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Article in *Records Management Journal* · January 2025

DOI: 10.1108/RMJ-06-2023-0031

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Development of a Web-based records management system: an ERMS initiative for the Office of Senior Citizen Affairs in the Philippines

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Received 18 June 2023
Revised 29 December 2023
3 November 2024
8 December 2024
Accepted 31 December 2024

Abstract

Purpose – This paper aims to design and develop a web-based Electronic Records Management System (ERMS) for the Office of Senior Citizens Affairs (OSCA) in the Philippines. The ERMS seeks to centralize record-keeping and streamline the collection, storage and processing of records and member information. By addressing challenges associated with manual record-keeping, the system seeks to enhance the overall efficiency of record management within the organization. The utilization of web and data capturing technologies is expected to optimize record management workflows, enabling quick and accurate information retrieval at the OSCA.

Design/methodology/approach – This work provides a practical case example of an ERMS implementation. Problems and requirements are identified through interviews and feasibility analysis. Process and data flow diagrams, along with use-case scenarios, capture system needs. The system is developed using MySQL for the database and Laravel for the web interface, including database modeling, interface design and coding. Thorough testing of the database, web forms and source code is conducted using white-box testing. Evaluation follows the ISO 25010 product quality model, involving IT experts and users. The system is piloted on selected sites to further identify bugs or usage problems.

Findings – The system provides integrated modules with various functionalities, such as real-time data monitoring, task management, member registration, reports generation and system settings management. The evaluation confirms the system's usability, reliability, data management efficiency, user-friendly interface and security.

Originality/value – This work introduces a tailor-fit record management system that integrates an in-depth understanding of the membership record-keeping process of the OSCA with the utilization of web and data-capturing technologies. By leveraging this synergy, the system optimizes and enhances the existing record management workflow, presenting a comprehensive and innovative approach to record-keeping practices at the OSCA. The system incorporates fundamental record management processes, including the classification and storage of records, controlled access and ensuring the availability of records when needed – all while upholding privacy and confidentiality in adherence to existing government rules and regulations.

Keywords Web development, Technology integration, Record-keeping, ERMS, Workflow optimization

Paper type Research paper



1. Introduction

In 2020, the population of the Philippines stood at 110, 947, 900, with approximately 10 million persons 60 years of age and older (PSA, 2021). The Filipino culture places a high regard for older persons, and caring for the elderly is of prime importance in Philippine society. Due to their perceived wisdom and significant contributions to various institutions

such as government, family, education and religion (Carlos, 1999), measures have been crafted by the government to address the predicaments faced by the elderly sector. The 1987 constitution contains several provisions specifically aimed at promoting elderly welfare. Article XIII, Section 11 emphasizes the priority given to the needs of the elderly for health development. Article XV, Section 4 establishes the family's duty to care for its elderly members, while also allowing the State to provide support through social security programs. Similarly, Article XVI, Section 8 mandates the State to periodically review and increase pensions and benefits for retirees in both the government and private sectors.

Laws intended to protect the rights, benefits and privileges of senior citizens [1] have been passed and approved. Republic Act No. 7432, enacted in 1992 and subsequently amended by Republic Act No. 9257 in 2003 and Republic Act No. 9994 in 2010, stipulates these rights. These laws also established the Office of Senior Citizens Affairs (OSCA) in every municipality and city across the country. The OSCA serves as a general information and liaison center for senior citizens (PCOO, 2010). Its responsibilities include planning, implementing and monitoring activities and services provided either to or by senior citizens. Furthermore, it ensures compliance with the provisions of Republic Act 9994, particularly in relation to the grant of special discounts and privileges. Among the vital functions of the OSCA is the maintenance of an updated inventory of its members, specifically the senior citizens within a municipality or city. This inventory is highly dynamic due to the continuous addition of new members who turn 60 years old and the frequent occurrence of member mortality.

In a specific municipality, as part of maintaining an up-to-date record of its senior citizens, the OSCA handles member registration, which includes the issuance and replacement of the OSCA-ID or the Senior Citizen's Card. This card serves as a nationally uniform individual identification card and enables senior citizens to avail themselves of discounts, benefits and other privileges provided by both the local and national government. Additionally, the office manages the replacement of cards requiring corrections or updates, as well as the handling of damaged or lost cards.

Furthermore, the OSCA oversees the issuance of documents related to senior citizen members, such as coupons for government provisions and certifications. These certifications may be requested for various purposes, including burial documentation or when individuals are relocating to another city or municipality. Additionally, the office provides assistance to the Department of Social Welfare and Development in the implementation of financial assistance programs for indigent senior citizens.

The operations of the OSCA heavily rely on membership records. To perform its various functions effectively and competently, reliable records management is crucial. Consistency in the records is of utmost importance. However, the manual record-keeping [2] has led to several issues. Firstly, data duplication and inconsistency are inevitable due to the existence of multiple copies of member data at different levels (e.g. barangay-level [3] and city-level records). For example, an update to a member's information at the barangay level may not be reflected in the city-level record, or vice versa. The duplication of records is also prevalent. When a member updates their information and submits a new form, the old membership form may not be detached from the compiled records, resulting in redundant and inconsistent member information. Secondly, the loss or absence of member information from the records occurs frequently. As the filing and recording of member information are traditionally done using pen and paper, submitted forms may be misplaced, or the information may be inaccurately written in the record books. Thirdly, there is difficulty in generating various reports (e.g. an updated list of members), which are essential for the proper implementation

of government payouts and provisions. Due to the dynamic nature of membership, producing an updated report from the manual record-keeping system is challenging.

To address the abovementioned issues, the development of a web-based record management system is proposed to facilitate the collection, storing, and processing of records and member information. This system serves as a starting point to realize electronic records management (Svard, 2017) which has been proven to significantly improve competency and efficiency of processes in various establishments (e.g. Demirtel and Bayram, 2014; Eusoff and Yusof, 2011; Henriksen and Andersen, 2008). As a fully developed electronic records management system (ERMS) needs both the infrastructure and viable implementation framework which are often more accessible in developed countries (Mukred *et al.*, 2022), this proposed approach leverages currently available information technologies to initialize an ERMS.

