

# Utilizing Web-based Technology for Improved Malnutrition Management in Healthcare Settings

Lovely C. Quimbo<sup>1</sup>, Angelie G. Bendoy<sup>2</sup>, Maureen M. Sumaya<sup>3</sup>, John Paul S. Alandra<sup>4</sup>, Mark Dave P. Ribot<sup>5</sup>, Cheryl A. Ebajo<sup>6</sup>, Elvira S. Pecajas<sup>7</sup>, Edison R. Ralar<sup>8</sup>, Marlita P. Nierras<sup>9</sup>, Edwina C. Dela Peña<sup>10</sup>

<sup>1 2 3 4 5</sup>Undergrad, Biliran Province State University – School of Technology and Computer Studies

<sup>6</sup>Assistant Professor IV, Biliran Province State University – School of Technology and Computer Studies

<sup>7</sup>Associate Professor V, Biliran Province State University – School of Technology and Computer Studies

<sup>8</sup>Instructor III, Biliran Province State University – School of Technology and Computer Studies

<sup>9</sup>Assistant Professor I, Biliran Province State University – School of Technology and Computer Studies

<sup>10</sup>Assistant Professor IV, Biliran Province State University – School of Technology and Computer Studies

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## ARTICLE INFO

## ABSTRACT

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Malnutrition is a major global health concern affecting millions, primarily in underdeveloped nations. Malnutrition management needs precise and prompt assessment and monitoring. However, existing manual systems for identifying and managing malnutrition cases frequently suffer from inefficiencies, data errors, and a lack of accessibility. This capstone project describes the creation of a web-based malnutrition management system to solve these issues. Healthcare personnel can use the system's user-friendly interface to record, identify, track, and monitor the prevalence of child malnutrition from 0-59 months old in different locations. The developed system is evaluated using the ISO/IEC 25010 out of 10 IT experts from the Municipal Health Office of Naval, Biliran in terms of its software quality characteristics outlined in the ISO/IEC 25010:2011 standards. As the result shown, the developed system indicates a very great extent of compliance with ISO 25010 Software Quality Standards, with an overall mean of 4.5 consolidates the assessment across all criteria. This web-based malnutrition management system has the potential to transform the way child malnutrition are managed, giving healthcare providers a strong tool for improving patient outcomes. Its scalability and adaptability make it suited for use in a variety of healthcare settings, including resource-limited areas as well as well-equipped clinics.

**Keywords:** malnutrition, management, system, assessment, healthcare, software, child

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## INTRODUCTION

Malnutrition is a global health problem affecting millions of people of all ages, specifically children. According to a study by the World Health Organization (2023), malnutrition is the leading cause of death among children under five, accounting for 45% of all deaths in this age group. Thus, healthcare providers use rudimentary systems to track, manage, and monitor the prevalence of malnutrition. This system utilizes a combination of manual procedures and a spreadsheet assessment tool to assess and monitor the child's nutritional status in every barangay. However, due to its limited capacity or functions and time-consuming procedure, this presents a significant challenge to healthcare institutions to efficiently and effectively manage the prevalence of malnutrition.

The growing interest in using technology, especially web-based solutions, to manage malnutrition has been observed in recent years. These systems allow for timely and accurate data collection, analysis, and dissemination, enabling healthcare providers to make informed decisions and provide personalized care.

Currently, the Municipal Health Offices of Biliran use a basic system for managing malnutrition. This system is designed to handle essential functions like data entry, storage, and retrieval. Nevertheless, it lacks advanced features like decision support, enhanced monitoring and tracking progress, and interoperability. Managing malnutrition can be challenging, especially in areas with limited resources and inadequate infrastructure. Additionally, traditional paper-based methods are still used for monitoring and managing malnutrition. These methods can be time-consuming, prone to errors, and difficult to scale.

Understanding the needs of Municipal Health Offices and Barangay Health Centers is crucial for developing a user-centric platform. Analyzing the competitive landscape, establishing collaborations, and leveraging data management and analytics are critical factors in creating differentiation and value. Planning for scalability and growth will enable the platform to accommodate increasing demands and potential integration with other healthcare systems. Considering these factors, a web-based malnutrition management system can effectively address the challenges of malnutrition and provide valuable solutions to MHO and patients.

