

TECHNOLOGY CONSULTING

IN THE GLOBAL COMMUNITY

Final Consulting Report

Palau MOE

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Carnegie Mellon University



Palau Ministry of Education

Executive Summary

Student Consultant, Savannah Xu
Global Community Partner, Dale Jenkins

I. About the Organization

Tasked with overseeing and enhancing the public education system, the Palau Ministry of Education (MOE) manages both elementary and secondary schools and is responsible for implementing the national curriculum. It is a vital entity within the Executive Branch of the National Government of the Republic of Palau.

The MOE's mission is:

"In partnership with parents and the community, is to ensure that children and youth preserve Palauan culture and become contributing citizens and productive workers in a changing world."

The MOE's vision is also straightforward:

"Our students will be successful in Palauan society and the world."

II. Consolidation and Cleaning of Special Education Data

The first goal was to consolidate and clean the scattered Special Education Data from 1200 Excel files into a single, organized master file. This was essential because the previous disorganized state made the data difficult to access and use effectively. A Python tool was developed to automate the extraction and cleaning process, ensuring that the data is accurate, consistent, and easily accessible.

Outputs and Outcomes:

- A master file with all relevant data.
- Streamlined and standardized column names.
- Removal of redundant data and normalization for consistency.
- A table schema for future database use.
- A manual for running the script and maintaining data integrity.

Major Risks to Sustainability:

- Potential data inconsistencies from future updates.
- Script issues due to software changes.
- New staff unfamiliar with the tool and manual.

Recommendation:

To ensure sustainability, regular staff training, routine data reviews, and a possible transition to a more robust database system with automated validation checks are recommended.

III. Enhancing Operational Efficiency and Resource Accessibility for the MOE

The second goal of the project was to improve the operational efficiency of the Ministry of Education (MOE) and enhance accessibility to resources for staff and teachers. This involved redesigning the SIS (Student Information System) website with an automated issue tracking system to ensure that no ticketing issues were overlooked, as well as reorganizing the MOE Resource site with a more user-friendly structure. SOPs were created to save time and improve efficiency by offering specific guidance for common tasks in the Rediker Software, where the SIS is housed.

Outputs and Outcomes:

- Redesigned SIS website with automated issue tracking.
- Reorganized MOE Resource site with improved structure.
- SOPs created for quicker task reference.

Major Risks to Sustainability:

- Potential reliance on automated systems without adequate support.
- Inconsistent use of redesigned systems and SOPs by new staff.

Recommendation:

To maintain these improvements, regular training sessions and periodic reviews of the systems and resources are recommended. Designated individuals have been established for the upkeep of the SIS website and the MOE resource site.

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Savannah is a junior in Information Systems, Human-Computer Interaction, and Product Management. She will return to CMU for her junior year this Fall.

Palau Ministry of Education

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I. About the Organization

Organization

The Palau Ministry of Education (MOE) is a vital entity within the Executive Branch of the National Government of the Republic of Palau, entrusted with overseeing and enhancing the nation's public education system. Managing both elementary and secondary schools, the MOE is responsible for implementing the national curriculum and ensuring that education standards are met across the country.

The MOE's mission, *"In partnership with parents and the community, is to ensure that children and youth preserve Palauan culture and become contributing citizens and productive workers in a changing world,"* underscores its commitment to fostering a deep connection between education, cultural preservation, and societal contribution.

The MOE's vision, *"Our students will be successful in Palauan society and the world,"* highlights its dedication to preparing students for success both locally and globally.

Led by the Minister of Education, the MOE oversees 16 public elementary schools (grades 1-8) and one public high school (grades 9-12) throughout Palau. In addition to these public institutions, six private schools operate independently under the MOE's charter, ensuring adherence to educational standards while maintaining their autonomy. The MOE is structured into two bureaus—the Bureau of Curriculum & Instruction and the Bureau of Operation & Administration—which work in close coordination to deliver high-quality education and uphold the MOE's mission and vision.