The contribution of this paper is a fit-to-purpose born-digital record management system that considers both the membership record-keeping process of the OSCA and the available technologies that can be used to enhance the existing process. The system aims to:

- establish an online portal for membership application and processing;
- integrate a QR code feature for verifying membership information;
- implement an SMS-based notification system to inform members of OSCA matters; and
- provide on-demand report generation capabilities for individual or management use.

The rest of the paper is structured as follows: Section 2 provides a review of the relevant literature in the area of record management systems; Section 3 outlines the methodology employed in developing the Web-based system; Section 4 presents the results of the system implementation and provides a detailed discussion of the evaluation; finally, Section 5 concludes the paper and enumerates potential future works.

2. Related literature

At the end of the 20th century, organizations began exploring electronic record management systems (ERMS) to facilitate efficient and reliable record keeping and information sharing (Lewellen, 2015). The need for an ERMS in certain situations is globally recognized, particularly as countries aspire to leverage information for sustainable development in today's digital environment (Baron and Thurston, 2016). Weaknesses in records and information management undermine the pursuit for transparency, freedom of information, and accountability (Lemieux, 2020). The literature presented provides a significant body of work dedicated to the implementation of ERMS in various situations. Given the high risks and costs involved (e.g. in building effective infrastructure and regulatory frameworks, or in institutionalizing and legalizing electronic records), there is a noticeable disparity in the level of ERMS implementation initiatives between developed and developing countries (Baron and Thurston, 2016; Mukred *et al.*, 2022).

To augment the speed of adoption of information technologies in records management, developed countries have been establishing regulatory frameworks of laws, policies, standards, systems, technologies and capacities for capturing, managing and preserving electronic records (Baron and Thurston, 2016). In developed countries, ERMS implementations are of national scope such as the interoperable electronic health records in Canada (Rozenblum *et al.*, 2011), Israel, Switzerland and South Korea (Fragidis and Chatzoglou, 2018), the across-government electronic records management strategy in Australia (Nguyen *et al.*, 2009), and the presidential directive to develop comprehensive set

of policy initiatives aimed at advancing federal e-recordkeeping in the USA (Baron and Thurston, 2016). The implementations of electronic records management have been shifting towards a central legal requirement across all public and private organizations (Lewellen, 2015).

Meanwhile, in developing countries, ERMS is still at the very periphery of organizational attention. The latest literature survey reveals that ERMS efforts in developing countries are mostly focused on limited organizational implementation (Oladejo and Hadzidedic, 2021). There is a substantial lack of structures and skills for managing digital records (Baron and Thurston, 2016). ERMS adoptions are fragmented and uncoordinated rather than being based on an established regulatory framework for capturing and managing electronically generated records. For instance, individualized ERMS adoption (i.e. localized use for a certain government unit) is observed in Pakistan, Yemen and China (Butt *et al.*, 2021; Mukred *et al.*, 2022; An, 2009). Moreover, adoption of electronic medical records among health-care facilities in Saudi Arabia is impeded by concerns on security, technical skills, unfamiliarity with the technology and poor enthusiasm of users (AlSadrah, 2020).

Initiatives for setting up appropriate infrastructures and establishing workable legislations and regulatory frameworks are necessary for a holistic solution to the challenges of ERMS implementation (Asogwa, 2012; An, 2009). Developing countries are making strides in these initiatives. For example, the National IT Policy of Pakistan has promoted e-government projects for digital processes across both the federal and provincial government levels (Henriksen and Andersen, 2008). The e-Government Project in Yemen has been a national initiative to design and develop online systems to facilitate provision of services in all government organizations (Mukred *et al.*, 2022). The National ICT Policy and e-Government Strategy of Tanzania has enabled tremendous progress towards digital governance and records management within the public sector (Baron and Thurston, 2016). Indonesia has been crafting series of laws to develop the national, strategic and integrated policies for digitalization and electronic transactions (Setyorini, 2019). The Philippines has also made initial strides in formulating national regulations to govern both ICT and digitalization matters (Barcenas, 2019). The National Archives of the Philippines (NAP) was established in 2007 to plan and implement management and archival programs for public records (PCOO, 2007). The NAP is also mandated to develop and enforce government-wide policies on records management and series of NAP memorandum circulars have been issued defining relevant policies (e.g. NAP, 2021). Likewise in 2016, the Philippine government created the Department of Information and Communications Technology (DICT), an agency mandated to develop policies and strategies for ICT development in the country. Both the Indonesia and Philippines emphasize policies in telecommunication, e-commerce and cybercrime.

With or without comprehensive ERMS regulations to support organizational policies, the common aim in the development of ERMS is to improve effectiveness and efficiency of services. Current implementations that are presented in Mukred *et al.* (2019) hold common technical system features such as ready access to information, reduced record storage, user-access management, on-demand report generation and secure information sharing.

Besides the huge efforts being made to digitalize government records, ERMS implementations are also thriving both in the education and healthcare sectors. On the one hand, ERMS in the education sector are traditionally focused on digitalizing student records, which cover enrollment, grades, transcripts, and other administrative and academic data. Learning Management Systems (LMS) have recently emerged as platforms for communication among faculty and students, tracking of student progress and management of student records (Turnbull *et al.*, 2020). Evolving ERMS features are leveraging data

analytics and AI technologies for personalized learning. Such features include the use of predictive analytics to identify at-risk students, adaptive learning platforms that personalize learning pathways based on individual student needs and analytics-driven interventions to improve student outcomes (Syed *et al.*, 2017; Muslim *et al.*, 2020). Moreover, there is also an increase in the adoption of mobile access to student records through mobile apps, digital credentials and e-transcripts (Caldarelli and Ellul, 2021).

On the other hand, ERMS in the health sector are looking for interoperability to allow seamless exchange of health information among different health-care organizations and systems. Health ERMS are also focusing to enhance patient engagement by allowing patients to access their own health records and empowering them to take an active role in their health care (Mangus *et al.*, 2021). Other developments include mobile health (Nussbaum *et al.*, 2019) and robust mechanisms for securing digital health records like the blockchain technology (Chukwu and Garg, 2020).

