From Spreadsheets to Scalability: Databases as a Next Step for Non-Profits

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Abstract: *This article discusses the evolution of data management strategies for non-profit organizations, transitioning from spreadsheets to more scalable database systems. As non-profits grow and their data becomes more complex, the need for robust database solutions becomes apparent. The article examines the types of databases suitable for program evaluation, highlighting the benefits and limitations of each. It also explores the challenges non-profits face in implementing these systems, such as infrastructure limitations, lack of full-time IT support, and the need for staff training. Through case studies, successful database implementations are analyzed to derive best practices. The findings emphasize the importance of tailored database solutions, ongoing staff training, and collaborations with IT experts for non-profits to maximize the benefits of database systems in their program evaluations.*

Keywords: *data analysis*, *data management*, *data mining*, *database systems*, *database training*, *IT infrastructure*, *organizational capacity*, *non-profit organizations*, *program evaluation*

Résumé : *L'article parle de l'évolution des stratégies de gestion des données pour les organisations à but non lucratif, et du passage de chiffriers à des systèmes de bases de données plus évolutifs. La croissance des organisations à but non lucratif et la plus grande complexité de leurs données font en sorte que la nécessité de mettre en œuvre des solutions de bases de données plus robustes se fait jour. L'article examine les types de bases de données pertinentes pour l'évaluation de programmes, et parle des avantages et des limites de chaque option. Il explore aussi les défis auxquels*

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sont confrontées les organisations à but non lucratif en ce qui concerne la mise en œuvre de ces systèmes, comme des problèmes d'infrastructures, des lacunes en appui à temps plein en matière de TI et le besoin de former le personnel. Par l'intermédiaire d'études de cas, des mises en œuvre réussies de systèmes de bases de données sont analysées pour en dériver des pratiques exemplaires. Les conclusions mettent l'accent sur l'importance de trouver des solutions de bases de données personnalisées, de former le personnel de façon continue et de collaborer avec des experts en TI qui connaissent bien les organisations à but non lucratif pour maximiser les avantages des systèmes de bases de données dans l'évaluation de leurs programmes.

Mots clés : *analyse des données, capacité organisationnelle, évaluation de programme, extraction de données, formation en base de données, gestion des données, infrastructure de TI, organisation à but non lucratif, système de base de données*

INTRODUCTION

Non-profit organizations must store data in various formats (Ortega-Rodríguez, Licerán-Gutiérrez, & Moreno-Albarracín, 2020) to understand clients' data and provide evaluation services. Organizations apply for funding using data insights and perform ongoing evaluations and assessments to understand their impact as there is increased accountability pressure for non-profits to demonstrate their effectiveness beyond output measurements (Rey-Garcia, Liket, Alvarez-Gonzalez, & Maas, 2017). In a previous article (Shapiro & Oystrick, 2018), we argued that spreadsheets are typically the most accessible form of gathering data and provide a sustainable and stable choice for organizations with limited resources. While spreadsheets are a recommended starting point for storing and analyzing data, (Broman & Woo, 2018), there are some situations when a database may be the next step in building capacity for non-profit organizations. For example, when the data is larger than the computer can handle, when many employees are using the data simultaneously in different contexts, or when data is used for internal management or operational systems, scaling to a database may be required.

In these situations, evaluators and clients should work together to create a database solution, provide feedback on the data needed for evaluation, and work in small iterative cycles (McCosker et al., 2022) to co-create data solutions. Despite the technical challenges, many organizations are interested in exploring their data in new ways (Ranjan & Foropon, 2021) and leveraging the power of databases (Rathi & Given, 2017). More extensive data capabilities can create societal good (Engø-Monsen, 2020) by helping organizations understand their data (Soelton, Noermijati, Rohman, & Mugiono, 2021), conduct program evaluations, and scale their ability to help their clients through new insights.

Types of database systems

Databases are an important resource in program evaluation as they can provide a singular repository. This can simplify the process of generating reports and cross-referencing complex data. There are many types of databases; however, databases typically use Structured Query Language (SQL) to manage and manipulate data. SQL databases store data in a structured way, similar to a spreadsheet with rows and columns, and typically operate on a relational or hierarchal model and cross-reference with other tables (Cutler & Dickenson, 2020). SQL commands find specific information, add new entries, or update existing records. Database solutions can be used locally or with cloud software service providers (Deka, 2014).

Organizations can customize databases to meet their specific needs. Other database technologies, such as NoSQL (Meier & Kauffmann, 2019) or Microsoft Access (Azcorra, 2021), offer flexibility and agility in handling unstructured (email, image) (Blumberg & Atre, 2003; Hassan, 2021) or semi-structured (spreadsheet, form) data (Strekalova & Bouakkaz, 2022). When selecting the most suitable database solution, it is important to evaluate the functionalities of each option.

Benefits and limitations of various database systems

Each type of database system has distinct benefits and limitations in the non-profit context. Microsoft Access is cost effective (Tony-Okeme, 2021) and easy to use, making it ideal for creating customized forms and reports (González Berrios, 2022). However, Access struggles with large datasets and requires regular maintenance (Beynon-Davies, 2004).