Facilities

The Palau Ministry of Education (MOE) operates from its main office located west of downtown Koror, a facility that spans 2 floors and houses key functions critical to the organization. On the first floor, you'll find the office of the Minister, several conference rooms, and the server room. The second floor is strategically divided: the Bureau of Curriculum & Instruction occupies the east wing, while the Bureau of Education Administration is situated on the west side. The upper floors are dedicated to staff cubicles, offices for Bureau Directors and Division Chiefs, reception areas, and a central meeting space. All workspaces are air-conditioned and equipped with reliable internet access, ensuring a comfortable and connected environment for all employees.

In addition to the main office, the MOE maintains a secondary office within the Palau High School complex. This location primarily serves employees from the Bureau of Curriculum & Instruction, including specialists in physical education and science, as well as the scholarships office. The

Ministry also owns three speedboats, which are essential for reaching outlying islands such as Peleliu, Angaur, and Kayangel. These boats facilitate the transportation of school materials and enable staff to visit schools on these remote islands.

The MOE oversees an expansive infrastructure, managing a total of 118 buildings across the Republic of Palau, which encompass both educational and administrative facilities covering approximately 340,000 square feet. While most schools are equipped with internet connectivity and computers, three remote schools currently lack these amenities. To bridge this gap, the MOE ensures that each student is provided with a personal tablet, allowing them access to the necessary educational resources.

Further enhancing its sustainability efforts, the MOE's main office parking lot features solar panels, installed in 2010, which theoretically generate up to 51 kW of electricity, though their reliability can fluctuate. Vehicle maintenance is managed by an in-house department, while the boats require external servicing. This robust infrastructure allows the MOE to effectively manage and deliver quality education across the Republic of Palau, ensuring that students receive the resources and support they need to thrive in their educational journeys.

Programs

The Palau Ministry of Education (MOE) is dedicated to ensuring quality education while preserving Palauan culture through a range of innovative programs and initiatives. Central to these efforts is the ongoing development and refinement of the national curriculum. The MOE works tirelessly to create and update educational curricula that align with Palau's national standards. This program involves continuous review and enhancement of curricular materials, ensuring they meet the evolving needs of students in a rapidly changing world. By collaborating with educators, subject matter experts, and various stakeholders, the MOE designs curricula that foster critical thinking, creativity, and cultural awareness. Through these efforts, the MOE equips students with the knowledge, skills, and values necessary for success in both Palauan society and the global community.

In addition to curriculum development, the MOE provides comprehensive support to schools across Palau through its School Administration Support program. This initiative ensures that schools have access to efficient administrative systems, effective resource allocation, human resource management, and infrastructure development. The MOE oversees 17 public elementary schools, one public high school, and supports two private elementary and four private high schools operating under its charter.

A major focus of the MOE is enriching student learning through the integration of technology. The Ministry has distributed over 2,000 Samsung tablets and 500 Chromebooks to students, with a commitment to expanding their use. This year, 8th graders received brand new Chromebooks, marking a significant step in the MOE's initiative to integrate technology into the curriculum. These devices are designed to enhance the educational experience by providing students with the tools they need to succeed in a modern learning environment.

These programs and initiatives underscore the MOE's commitment to preserving Palauan culture, fostering responsible citizenship, and preparing students for the challenges of a rapidly changing world. Through its efforts, the MOE continues to uphold Palauan values while equipping the next generation with the skills and knowledge they need to thrive.

Staff

The Palau Ministry of Education (MOE) is led by Dr. Dale Jenkins, the current Minister of Education, and employs approximately 450 individuals, encompassing both teaching and administrative staff across various schools. When including staff from the private schools chartered by the MOE, the total number of employees reaches around 700. Each school is managed by a principal, with three schools also having vice principals to support administrative duties.

The schools under the MOE's jurisdiction serve a diverse student population of approximately 2,100. Student enrollment varies widely, with the largest school accommodating around 600 students, while the smallest school serves just 7 students. This range underscores the unique challenges and responsibilities faced by the MOE in providing quality education across the nation.