In the literature, Mukred *et al.* (2019) have identified three key determinants for the successful adoption of Electronic Records Management Systems (ERMS): individual, technology and environment. These determinants highlight the importance of considering various factors when implementing an ERMS. The individual factor emphasizes the role of individuals involved in the adoption process, including their knowledge, skills, attitudes and willingness to embrace the system. The technology factor pertains to the functionality, usability and compatibility of the ERMS, ensuring that it meets the specific needs of the organization. Finally, the environmental factor encompasses the organizational culture, resources, policies and regulations that shape the ERMS implementation.

The adoption of ERMS is driven by the benefits that effective record management brings to organizations. Transparent, credible and accountable records enhance organizational trust and respect among clients. To achieve reliability, records must contain relevant, accessible, accurate, current and reliable information (Baron and Thurston, 2016). However, it is essential to recognize that the development and implementation of ERMS may vary across regions, countries and organizations. The landscape of ERMS is dynamic, constantly evolving with advancements in technology and changes in regulations.

Understanding these determinants and the significance of reliable record-keeping practices provides valuable insights for organizations considering the adoption of ERMS. By addressing individual, technological and environmental factors, organizations can enhance their record management processes, promote accountability and meet the evolving needs of their stakeholders.

3. Methods

The system was developed by a team of six individuals, including two programmers, one systems analyst, two stakeholders and one consultant. The consultant, an information technology expert, collaborated with the stakeholders – the chairperson and primary record custodian of the OSCA – alongside senior information technology students who served as programmers and analysts. The traditional Systems Development Life Cycle (SDLC), as outlined in McMurtney (2013), was used to guide the process, with each phase executed to ensure the successful implementation of a records management system.

The initial phase involved analyzing the organization's key requirements. A series of discussions were held with potential users, including employees and stakeholders, to introduce the development opportunity and gather insights into their current record-keeping practices and challenges. In addition, a technical, economic, and operational feasibility analysis was performed to evaluate the system's viability: Technical – Does OSCA have the necessary resources and infrastructure? Economic – Is there financial capability for system

implementation, support, and maintenance? Operational - Are there individuals available to operate and use the system?

A survey of various commercial (e.g. DocPro Suite [4] and DocFlow [5]) and open-source (e.g. BitCurator [6] and BagIt Library [7]) record management software was conducted. However, these options primarily offered features suited for enterprise-level document management or were tailored for specific digital collections. Given OSCA's limited funding, procuring commercial software that might not align with the organizational operations was not an option. Additionally, open-source alternatives were ruled out since none met OSCA's requirements. As a result, the decision was made to implement a bespoke system for managing OSCA's born-digital records.

Feasibility analysis affirmed all three aspects, as OSCA had Internet-connected desktops that met or exceeded the required specifications, and the necessary additional equipment, such as a QR-code scanner, could be acquired within budget. The Internet connectivity bandwidth in the OSCA office also exceeded the optimal requirement. While the systems development itself was considered free, OSCA would incur a monthly cost of only \$8.00 for web hosting and SMS service. The required development tools, specifically PHP and MySQL, were both open-source and free.

During the analysis phase, specific functionalities and features required were identified, and process and data flow diagrams were created to visualize current record-keeping practices and pinpoint areas for improvement. Use-case analysis captured various interactions and scenarios the proposed system should support, identifying key functional requirements: portal for membership application and processing, QR-based membership verification, SMS notification for members and report generation capabilities.

Once the system requirements were established, the design phase began. MySQL was used for data modeling to design the data structure and relationships, ensuring effective organization and retrieval based on user needs.

Following the design phase, the development of the web-based system took place. The interface was designed to provide an intuitive and user-friendly layout. Coding was then carried out to implement the functionalities identified in the earlier stages. Laravel, a powerful PHP web coding framework, was used. During the development process, the white-box testing approach was used to ensure quality and reliability. This approach involved testing the database, web forms and source code through a thorough examination and analysis of the internal structure and logic:

- Database testing: The database was thoroughly tested to ensure data integrity, proper indexing and efficient query performance. Various test scenarios were executed, including data insertion, retrieval and modification operations, to ensure accurate and consistent results.
- Web form testing: The Web forms within the system were tested to ensure proper functionality and validation of user inputs. This included testing various use cases and scenarios to verify the expected behavior of the forms, handling error conditions and ensuring a seamless user experience.
- Source code testing: The source code of the system was subjected to rigorous testing to identify and rectify any logical errors, bugs or vulnerabilities. This encompassed unit testing, integration testing and system testing to ensure the proper functioning of individual components and their interactions.

After the development phase, thorough testing was conducted by the development team, covering functional, performance and security aspects.

Upon successful testing, the system was deployed for partial use within the organization. This process involved the installation and configuration of the system on a web server, using Hostinger as the web hosting service and the Vonage SMS API for the messaging component of the system. Subsequently, a workshop and user training session was conducted for selected users, including employees and members, as well as IT experts who served as evaluators. The workshop aimed to familiarize participants with the system. Following the workshop, participants were asked to evaluate the system based on its effectiveness in addressing the identified issues and meeting the organization's needs. Feedback was collected to identify areas for improvement and potential future enhancements. The evaluation used the product quality model based on ISO 25010, which provides a comprehensive framework for assessing the system's characteristics and overall quality. The evaluation process included measuring the system against defined quality attributes, such as functionality, usability, reliability, performance, security, maintainability and portability.

After addressing the initial evaluation concerns, five barangays were selected to pilot the system's use, specifically targeting those where the OSCA coordinators who attended the user training were located. Over a period of four consecutive weeks, the system's utilization was monitored, during which several technical issues were identified and resolved. Additionally, significant adjustments were made to improve how the system handles the involved processes.

The entire process, from requirements analysis to system deployment and evaluation, spanned a total of 10 months.

