaps one of the most remarkable and well-known products of technology is the conversion of paper-based or manually-operated systems to automated systems. It is unquestionable that automation greatly impacts people's lives, providing increased efficiency and productivity.

The University of the Philippines Visayas - Regional Research Center (UPV RRC) is a centralized facility that strengthened UP Visayas' research and innovation capabilities by providing researchers access to and training on advanced analytical equipment and method development. It provides several services catering to different fields of natural and physical sciences. At the time, the institution relies

heavily on manual processes, using tools such as Google Apps throughout its entire service delivery process, from handling service requests and tracking to data management. Although this method offers a foundational level of functionality, it fails to address the specific needs of the UPV RRC in its service delivery workflow. This poses challenges not only for the staff but also for the clients of the institution.

Automation, defined as “the application of technology, programs, robotics or processes to achieve outcomes with minimal human input” (IBM, 2024), has been effectively adopted across various industries to enhance quality, productivity, efficiency, timeliness, effectiveness, and operational safety. It also helps in reducing costs and provides greater value to customers (Zayas-Cabán, Haque, & Kemper, 2021).

Over the years, various technologies emerged to address the pressing need for automation. The increase in advanced software solutions offered organizations and institutions an opportunity to enhance their operational efficiency. However, existing systems fell short in addressing the specific needs of some institutions. Adapting these existing systems often gave birth to other problems as integrating and customizing off-the-shelf softwares can be difficult, costly, and limited in scalability (BITCAT, 2023). In such cases, developing new software tailored to the specific needs of an institution is often a better option.

Recognizing this gap, this study explored the design and implementation of a software solution tailored to the unique needs of the UPV RRC, aiming to replace the institution’s current system by automating its service delivery flow and data management. Additionally, this paper included the development and integration

of a chatbot using the Rasa framework to enhance and streamline the institution's client support, interaction, and communication. By using modern technologies and best practices in software development, this study sought to add knowledge on building a practical and scalable system, specifically one that could be used by the UPV RRC for their service delivery processes.

1.2 Problem Statement

In today's fast-paced world, success is often associated with efficiency, especially in the business environment. A report by McKinsey & Company (Manyika et al., 2017) reveals that about 60% of occupations involve at least 30% of tasks that were automatable. Despite the growing recognition for the need of automation and even with the rise of different technologies, many businesses and institutions are still dependent on manual or semi-automated workflows. While various workflow automation technologies exist, adapting off-the-shelf softwares is costly and challenging as these softwares often requires extensive customization to fit the institution's unique needs and are difficult to integrate.

The University of the Philippines Visayas Regional Research Center (UPV RRC) is one such institution that is still reliant on manual processes, especially on its service flow delivery and data management. Various tasks including handling of client requests, managing laboratory services, and tracking service-related activities are carried out with the use of semi-automated tools like Google Apps, which is technically still dependent on human intervention. This leads to inefficiencies such as delays, difficulty in tracking, and vulnerability to errors, ultimately com-

promising the institution's overall productivity.

To address these issues, an integrated workflow automation system tailored to the needs of the UPV RRC was developed to ease the difficulties faced by the institution in its service delivery. This system automated service requests, streamlined data management, enhanced communication between RRC staff and clients, and improved overall operations. With automation, the center improved the efficiency, accuracy, and accessibility of its services, supporting both internal management and the external client experience.

1.3 Problem Statement

In today's fast-paced world, success is often associated with efficiency, especially in the business environment. A report by McKinsey & Company (Manyika et al., 2017) reveals that about 60% of occupations involve at least 30% of tasks that were automatable. Despite the growing recognition for the need of automation and even with the rise of different technologies, many businesses and institutions are still dependent on manual or semi-automated workflows. While various workflow automation technologies exist, adapting off-the-shelf softwares is costly and challenging as these softwares often requires extensive customization to fit the institution's unique needs and are difficult to integrate.