Each bureau within the MOE is overseen by a director, with divisions led by corresponding chiefs. This structured leadership ensures the effective management and operation of the education system in Palau. The administrative staff I interact with daily are equipped with both MacBooks and desktop computers, and they frequently use Gmail for communication and landlines to coordinate within the office.

In addition to managing the education system, the MOE is committed to the professional development of educators, offering opportunities to stay current with the latest teaching methodologies. By providing comprehensive administrative support, the MOE strives to create an optimal learning environment that promotes student growth and achievement.

During my work with the MOE, I collaborated closely with Charmaine, the English/Tech Specialist, Vernice Stefano, the MOE Consultant on the SIS, and Keizy Shiro, the IT Specialist. Together, we aimed to enhance the technological and administrative systems within the Ministry, contributing to its mission of delivering quality education across Palau.

Technology Infrastructure

Technology Category	Description
Hardware	<ul style="list-style-type: none"> - Macbook or Desktops of ministry Staff - Macbook Air for teachers - 2000 Samsung Galaxy tablets ○ Models: Tab 3, Tab 4, Tab A, Tab S - Chromebooks for students grades 4 - Each school has at least 2 printers, a copier machine, telephone system, Wi-Fi connection, a projector, and blackboards
Internet Connection	<ul style="list-style-type: none"> - Stable internet access accept at the 3 remote schools - communicate to schools via single band radios - Occasional power outages that disrupt internet connection
Operating System	<ul style="list-style-type: none"> - 90% of laptops/computers use Mac OS, 10% use Windows - Linux is used in the server room
Software Programs	<ul style="list-style-type: none"> - Google Suite and Microsoft Office suite

Technology Management

The IT unit at the Palau Ministry of Education (MOE) is led and solely composed of Keizy Shiro, who is responsible for overseeing the IT infrastructure, providing technical support, and managing equipment maintenance and network issues for over 2,200 students and 430 staff members. Despite the small size of the team, Keizy's expertise is crucial to the smooth operation of the MOE's technological environment.

In addition to Keizy's efforts, the MOE collaborates with local IT vendors for larger projects and hardware maintenance. The IT department was previously staffed with a dedicated team, but several members have since departed. To support the IT needs at each school, a designated teacher is responsible for addressing minor technical issues. These teachers assist with basic tasks, such as installing applications on mobile devices and teaching students how to use word processing software. However, for more complex technical issues, they rely on the MOE's technician for assistance. This structure ensures that the MOE can manage its widespread technological needs, despite the challenges posed by a reduced IT team.

Technology Planning

The Ministry of Education does not have a formal technology planning committee. Instead, new technology implementations are typically initiated through proposals submitted by members of the MOE. These proposals are then reviewed and, if deemed appropriate, approved by Minister Jenkins. Once approval is granted, the necessary funding for the project is authorized, allowing for the implementation of new technology initiatives within the Ministry.

Communication

At the Palau Ministry of Education (MOE), communication is primarily conducted in person on an ad-hoc basis, with staff often walking to their colleagues' offices for direct, face-to-face conversations. Recently, in an effort to improve communication efficiency, the MOE staff have transitioned to using Gmail accounts with the “@palauschools.org” extension.

The MOE’s website (palaumoe.net) is designed to serve as a vital resource for students, parents, and government officials. However, the site is currently outdated, with many pages still under construction, which limits its effectiveness as a communication tool.

Internally, the MOE utilizes a mix of communication methods. While email is commonly used for official correspondence, in-person discussions and phone calls are frequent, allowing for immediate and direct interaction. For more formal occasions, such as the Monthly Principal Forums, Zoom is employed. During these forums, all the principals gather in a conference room at the Ministry, while principals from schools located on outlying islands, some of which are two full boat-ride days away, join via Zoom. Recently, all schools have been equipped with Wi-Fi, further enhancing the ability to communicate and collaborate effectively across the archipelago.