4. Results and discussion

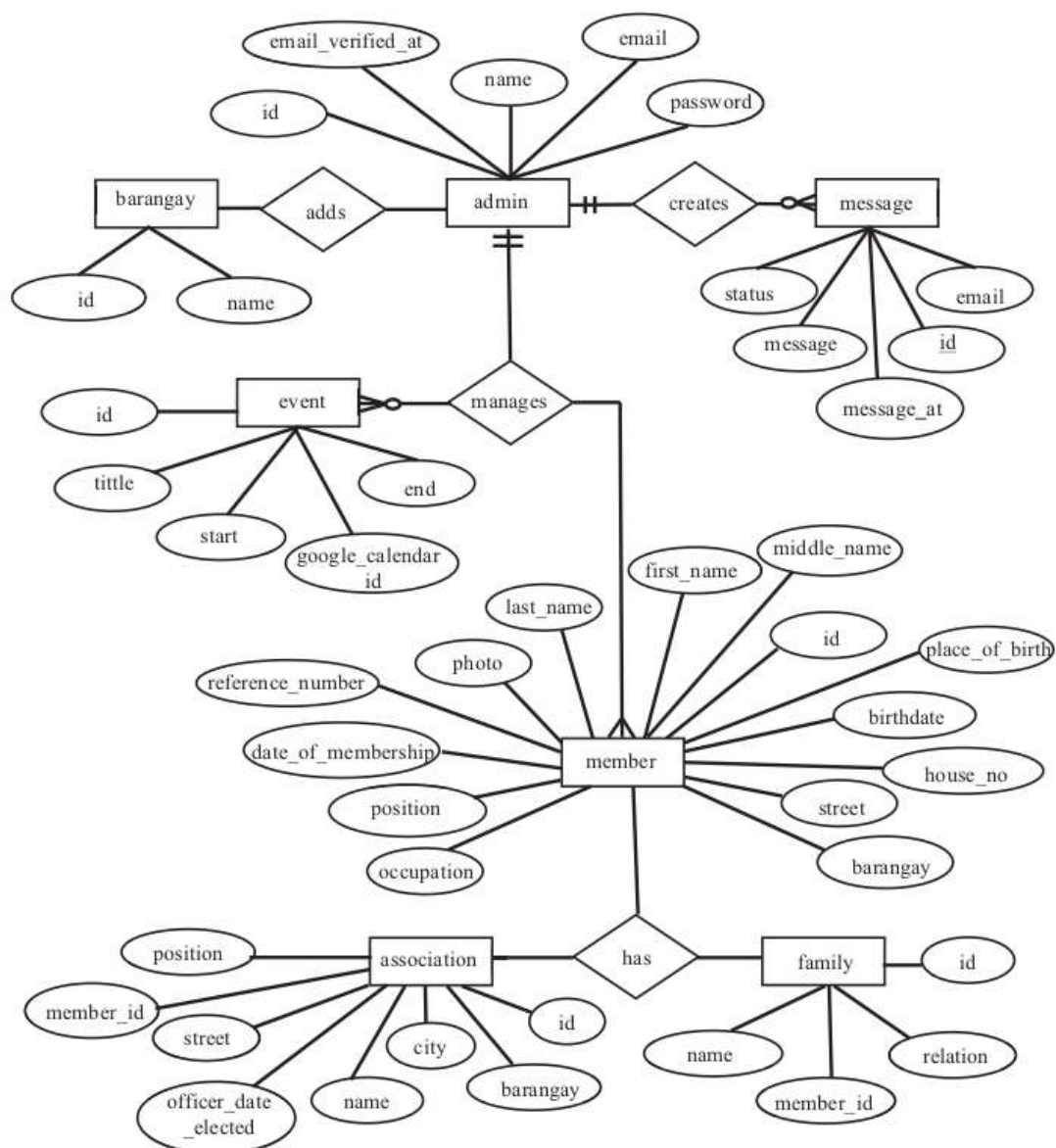
4.1 The database model

Figure 1 shows the database design of the system. The design incorporates various entities to facilitate efficient data management and user interactions. The "admin" entity represents the administrative user who has privileged access to the system. The "admin" is responsible for adding "barangays" into the system, creating "messages" to communicate with members, managing "events" for the organization and overseeing "members" and their associated data. The inclusion of an "admin" entity ensures proper system administration and control.

The "barangay" entity represents the different local subdivisions within the organization's jurisdiction. A city or municipality in the Philippines is composed of smaller government units called *barangays*. The "admin" can add new "barangays" to the system, allowing for granular management and organization of data at the local level. This entity enables efficient data categorization and retrieval based on geographical divisions. The "message" entity allows the "admin" to communicate important information or announcements to the members. This functionality ensures effective communication between the organization and its members, promoting transparency and timely dissemination of information.

The "event" entity enables the "admin" to manage and organize various events hosted or sponsored by the organization. It includes details such as event name, date, time, venue, and any additional relevant information. The "event" entity ensures proper event planning, coordination and record-keeping within the ERMS.

The "member" entity represents individual senior citizens who are associated with the organization. Each "member" belongs to an "association", signifying their affiliation with a specific group or category within the community. The "member" entity facilitates accurate member profiling and streamlined data management. Additionally, the "member" entity has a



Source: Authors' own work

Figure 1. Database model of the system

relationship with the “relative” entity, allowing the storage of information about a member’s family or relatives. This feature enables the ERMS to maintain a comprehensive record of a member’s familial connections and relationships.

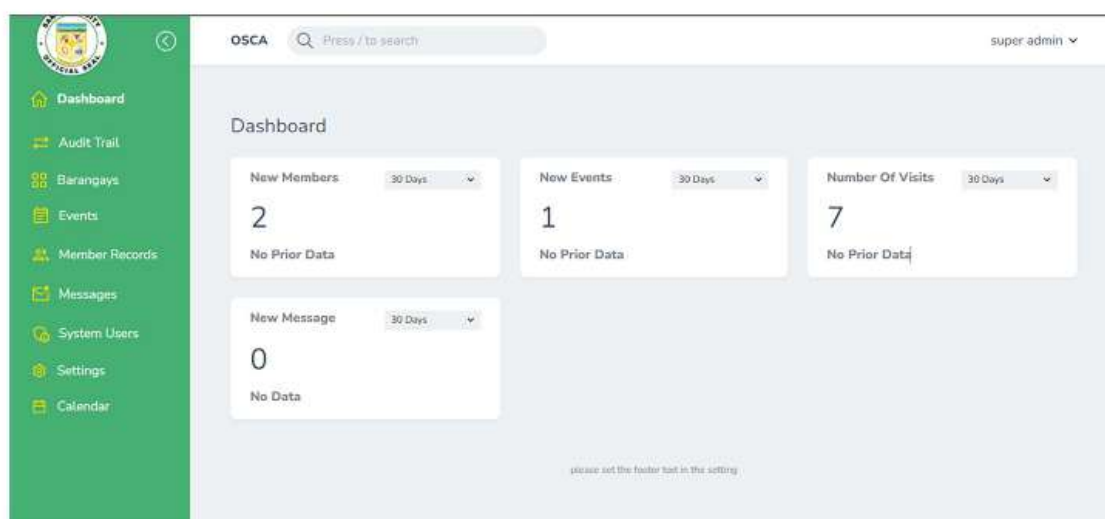
The database design, incorporating these entities, provides a solid foundation for the system to effectively manage and organize data related to admin activities, barangay information, messaging, event management, member profiles, associations and member-relative relationships. The relationships established between these entities ensure data integrity and enhance the overall functionality and usability of the system. Furthermore, the database design allows for scalability and extensibility, accommodating future enhancements

and additional entities as needed. The logical organization of data and relationships ensures efficient querying and retrieval of information, supporting the diverse needs of the organization and its members.