The University of the Philippines Visayas Regional Research Center (UPV RRC) is one such institution that is still reliant on manual processes, especially on its service flow delivery and data management. Various tasks including handling of client requests, managing laboratory services, and tracking service-related activi-

ties are carried out with the use of semi-automated tools like Google Apps, which is technically still dependent on human intervention. This leads to inefficiencies such as delays, difficulty in tracking, and vulnerability to errors, ultimately compromising the institution's overall productivity.

To address these issues, an integrated workflow automation system tailored to the needs of the UPV RRC was developed to ease the difficulties faced by the institution in its service delivery. This system automated service requests, streamlined data management, enhanced communication between RRC staff and clients, and improved overall operations. With automation, the center improved the efficiency, accuracy, and accessibility of its services, supporting both internal management and the external client experience.

1.4 Research Objectives

1.4.1 General Objective

The general objective of this paper is to develop a system to automate and optimize the service flow and data management at UPV Regional Research Center and evaluate its effectiveness. The system will be called TUKIB, an acronym for Tracking Utility for Knowledge Integration and Benchmarking.

1.4.2 Specific Objectives

Specifically this study aims to:

1. develop a centralized data management system for the RRC to ensure secure, efficient storage, retrieval, and management of information related to service requests, laboratory usage, and client transactions,
2. design and implement an automated chatbot to handle consultations and frequently asked questions, enabling clients to interact with the system for service inquiries and support in real-time,
3. implement an intuitive and user-friendly design that ensures ease of use and accessibility for both staff and clients of UPV RRC, and
4. evaluate the system's impact on operational efficiency, and compare the automated workflow with the previous manual processes in terms of speed, accuracy, and user satisfaction.

1.5 Scope and Limitations of the Research

As mentioned, this special problem focuses on developing TUKIB - short for Tracking Utility for Knowledge Integration and Benchmarking, a workflow automation system designed for the UPV Regional Research Center (RRC).

TUKIB covers the full-service management cycle of the UPV RRC, from initial client service requests to the completion and service feedback stage. It has features such as real-time tracking of service requests, facility and equipment availability tracking, and a centralized platform for storing and managing service-related data. Key components such as user interfaces for staff and clients, real-time service status updates, events, service schedule management, transaction records,

and a feedback collection mechanism were also added. With this, data accuracy throughout the service flow process is ensured by minimizing manual input and automating repetitive processes, reducing errors and improving the operational efficiency of the UPV RRC. This special problem also involved the development and integration of a chatbot to enhance user support and communication between clients and staff, providing instant responses to inquiries. Additionally, the system was made scalable, allowing it to be flexible for further modification as the needs of UPV RRC evolved.

The system's functionalities were limited to the service-related processes of the UPV RRC and did not cover other internal and external functions. The development was tailored to the specific workflows of UPV RRC, so modifications would be needed for implementation in different institutions or industries. Additionally, this special problem focused on workflow automation but did not delve into advanced analytics or AI beyond using chatbots for customer communication and basic statistics for service feedback reports. The system required a stable internet connection for real-time features like notifications and status tracking; thus, its performance could be compromised in areas with poor connectivity. Moreover, the effectiveness of the system depended on staff and client adaptability to the new system, which required a period of training and adjustment.

1.6 Significance of the Research

This study offers great significance in many domains, benefiting the UPV RRC and its clients, the researchers, other institutions, the computer science community,

and future researchers.

- **The Researchers**

This study provides a great opportunity for the researchers to apply their theoretical knowledge and practical skills to solve real-world problems. This allows them to demonstrate their competency in system design and software development.

- **The UPV RRC and its Clients**

The development of TUKIB will significantly improve the operational efficiency of the UPV Regional Research Center by automating its service request workflows and data management processes. This will not only benefit the staff but the clients as well.

- **Other Institutions**

Other institutions facing similar challenges in managing their service flow processes and data can also benefit from this special problem. They can adapt TUKIB to their own workflows or this study can serve as a guide for them in creating their own specialized software solution.