Information Management

The Palau Ministry of Education (MOE) has a longstanding history of collaboration with the TCinGC program, which has led to significant advancements in managing student information. One of the major achievements from this partnership is the development of comprehensive Student Information Databases, which were utilized in schools until the recent adoption of the Rediker Student Information System, purchased by Minister Jenkins. The MOE is currently in the process of migrating all student data to Rediker, with the goal of streamlining data management and improving overall efficiency.

In addition to managing student data, the MOE oversees financial information using a commercial accounting system from a U.S. company. This system ensures accurate budget tracking by converting electronic forms into records that are managed by the Ministry of Finance. For inventory management, Charmaine currently uses a series of Excel spreadsheets to track tablets and Chromebooks, including details such as device IDs, specifications, and statuses. She envisions transitioning this system to an electronic database to enhance sustainability and efficiency.

Communication within the MOE is facilitated through a mix of in-person interactions, phone calls, and emails. All MOE staff, including teachers and administrators, are integrated into the Google Workspace under the “palauschools.org” domain. The MOE’s website (palaumoe.net) serves as a key communication platform, though it is currently outdated and requires updates. While most

schools and offices have internet access, some remote schools still rely on alternative communication methods due to connectivity challenges.

Business Systems

The Palau Ministry of Education (MOE) works closely with internal departments and external entities to manage its business systems, including accounting, payroll, and benefits. The Ministry of Finance (MOF) oversees payroll operations, while the MOE is responsible for timesheet reporting and processing related paperwork. Employee status is electronically recorded by the Division of Personnel Management, ensuring accurate and up-to-date records.

In 2018 and 2019, student consultants contributed to the development of a requisition application, which has streamlined the process of requesting and approving expenditures, leading to improved budget management and efficiency.

II. Consolidation and Cleaning of Special Education Data

Motivation:

The primary goal of this project was to consolidate and clean the fragmented Special Education Data, previously dispersed across 1,200 different Excel files, into a single, coherent master file. The disorganized state of the data made it difficult to access, analyze, and utilize effectively for decision-making and resource allocation. By developing a Python tool to automate the extraction and cleaning process, the project aimed to ensure the data was accurate, consistent, and easily accessible for future use.

This effort directly supports the Ministry of Education's mission by enabling more efficient use of critical data, ultimately improving decision-making and resource allocation for special education programs. Moreover, the project was crucial for maintaining compliance with educational standards and regulations, ensuring that the data could be reliably used in audits, reporting, and long-term planning.

The ultimate goal was to create a clean, organized dataset that would not only meet immediate needs but also be ready for seamless integration into a database, laying the foundation for a more advanced data management system. This transition to a more sophisticated system is vital for supporting the Ministry's long-term strategic goals, including enhancing transparency, improving data-driven decision-making, and ensuring the sustainability of educational programs.

Activities and Outputs:

First, a robust and adaptable Python tool was created to automate the extraction and cleaning process. This tool allowed for the seamless consolidation of data from the 1,200 Excel files, regardless of the varying data formats and structures within them. During this process, the data was consolidated into a single master file, with column names streamlined and formats standardized to ensure consistency across the entire dataset.

In addition to consolidation, the project focused on data cleanup and redundancy removal, identifying and eliminating unnecessary duplicates to enhance the accuracy and reliability of

the dataset. A detailed table schema was also designed, laying the groundwork for future database implementation and a more organized data management system.

To support ongoing use, a comprehensive manual was compiled, providing step-by-step guidance on running the script and maintaining data integrity.

Outputs:

- A consolidated master file containing all relevant Special Education Data, standardized column names, and normalized data for consistency
- A detailed table schema for future database implementation
- A comprehensive manual for setting up Python, running the script and maintaining data integrity (Appendix A).

Outcomes:

The successful execution of these activities led to significant outcomes.

- The consolidation of data into a single master file has greatly improved accessibility and usability, enabling staff to easily retrieve and analyze the data. This improvement supports more informed decision-making within the Ministry.
- The standardization and cleanup of the data have enhanced its accuracy and consistency, ensuring that it is reliable and trustworthy for use in decision-making and resource allocation.
- By streamlining the data management processes, the project has reduced the time and effort required to manage the data, making the system more efficient overall.
- Additionally, the creation of a detailed table schema (ERD) and manual has established a strong foundation for future database integration, allowing the MOE to move towards a more sophisticated and scalable data management system.