4.2 The system features

The various system features address the key functional requirements specified for the system. Notably, a single key requirement may be fully addressed through one or a combination of these features. With all key functional requirements implemented, the system is expected to enhance OSCA's record-keeping processes and facilitate efficient management:

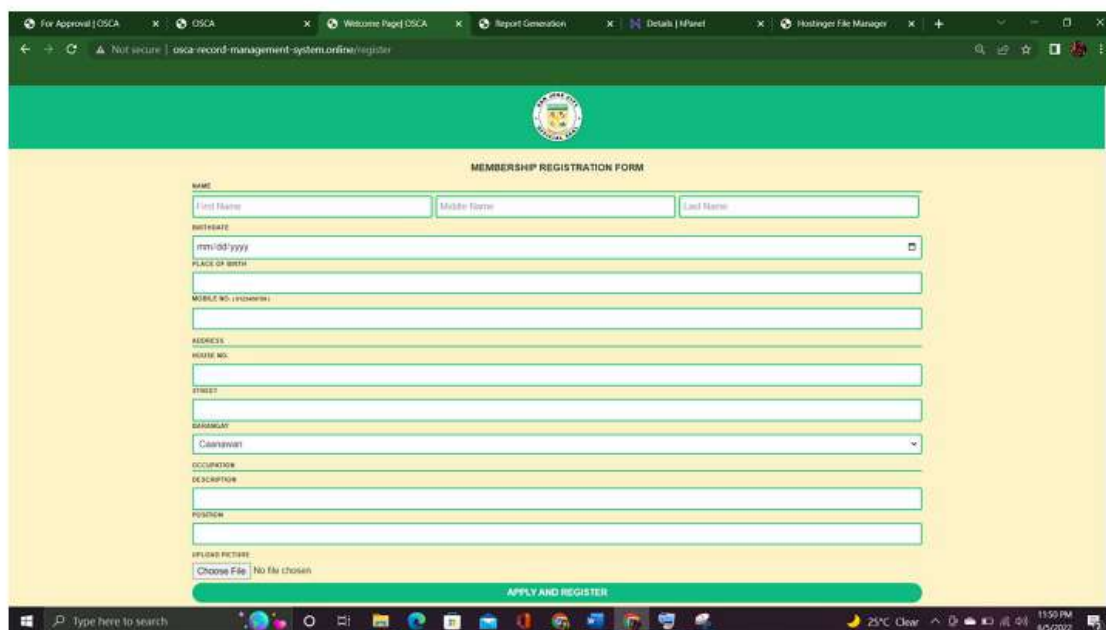
- Login page and default landing page – The Login Page serves as the entry point for authorized users to access the system, providing a secure authentication mechanism that ensures only authorized personnel can gain access. By implementing strong user authentication protocols, such as username and password combinations, the Login Page helps maintain data privacy and system security. There are three user roles, each with specific access rules. The default access rule is that users can only view their own records. The super-admin, a role assigned to OSCA's primary record-keeper, has access to all system features and data, and is responsible for managing and assigning user roles. The admin role is assigned to OSCA coordinators who manage records within a specific barangay, allowing them to access only the records of members residing in the same barangay. Lastly, the common user role is designated for members. The default landing page (see Figure 4) for all users provides a brief description of OSCA, as well as an overview of the main services offered by the system.
- Dashboard – The Dashboard (see Figure 2) serves as the central hub of the system, providing an overview of important system information and real-time monitoring capabilities. Through the Dashboard, the admin can track key metrics, such as the number of members, visits, new messages and audit reports. This real-time monitoring enables the admin to stay updated on system usage and activities, facilitating effective decision-making and resource allocation.



Source: Authors' own work

Figure 2. The admin dashboard


- Task management pages – The Dashboard provides the admin with various task management pages to streamline administrative operations. It also serves as the portal to the different functional modules of the system. The admin can create events and post announcements, facilitating effective communication with members. Additionally, the system simplifies the management of barangays, enabling the admin to organize and oversee the different local subdivisions within the organization's jurisdiction. The system also allows for the search and management of member records, facilitating data creation, retrieval and updates (see [Figure 5](#)). Membership requests can be approved within the Dashboard, ensuring a smooth and efficient membership process. Furthermore, the admin can manage both online and SMS messages, supporting effective communication channels with members.
- Member registration page – The Member Registration Page offers an online application form (see [Figure 3](#)) for individuals seeking membership in the organization. This feature streamlines the membership process by allowing applicants to fill out and submit their applications digitally. Additionally, during the registration process, the system incorporates a QR code generator, which creates a unique QR code for each member. This QR code can be used for identification purposes and facilitates efficient member verification during various organizational activities.
- Reports generation – The system offers the capability to generate various reports, providing valuable insights and aiding decision-making processes. The system generates member reports using variants of filter options such as barangay of residence, registration date range, membership status and age range. The system also generates usage reports, which provide an overview of system usage patterns and member activities. Additionally, event reports can be generated, enabling the admin to assess the success and impact of organized events. All of these reports assist in



The screenshot displays a web browser window with multiple tabs open, including 'For Approval | OSCA', 'OSCA', 'Welcome Page | OSCA', 'Report Generation', 'Details | MPinet', and 'Hosting File Manager'. The active tab shows the 'Membership Registration Form' on the website 'osca-record-management-system.online/register'. The form is titled 'MEMBERSHIP REGISTRATION FORM' and includes the following fields: NAME (First Name, Middle Name, Last Name), BIRTHDATE (mm/dd/yyyy), PLACE OF BIRTH, MOBILE NO. (PERSONAL), ADDRESS (HOUSE NO., STREET, BARANGAY), OCCUPATION, and POSITION. There is also an 'UPLOAD PICTURE' section with a 'Choose File' button and a 'No file chosen' status. A green 'APPLY AND REGISTER' button is at the bottom of the form. The browser's address bar shows the URL 'osca-record-management-system.online/register' and a 'Not secure' warning. The Windows taskbar at the bottom shows the search bar, task view, and various application icons, with the system clock indicating 11:50 PM on 4/2/2022.