SQL databases are robust and scalable, efficiently handling large data volumes and complex queries and integrating data from multiple sources, making them suitable for larger non-profit organizations. However, they require specialized expertise, posing challenges for those with limited IT resources (Scquizzato, 2024). Similarly, NoSQL databases offer flexibility in managing unstructured and semi-structured data, ideal for non-profits with diverse data types. They can scale for large datasets, though they require knowledge of specific query languages and data models, which can be difficult for organizations without in-house technical expertise.

Data mining and extracting insights from administrative data

With the adoption of database systems, non-profit organizations can unlock valuable insights from their administrative data. Data mining techniques can be employed to discover hidden patterns, relationships, and trends within data, making it easier to conduct formative evaluations. Organizations can derive actionable insights to enhance their program effectiveness and decision-making capabilities using exploratory and visualization tools. For example, by analyzing participant demographics, attendance records, and satisfaction rates stored in a database, organizations can identify target populations, evaluate program impact,

and make data-informed adjustments to support grant funding applications (Zanti et al., 2022). Utilizing databases opens doors to integrating advanced analytics and making data-informed decisions.

Non-profit organizations often need to collect semi-structured and time-series data, which presents unique analytical challenges and opportunities. Semi-structured data (for example, audio or video recordings) combines structured and unstructured elements and requires specialized parsing techniques for effective information extraction. Databases can support program evaluation by housing data and revealing valuable insights into user behaviours and interactions not easily identified in traditional data formats (Naeem et al., 2022). This data type can uncover patterns and trends hidden in structured data, offering a deeper insight into user engagement and preferences. Semi-structured methodologies, including interviews and observations, are pivotal in capturing detailed user experiences and perceptions, allowing researchers the flexibility to explore specific user interactions and behaviours that more standardized data collection methods might miss. These approaches enable a comprehensive understanding of user needs, preferences, and challenges, essential for improving service delivery and customizing interventions.

Semi-structured data facilitates the combination of qualitative and quantitative analysis. Housing semi-structured data in a database can provide a holistic view of user experiences and behaviours that can enhance decision-making, drive targeted interventions, and improve the effectiveness of services offered to users, optimizing non-profit organizations' operational and strategic outcomes. A mixed-method approach to program evaluation allows for a more nuanced understanding of the individual users' experience and the broader community impact.

We have also found that time-series data, characterized by sequential measurements over intervals, offers a dynamic view of trends and patterns over time. This is particularly relevant for organizations monitoring program outcomes, participant engagement, and fundraising efforts. Analyzing time-series data involves statistical techniques that can accommodate seasonal variations, trends, and cyclical patterns, providing a deeper understanding of the factors influencing program effectiveness.

CHALLENGES IN IMPLEMENTING DATABASE SYSTEMS FOR PROGRAM EVALUATION

Infrastructure requirements and limitations in non-profit organizations

Non-profit organizations often face infrastructure challenges when implementing database systems that can be used for evaluation. Financial resources may restrict investment in hardware and software (Finkler, Calabrese, & Smith, 2022). This may impact the performance and scalability of the database, leading to slower query processing or difficulty accommodating growing volumes of

data. Non-profits may need additional IT infrastructure for storing and securing data and backup systems. Infrastructure requires careful consideration and planning to optimize available resources to support the implementation of a database.

Impact and implications of limited IT support

Compared to larger organizations that may have dedicated IT departments, many non-profits operate with limited IT support or rely on part-time staff or external consultants (Fasano & Shapiro, 1991; Kamal, 2024). This lack of full-time IT support poses challenges when implementing complex database systems. Non-profits may need help with system maintenance, software updates, and troubleshooting in case of technical issues. Resolving database-related problems can become time consuming and disrupt ongoing program evaluation activities. Establishing clear communication channels with external technical support or consultants is essential to quickly identify and address database issues. Regular backups, data integrity checks, and security measures should be in place to safeguard against data loss or unauthorized access. Implementing comprehensive documentation and training for staff members involved in database management can contribute to efficient issue resolution and ensure the smooth functioning of the database system.

NAVIGATING TECHNOLOGICAL HURDLES IN DATABASE DEPLOYMENT

Addressing infrastructure constraints within non-profit settings

Within the non-profit sector, many organizations operate using outdated hardware and rely on older software (Gonzales & Yan, 2020). This poses significant organizational challenges, especially when transitioning data from spreadsheets to databases. The aim is to have a system that preserves the integrity of formulas, data, and standards while simultaneously supporting multiple users. With rapid technological advancement, adopting the latest methodologies can be complex. Solutions may require modification to align with the existing technical environment, and understanding data security is required to mitigate risk. Before implementing a database, it is crucial to assess the current technological environment thoroughly. This evaluation identifies potential obstacles and determines the most effective strategies for overcoming them.