The single master file and the ERD have been both provided to the Ministry of Education.

Major Risks to Sustainability:

Despite these successes, several risks to long-term sustainability remain. Future updates to the data could introduce inconsistencies if not managed properly, posing a risk to data integrity. To mitigate this, it's essential to establish protocols for updating and maintaining the data.

Another risk involves the potential for changes in the software environment or Python dependencies, which could disrupt data management. Regular updates and maintenance of the Python tool are necessary to prevent this. Additionally, the potential lack of familiarity with the script and manual among new and current staff members could lead to incorrect usage and data integrity issues. Continuous training and documentation updates are crucial to ensuring all staff are proficient in using the tool and managing the data.

Recommendations:

To address the risks and ensure the long-term sustainability of the consolidated Special Education Data project, the following recommendations are proposed:

Educational Video-Based Python Training:

- Utilize educational videos and online tutorials to conduct introductory training sessions for staff. These resources should focus on familiarizing staff with Python and the specific tool developed for this project, offering a hands-on, self-paced learning experience.
- Curate a list of recommended videos and online courses that cover the basics of Python programming, data extraction, and cleaning processes relevant to the MOE's needs.

Routine Data Reviews and Updates:

- Establish a routine schedule for data reviews and updates, with specific staff members designated to manage these tasks. This process should include verifying data accuracy and consistency before integrating any new information into the master file.
- Develop a clear protocol for updating the data, ensuring that all changes are documented and verified to prevent inconsistencies.

Transition to a Robust Database System:

- Begin planning for the transition to a more robust database system that can accommodate the MOE's growing needs. This system should include features such as automated data validation checks to enhance data integrity.
- Involve staff in the selection and planning process for the new system, ensuring they are familiar with its functionalities and how it will improve current processes.

Collaboration with External Experts (If Needed):

- If feasible, seek collaboration with external experts or consultants who can provide additional guidance and support during the transition to a more advanced data management system. This external assistance can be particularly useful during the initial phases of the transition.

III. Enhancing Operational Efficiency and Resource Accessibility for the MOE

Motivation:

The goal of this project was to enhance the operational efficiency of the Ministry of Education (MOE) and improve accessibility to essential resources for both teachers and administrative staff. The MOE faced several challenges, including a manual and inefficient process for tracking issues, disorganized resource management, and time-consuming methods for accessing instructional content. The project aimed to address these issues by streamlining processes and making resources more accessible, ultimately creating a more effective working environment within the MOE.

Activities and Outputs:

To achieve this goal, several key activities were undertaken:

- **SIS Website Redesign and Automated Issue Tracking System:** The SIS website was redesigned to include an automated system that sends notifications to the MOE SIS email (Via a Google Sheet Extension) whenever a form is filled out. This automation replaced the previous manual process, where staff had to check for ticketing issues manually, often leading to oversights (Appendix B).

- MOE Resource Site Redesign: The MOE Resource site for teachers was restructured, with separate Google Drive folders created for each subject. This new organization made it easier for teachers to find the most updated resources and for the MOE to maintain these materials efficiently.
- Creation of SOPs and Video Transcriptions: To save time and improve usability, Standard Operating Procedures (SOPs) were developed. These SOPs provide specific references within long instructional videos, allowing staff to quickly locate the information they need. To support this, three 2-hour videos were transcribed, enabling precise references within the SOPs.

Outcomes:

The implementation of these initiatives led to several positive outcomes. The automated system on the SIS website greatly improved the efficiency of issue tracking, ensuring that no ticketing issues are missed and reducing the time and effort needed to manage and resolve them. The redesigned MOE Resource site enhanced resource accessibility, making it easier for teachers to find and use the latest teaching materials, which in turn supports the delivery of quality education. The creation of SOPs, along with the transcriptions of instructional videos, saved significant time for staff by allowing them to quickly locate the information they needed, improving the usability of instructional content and streamlining training processes.