Source: Authors' own work

Figure 3. Membership registration form



REGISTER NOW!

Step 1: Register

Fill out all required fields, and submit your application form or you could go to your respective Barangay to register.

Step 2: Confirmation

Wait for the confirmation message before you proceed to the OSCA Office to claim your senior citizen ID.

Step 3: Issuance of ID

After receiving the confirmation, proceed to the OSCA office and present the following documents:

- 2 copy of recent 1x1 picture
- Birth Certificate
- Any of the following IDs: Postal ID, Driver's license, NHA Clearance, Voter's ID, Police clearance, Old resident's certificate, Valid passport, or other documents containing your name, birth date, and current address.

The creation of the OSCA in San Jose City paved the way for the protection of the rights of the senior citizens. It was established to promote the welfare of the senior citizens and put in place programs and policies that benefits them.

ABOUT US



The Office for Senior Citizens Affairs commits itself to look after the needs of the elderly, ensure that their right and privileges under Republic Act No. 9994, otherwise known as "An act to maximize the contribution of Senior Citizens to nation building, grant benefits and special privileges and for other purposes" which allow them to have discount privileges, government financial assistance, and many more. They make sure that this said privileges is recognized and encourages them to keep on participating in the progress of San Jose City. The OSCA is also the one that deals with receiving of communications from other offices, issuing of national uniform ID for senior citizens, Organizes senior citizen associations and attending their induction of their new set of officers.

EVENTS & ANNOUNCEMENTS

Senior Citizen's Night
- Apr-29-2022, 19:00 PM - Apr-29-2022, 22:00 PM

Gift Giving
- Dec-17-2021, 12:00 PM - Dec-25-2021, 12:00 PM

MESSAGE US

Email

juarv@example.com

Message

As

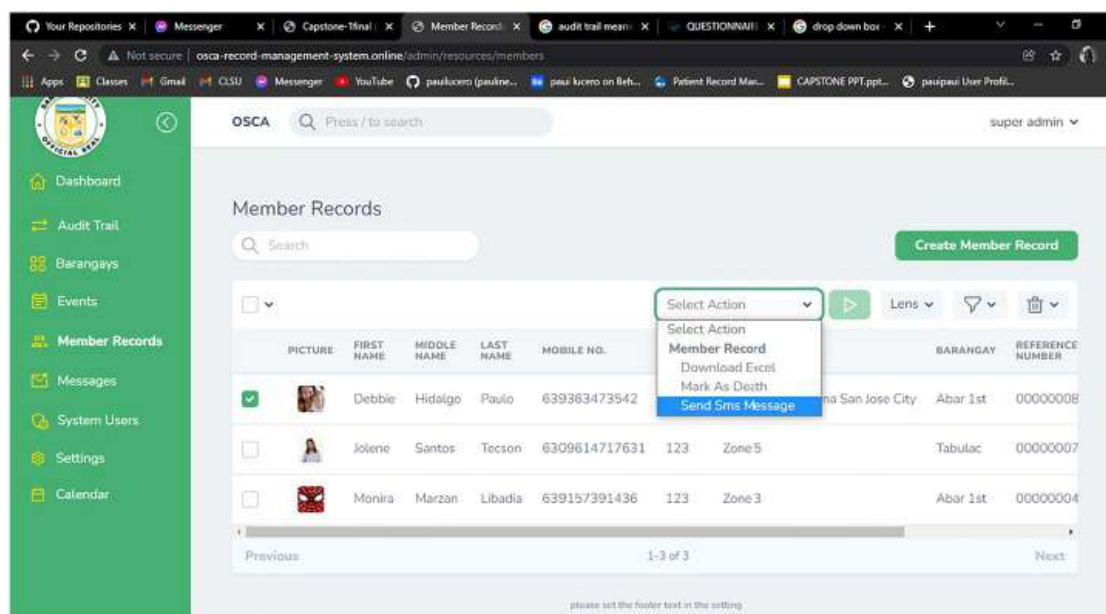
Maximum Character 200 only

SEND

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Source: Authors' own work

Figure 4. The user default landing page



Source: Authors' own work

Figure 5. Member records management page

evaluating the effectiveness of various initiatives and enable data-driven decision-making within OSCA.

- Systems settings and ID generation page – The System Settings feature allows the admin to customize and configure the system according to organizational requirements. It provides flexibility in tailoring the system to specific needs, such as adjusting access levels, managing user roles and setting up notification preferences. Additionally, the ID Generation Page enables the admin to generate identification cards for members, further enhancing the authentication and verification process.

4.3 System evaluation

The evaluation of the developed system using the product quality model based on ISO 25010 provided valuable insights into its performance and effectiveness. The evaluation involved the participation of 8 IT experts and 15 users, who rated the system based on various system properties using a 1–5 rating scale. Table 1 and Table 2 summarize the mean scores from the IT experts and users, respectively.

In terms of functional suitability, the system received high ratings in Functional Completeness (4.67), Functional Correctness (4.17) and Functional Appropriateness (4.17). This indicates that the system effectively fulfills the functional requirements, ensuring that it includes all necessary features, performs accurately and meets the users' needs.

Under Performance Efficiency, the system performed well in Time Behavior (4.5), Resource Utilization (4.17) and Capacity (4.5). These ratings reflect the system's ability to provide efficient and responsive performance, effectively use system resources and handle a substantial workload without compromising performance.