Enhancing organizational competence through database training

For any database system to be effective, staff must understand the technology and feel confident navigating it. Building internal capacity goes beyond system understanding; it encompasses the broader skills of database management, troubleshooting, and optimization. Regular database training sessions, workshops, and hands-on tutorials can empower employees (Ahrens & Sankar, 1993).

Creating learning resources can serve as a continuous reference, fostering an environment of self-directed learning and problem-solving.

Fostering synergies with IT experts and external consultancies

The complexities of database systems, especially during the initial implementation phases, can be overwhelming for non-profits that may need more robust IT departments. Forming collaborative partnerships with IT professionals or contacting external consultants can enhance the ability to gather and analyze data (Leckel, Veilleux, & Dana, 2020). These experts bring technical know-how and offer insights into best practices, optimization strategies, and potential pitfalls to avoid. They can assist in tailoring the database solution to the specific needs and constraints of the non-profit, ensuring a smoother, more efficient transition. Fostering relationships provides a support system for ongoing maintenance, updates, and troubleshooting, ensuring the longevity and robustness of the database system.

CASE STUDIES AND EMERGING BEST PRACTICES

Successful implementations of database systems in non-profit organizations

Despite the challenges mentioned previously, non-profit organizations could benefit significantly from implementing database systems to enhance program evaluation and improve their understanding of program-level and organizational data (Bach-Mortensen & Montgomery, 2018). We worked with a non-profit organization that transitioned successfully from an Excel-based data management system to a more sophisticated database solution. They recognized the need for a robust data management system to support program evaluation while acknowledging their limited IT resources and database expertise, and using a database allowed for centralizing many spreadsheets scattered across the organization.

The organization strategically selected a user-friendly yet cost-effective database system to address these challenges, enabling them to collect, manage, and analyze data efficiently. This decision hinged on the system's ability to offer tailored forms and reports and support specific data management needs, such as program and project evaluation, facilitating data entry and retrieval. The chosen solution provided the scalability necessary to handle increasingly complex datasets, which proved crucial in supporting the organization's evolving needs.

Implementing a database system allowed the organization to balance its data management needs with resource constraints. Considerations for a database solution included maintaining data integrity and security while unlocking the potential for more complex and nuanced data analysis. This strategic choice enhanced the organization's understanding of their data and helped them respond to the increased pressure to undertake evaluations by their funders and report on their program's success.

The case illustrates how non-profit organizations can effectively leverage database systems to evaluate their programs while accommodating limited

resources and expertise constraints. By transitioning to a sophisticated yet user-friendly database, the organization improved data management practices and gained more profound insights into program-level and organizational data. The experience underscores the importance of selecting a database system that aligns with an organization's specific needs, facilitating practical program evaluation and contributing to overall success.

Lessons learned and practical recommendations

We have gained valuable insights into practical database usage through our collaborations with non-profit organizations. One key lesson is the significance of thorough planning and scoping before implementing a database. Understanding the organization's specific needs and goals is critical, as it helps determine the proper database solution and reduces unexpected challenges during implementation. Maintaining a balance between complexity and practicality involves ensuring that database solutions provide necessary features without exceeding the organization's available resources and technical expertise. While advanced databases offer robust features, they may only sometimes align with the organization's resources and expertise. Striking this balance ensures effective database management and utilization. Non-profit organizations should optimize their use of database systems through strategic initiatives such as investing in comprehensive training programs for staff members responsible for database management. This training is pivotal as it equips staff with the essential skills to navigate and utilize the database systems effectively. It minimizes dependence on external technical support, fostering an environment of self-reliance and technical proficiency within the organization. This approach improves operational efficiency and enhances staff confidence in managing technological resources.

Through our collaborations with non-profit organizations, we have encouraged them to participate in workshops and evaluation conferences, fostering the development of more robust professional capacities for managing and analyzing organizational data. This engagement enhances their understanding of their operations and bolsters their capabilities in applying for new funding.

Establishing a repository of informational resources, such as user manuals and frequently asked questions (FAQs), is crucial. These resources should be easily accessible and tailored to the specific database system. They are vital reference tools, enabling staff members to independently resolve common issues and queries. This initiative promotes a culture of problem-solving and self-sufficiency within the organization and contributes to the long-term sustainability of database management practices. Additionally, collaborating with IT professionals or external consultants is highly beneficial.

CONCLUSION

Transitioning from spreadsheet-based data management to database systems in the context of non-profit organizations requires careful planning. Understanding

clients, securing funding, and storing the correct data to evaluate program impact using collected data is pivotal. It is crucial to balance complexity and practicality when adopting database solutions. While advanced databases offer robust features, they may only sometimes align with the resources and expertise available in non-profit organizations. Emphasizing practicality in selecting the most appropriate database solution ensures that organizations can effectively manage their databases, even with limited IT resources, and gradually scale their data capabilities as their needs evolve.

Staying ahead of and anticipating technological trends and advancements will help sustain database management for non-profits.

The path for non-profit organizations to transition from spreadsheets to databases can be complex, highlighting the importance of informed decision-making, collaboration, and adaptability in the ever-evolving data management landscape.

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