Major Risks to Sustainability:

Despite these successes, several risks to long-term sustainability exist. The reliance on automated systems for issue tracking could lead to disruptions if the technology fails or if there are updates that affect the system's functionality. To mitigate this, regular monitoring and updates are essential to maintain system performance. Additionally, there is a risk that staff may not be fully familiar with the new systems and processes, leading to underutilization or incorrect use. Continuous training and support are crucial to ensure that staff can effectively use these new tools. Finally, the Google Drive folders and SOPs will require ongoing maintenance to remain up-to-date and relevant. Without regular reviews, the organization of resources could deteriorate, and the SOPs could become outdated.

Recommendations:

To effectively address these risks, a multi-faceted approach is recommended. The following steps outline the key actions necessary to ensure the sustainability and resilience of the MOE's systems.

Comprehensive Training Sessions:

Start by conducting training sessions that familiarize staff with the Google Forms extension and similar tools. Given the current lack of in-house experts, it is recommended that staff watch relevant YouTube tutorials and educational videos as part of their training. These sessions should cover:

- Basic usage of the tools.

- Troubleshooting common issues.
- Understanding how these tools integrate with the MOE's systems.

Monitoring Protocol:

Establish a clear protocol for monitoring the performance of the Google Forms extension and related tools. This includes:

- Designating specific staff members to regularly check system functionality.
- Training these staff members to handle minor issues

Routine Reviews and Updates:

Implement a process for regularly reviewing and updating the Google Drive folders, SOPs, and automated systems. This process should include:

- Scheduled audits to ensure content is current, organized, and aligned with the latest standards.
- Designating a specific person responsible for making these updates, ensuring accountability and consistency.
- Regular updates to keep the system effective and user-friendly.

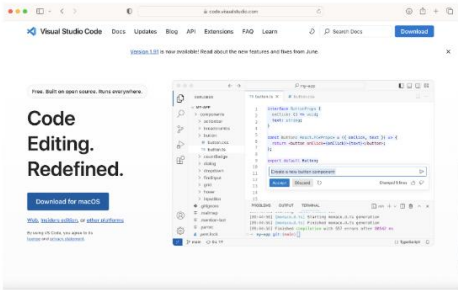
About the Consultant

Savannah Xu is a rising junior at Carnegie Mellon University, majoring in Information Systems with a minor in Human-Computer Interaction and Product Management. In addition to her academic pursuits, she is an active member of the university's Varsity Swim Team. She is passionate about embracing new experiences, such as her summer in Palau through the TCinGC program!


Appendix A

SET UP:

- 1. Install VS Code**
 - Download and install VS Code from the [official website](#).



- 2. Install Python**
 - Download and install Python from the [official website](#).



Appendix B



The image compares the old and new versions of the Palau Schools Student Information System (SIS). The 'OLD' version (left) features a blue header with the Palau Schools logo and the text 'Alii & Welcome to Palau Schools Student Information System (SIS)'. Below the header is a search bar and a 'PlusPortals Link' button. The main content area has a green background with the text 'Standard Operating Procedures (SOPs)'. The 'NEW' version (right) has a yellow header with the text 'WELCOME TO PALAU SCHOOLS SIS' and the Palau Ministry of Education logo. Below the header is a 'PlusPortals Link' button and the text 'Ministry of Education | Metatal Box 189 | (686) 488-6425'. The main content area has a yellow background with the text 'STANDARD OPERATING PROCEDURES (SOPs)' and the Palau Ministry of Education logo. Below the main content area is a table with the following data:

TITLE	LAST MODIFIED
Attendance SOP	Jul 12 Webdeveloper SIS MCE
Miscellaneous	Mar 26 Webdeveloper SIS MCE
SIS Jan Training Questions and Answers	Mar 26 Veronica Stefano
SIS Report Card SOP	Jan 24 Veronica Stefano
SIS SOP	Jul 12 Webdeveloper SIS MCE