The system also demonstrated good compatibility, as indicated by the ratings of co-existence (4.33) and inter-operability (4.5). This implies that the system can coexist and

Table 1. Summary of IT expert evaluation (using a 1–5 rating scale)

System properties	Mean of scores
Functional suitability	4.33
Performance efficiency	4.39
Compatibility	4.42
Usability	4.50
Reliability	4.42
Security	4.39
Maintainability	4.40
Portability	4.11

Source: Authors' own work

Table 2. Summary of users' evaluation (using a 1–5 rating scale)

System properties	Mean of scores
Usability	4.67
Reliability	4.65
Reliability of data	4.65
Effectiveness	4.71
User interface	4.67
Security	4.70

Source: Authors' own work

interact seamlessly with other software and systems, ensuring smooth data exchange and interoperability.

In terms of usability, the system received high ratings across various aspects, including Appropriateness Recognizability (4.67), Learnability (4.5), Operability (4.67), User Error Protection (4.17), User Interface Aesthetics (4.33) and Accessibility (4.67). These ratings highlight the system's user-friendly design, ease of use and its ability to protect users from making errors. The system's accessibility features also ensure that it can be used by individuals with diverse needs.

Under reliability, the system received high ratings in Maturity (4.67), Availability (4.67), Fault Tolerance (4.33) and Recoverability (4). These ratings indicate that the system is highly reliable, with a mature and stable performance, high availability and the ability to handle faults and recover from failures effectively.

In terms of security, the system scored well in Confidentiality (4.33), Integrity (4.33) and Non-repudiation (4.5). These ratings signify that the system maintains the confidentiality and integrity of data and provides non-repudiation features to ensure the authenticity and accountability of user actions.

In terms of maintainability, the system demonstrated good ratings in Modularity (4.5), Reusability (4.33), Analyzability (4.17), Modifiability (4.5) and Testability (4.5). These ratings reflect the system's ease of maintenance, its modular and reusable design, and its ability to be analyzed, modified and tested efficiently.

Under portability, the system received ratings of Adaptability (3.66), Installability (4) and Replaceability (4.67). While the ratings indicate that the system can be installed and replaced easily, there is room for improvement in terms of adaptability to different environments.

The user ratings provided valuable insights into their perception of the system. Users rated the system highly in terms of Usability (4.67), Reliability (4.65), Data (4.65), Effectiveness (4.71), User Interface (4.67) and Security (4.70). These ratings indicate that users found the system easy to use, reliable, effective in managing data and secure.

4.4 System deployment and use

The primary function of the system is to streamline both the member application process and record management. The intended process involves prospective members submitting their applications and required attachments through the membership portal, eliminating the need to visit the OSCA office. Subsequently, applications undergo evaluation by an admin (i.e. the respective barangay OSCA coordinator), who endorses valid applications to the super-admin for approval. Applicants are notified of approval or disapproval via SMS or email. If approved, the OSCA ID is generated along with the QR code; otherwise, the application is marked as pending or discarded. Pending applications must address concerns for potential consideration, and the application status can be tracked within the system.

However, during the system piloting phase, the envisioned ideal utilization did not fully materialize. Very few applicants successfully submitted their applications independently. The majority of applicants showed reluctance to use the Web-based form submission. Issues such as weak connectivity hindered access to the application submission portal for some, while others were unfamiliar with filling out online forms, expressing a preference for traditional paper forms.

In response, the intended process was adjusted to include the provision of paper forms for individuals who are unable to use the system directly. The accomplished forms will be collected by the barangay coordinator who will then input the information into the system. While this approach may offer convenience to applicants, it places a burden on the coordinator. The coordinator needs to create user accounts and maintains a list of those accounts. Despite accounts being given to their respective owners, majority of members still revert to the coordinator for system access. Alternatively, a member user can visit the OSCA main office to submit applications, and the processing of applications through the system follows a similar procedure: an employee with a super-admin role inputs the form into the system and approves the application.

Despite the anticipated additional encoding tasks for admins and super-admins, the system is expected to significantly enhance the management of records at OSCA. Although the use of paper application forms could not be fully eliminated for the majority of users, a gradual increase in member users directly using the Web-based forms is foreseen. The benefits provided by the system are considered to outweigh the additional encoding tasks required. Tasks such as report generation, ID generation, records monitoring, and real-time analytics can now be completed with a single click. Additionally, the W-based nature of the system enables both users and OSCA managers to access information from any location and at any time.

4.5 Privacy, freedom of information and records disposition concerns

While there is a recent policy issued by the Philippines Government specifically addressing the establishment and management of ERMS ([NAP, 2021](#)), various agencies, including the OSCA, are in the initial stages of adopting specific provisions of the policy. The policy covers crucial aspects such as record creation and capture, record maintenance processes, records use, security and disposition. The developed system's scope has encompassed most of these aforementioned aspects.

A record is automatically created and captured by the system while facilitating OSCA transactions. Each record's details are stored in separate database tables (see [Figure 1](#)) to minimize redundancy, ensure data consistency and provide flexibility in data retrieval. This approach differs from traditional paper-based records, where all details are captured and presented on a single document. The system also incorporates several features for records maintenance, such as the classification of records, where the records of deceased members are marked upon their death. This simple classification significantly contributes to system efficiency, particularly in records retrieval, as deceased members can be archived, thereby excluding them from regular system transactions. Another key aspect of record maintenance is the management of storage media. As the system operates through a third-party Web hosting service, storage maintenance is managed by the hosting provider, contributing to the system's overall reliability and functionality.

For records use and security, the system implements user access controls based on roles: the super admin, who manages and assigns user roles; the admin, who manages records within a barangay (i.e. the barangay OSCA coordinator); and the common user (i.e. a senior citizen). This role-based access control ensures the confidentiality of personal records among system users (i.e. OSCA members). As the system processes personal data, its design and usage are subject to the provisions of the Philippines' Data Privacy Act of 2012 ([NPC, 2012](#)). Before entering member information into the system, a pop-up message appears to request consent from members, allowing their personal data to be stored, processed and disclosed to OSCA authorities. Members are also permitted to access all data related to their personal records; however, the rectification or removal of previously entered data can only be performed by an admin. To make any changes, a member or their representative must contact the OSCA coordinator. To maintain system integrity and user accountability, the audit trail feature automatically logs significant actions related to records, tracking responsible users for past record changes in chronological order. The system utilizes MySQL's built-in "CREATED_AT" and "UPDATED_AT" logs to capture details such as user, time, location, and actions performed. The aforementioned system characteristics align with the Philippines' Freedom of Information Act ([PCOO, 2016](#)) which stipulates that every Filipino shall have access to information and official records, subject to ensuring the protection of privacy. Any system admin with access to personal information is responsible for safeguarding such data and ensuring disclosure is in line with applicable laws, rules or regulations.