- **The Computer Science Community**

The Computer Science Community also benefits from this study. This paper contributes to the existing knowledge in developing a tailored workflow automation system by providing perspective into the practical application of

various software development tools and methods. Additionally, this special problem also serves as a case study in designing a user-centered software. Other developers can gain valuable insights and inspiration from this for their own projects.

- **Future Researchers**

The special problem can serve as a reference and guide for future researchers who wish to pursue studies similar or related to this special problem.

Chapter 2

Review of Related Literature

This chapter discusses the features, capabilities, and limitations of existing research, algorithms, or software that are related/similar to the Special Problem.

The reviewed works and software must be arranged either in chronological order, or by area (from general to specific). Observe a consistent format when presenting each of the reviewed works. This must be selected in consultation with the adviser.

DO NOT FORGET to cite your references.

A literature review must do these things:

- be organized around and related directly to the thesis or research question you are developing
- synthesize results into a summary of what is and is not known
- identify areas of controversy in the literature

- formulate questions that need further research

A literature review is a piece of discursive prose, not a list describing or summarizing one piece of literature after another. It's usually a bad sign to see every paragraph beginning with the name of a researcher. Instead, organize the literature review into sections that present themes or identify trends, including relevant theory. You are not trying to list all the materials published, but to synthesize and evaluate them according to the guiding concept of your thesis or research question. You should also state the limits or gaps of their researches wherein you will try to fill these gaps in accordance to your research problem and objectives.

2.1 Theme 1 Title

This chapter contains a review of research papers that:

- Describes work on a research area that is similar or relevant to yours
- Describes work on a domain that is similar or relevant to yours
- Uses an algorithm that may be useful to your work
- Uses a software / tool that may be useful to your work

It also contains a review of software systems that:

- Belongs to a research area similar to yours
- Addresses a need or domain similar to yours
- Is your predecessor

2.2 Theme 2 Title

2.3 Chapter Summary

Should include a table of related studies comparing them based on several criteria.

Highlight research gaps and the research problem.

Chapter 3

Research Methodology

This chapter lists and discusses the specific steps and activities that were performed to accomplish the project. The discussion covers the activities from pre-proposal to Final SP Writing.

3.1 Research Activities

Research activities include inquiry, survey, research, brainstorming, canvassing, consultation, review, interview, observe, experiment, design, test, document, etc. Be sure that for each method, process, or algorithm used, there is a justification why that method was chosen. The methodology also includes the following information:

- who is responsible for the task
- the resource person to be contacted

- what were done
- when and how long the activity was done
- where it was done
- why should the activity was done

Chapter 4

Results and Discussions

This chapter presents the results of the system of your SP. Include screenshots, tables, or graphs and provide the discussion of results.

Chapter 5

Conclusion

This chapter summarizes your SP and provides conclusions regarding your results and analyses. Provide recommendations on what ought to be done with your SP or provide further directions on the topic you covered.

Chapter 6

References

- BITCAT. (2023, 10). *Off-the-shelf vs. custom software: Making the right choice for your business*. Retrieved from <https://bitcat.dev/off-the-shelf-vs-custom-software/>
- IBM. (2024). *What is automation?* Retrieved from <https://www.ibm.com/topics/automation> ([Accessed 28-10-2024])
- Manyika, J., Chui, M., Miremadi, M., Bughin, J., George, K., Willmott, P., & Dewhurst, M. (2017, 01). A future that works: Automation, employment, and productivity. In *McKinsey global institute report*. McKinsey & Company.
- Zayas-Cabán, T., Haque, S., & Kemper, N. (2021, 05). Identifying opportunities for workflow automation in health care: Lessons learned from other industries. *Applied Clinical Informatics*, 12, 686-697. doi: 10.1055/s-0041-1731744

Appendix A

Code Snippets

Appendix B

Resource Persons

Dr. Firstname1 Lastname1

Role1

Affiliation1

emailaddr@domain.com

Mr. Firstname2 Lastname2

Role2

Affiliation2

emailaddr2@domain.com

Ms. Firstname3 Lastname3

Role3

Affiliation3

emailaddr3@domain.net