The system, however, has yet to integrate a records disposition approach. In the records management life cycle model ([Padoni, 2023](#)), records disposition is a phase in which records are either destroyed following a disposal procedure or archived if they are to be retained for a longer period. An OSCA-specific policy is needed to establish the disposition process, including the disposition schedule, disposal methods, retention methods and the process for transferring records to archival custody.

4.6 Implications for practice, research and governance

This work presents an approach for developing and evaluating a Web-based record management system aimed at improving existing manual processes. The project addresses a need for efficient and modernized record-keeping within an organizational context, specifically tailored to meet the unique requirements of a traditional organization like OSCA. The use of Web and data capturing technologies helps streamline processes, enhancing overall efficiency and contributing to operational effectiveness. Moreover, the system's adaptive approach, which accommodates both online and traditional paper-based application processes, reflects consideration for a diverse user base, particularly the older demographic

of potential members and varying levels of technical adeptness. The methodology – comprising detailed analysis, development and testing phases – provides a practical blueprint for similar initiatives in organizations facing challenges associated with manual record-keeping. The system features complying to data privacy regulations and the incorporation of audit trail features underscore a commitment to security, which is essential for institutions navigating similar technological transitions. This ERMS initiative not only enhances OSCA's record management practices but also offers a replicable and adaptable model for organizations seeking to modernize their record management systems with a focus on accountability, confidentiality and security.

The system could become a baseline for numerous potential studies in record management that incorporate current technological advancements like AI-based text processing, document tagging, and blockchain. Many agencies in the Philippines have yet to fully leverage available technologies to enhance their service delivery systems. Specific aspects of ERMS, including scalability for enterprise integration and the processes of disposal and retention of records, warrant further investigations. The system's ability to accommodate both traditional and digital modes of record processing opens avenues for further research on adaptability and scalability in similar systems. By contributing to the practical implementation of records management, this project encourages exploration into best practices in record lifecycle management, compliance with regulatory frameworks and strategies for record disposition. This work thus provides a practical implementation while also stimulating inquiry into the establishment of effective practices in records management.

By centralizing and streamlining record-keeping processes, the system enhances the efficiency and transparency of governance within the organization. The ERMS facilitates better decision-making by providing real-time data monitoring, a central dashboard for task management, and comprehensive report generation. This contributes not only to the operational efficiency of the OSCA but also promotes a culture of accountability and responsiveness. The implementation of a standardized, technology-driven approach to record management aligns with contemporary governance principles, emphasizing data integrity, accessibility and adherence to regulatory frameworks. The implications extend beyond the OSCA, as the success of this initiative showcases the potential for other government agencies to adopt similar ERMS solutions, thereby improving governance practices across various sectors.

5. Conclusion and future works

The development of a web-based Electronic Records Management System (ERMS) for the Office of Senior Citizen Affairs (OSCA) in the Philippines has successfully addressed the challenges associated with manual record-keeping and improved overall record management efficiency. By leveraging modern technologies and methodologies, the system offers a robust solution that enhances the organization's ability to handle and manage records effectively.

The methodology used in this work, including problem identification, feasibility analysis and the use of process and data flow diagrams, facilitated a comprehensive understanding of the organization's needs. The system development process, using MySQL for the database and Laravel for the web interface, resulted in a well-designed and functional records management system.

Overall, the evaluation results demonstrate that the developed system performs well across various system properties, meeting the functional requirements, providing efficient performance, ensuring compatibility and usability and maintaining reliability and security. The positive ratings from both IT experts and users validate the effectiveness and quality of the system, affirming its value in improving record management processes within the OSCA.

While this work has successfully developed a web-based Records Management System, there are several potential areas for future research and improvement. These areas include the following:

- Integration with other government systems – the developed system can be further enhanced by integrating it with other government systems, such as the Department of Information and Communication Technology's eGov app [8], and local government unit databases. This integration would allow for seamless data sharing, improved coordination and more comprehensive services for senior citizens.
- Mobile application development – in an increasingly mobile-centric world, developing a mobile application for the ERMS can provide greater convenience and accessibility for users. A mobile app would enable senior citizens to access their membership information, receive notifications and interact with the system using their smartphones or tablets.
- Enhanced data analytics and reporting – the current system provides basic reporting capabilities; however, further research can be conducted to develop advanced data analytics and reporting features. This would enable OSCA administrators to gain deeper insights into member demographics, service utilization patterns and overall system performance, aiding in evidence-based decision-making and policy formulation.
- User experience (UX) research and improvements – conducting user experience research can help identify areas for improvement in terms of system usability, user interface design and overall user satisfaction. Gathering feedback from both administrators and senior citizen members can provide valuable insights to enhance the system's usability and user-friendliness.
- Scalability and sustainability – as the OSCA expands its services and membership base, it is crucial to ensure that the system remains scalable and sustainable. Future research can focus on optimizing the system's architecture, performance, and security to accommodate growing data volumes and user demands. Cloud-based ERMS may lower the cost of long-term system operationalization while enhancing resilience and security (Lee and Lee, 2017; Mahajan *et al.*, 2023).
- Record retention and disposal – long-term use of the system will inevitably accumulate significant amount of member records. It is therefore important to consider archiving and disposal strategies as part of system storage and performance sustainability.

Notes

1. Senior citizen or elderly is a resident citizen of the Philippines at least sixty (60) years old.
2. Manual record keeping refers to records being maintained by hand without using a computer.
3. Barangays comprise a city or municipality, and there can be an OSCA coordinator/sub-office in the barangay.
4. www.docprodms.com/products/records-management-system/
5. <https://pixelplex.io/doc-flow/>
6. <https://bitcurator.net/bitcurator-nlp/>

7. <https://github.com/LibraryOfCongress/bagit-java>
8. <https://e.gov.ph/>

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