## OBJECTIVES

Developing a web-based malnutrition management system that provides real-time monitoring and data integration is an innovative approach that can assist healthcare providers in improving malnutrition management.

Thus, the project aims to design and develop a Web-based Malnutrition Management System that organizes records of malnutrition among children from 0-59 months old within every barangay.

Specifically the project sought to:

1. Provide a centralized a platform for tracking and monitoring malnutrition cases;
2. Develop a system that can determine the nutritional status of children from 0-59 months old;
3. Create a tool that can be used to identify and track high-risk individuals and populations for malnutrition;
4. Make a malnutrition assessment tool with an intervention plan scheduler; and
5. Evaluate and analyze the design and developed system using ISO 25010 in terms of Functional Suitability, Performance Efficiency, Compatibility, Usability, Realibility, Security, Maintainability and Portability.

## METHODS

The proponents used the Scrum Methodology based on Agile Software Development principles, emphasizing collaboration, transparency, and iterative process.

Scrum is a special framework that contains values, philosophy, theory, and structure, which helps the Scrum team achieve their goals. The key points of this methodology include the following: cross-functional teams working together as a single unit; lots of close communication and interaction; repeating periods (not longer than 30 days) of completing a certain amount of work; no need for a large amount of documentation; completing smaller parts of the whole work during fixed periods (Sokolova, 2021).

This project also employed a mixed-methods approach, seamlessly integrating qualitative and quantitative methodologies to gain a holistic understanding of the needs, challenges, and opportunities for developing a web-based malnutrition management system (MMS). This approach will provide a comprehensive perspective, ensuring that the MMS is not only technologically sound but also aligned with the needs and expectations of its target users.

Interviews and observations of healthcare providers and community health workers was conducted to understand their current practices and perspectives on malnutrition management. Focus group discussions were also conducted with individuals and families affected by malnutrition to capture their experiences and recommendations. This data were used to develop a web-based malnutrition management system (MMS) that is tailored to the needs of its target users.

Surveys and existing data was used to assess knowledge, attitudes, and beliefs regarding malnutrition management and the use of technology. Additionally, data on the usage and effectiveness of existing WMSs will be collected to provide insights into best practices and areas for improvement.

Thematic analysis was used to examine the qualitative data to identify reoccurring themes and patterns in the interviews, observations, and focus group discussions. Descriptive and inferential statistics were utilized to assess quantitative data to uncover patterns and linkages in malnutrition rates, healthcare personnel attitudes and knowledge, and WMS use.

Integrating qualitative and quantitative findings will provide a comprehensive understanding of the needs, challenges, and opportunities for developing a WMS. This holistic perspective will ensure that the WMS is not only technologically sound but also aligned with the needs and expectations of its target users, ultimately contributing to improved malnutrition management outcomes.

Furthermore in this chapter, the proponents discussed the utilization of World Health Organization (WHO) Child Growth Standards as an important tool in the development of the WMS. WHO Child Growth Standards provide a standardized method for measuring and assessing child growth. The WHO Child Growth Standards are a set of international standards for measuring and assessing child growth. These standards, based on data from a large international study, were considered to be most comprehensive and up-to-date benchmark for evaluation child growth.

### RESULTS

Table 1. Summary table on the assessment of IT experts on the extent of compliance of the developed system to ISO 25010 Software Quality Standards.

Criteria	Weighted Mean	Descriptive Interpretation
Functional Suitability	4.4	Very Great Extent
Performance Efficiency	4.4	Very Great Extent
Compatibility	4.5	Very Great Extent
Usability	4.5	Very Great Extent
Reliability	4.6	Very Great Extent
Security	4.6	Very Great Extent
Maintainability	4.6	Very Great Extent
Portability	4.7	Very Great Extent
<b>Overall Mean</b>	<b>4.5</b>	<b>Very Great Extent</b>

The table presents weighted means for various criteria, offering insights into the system's performance in key quality dimensions. The overall mean of 4.5 consolidates the assessment across all criteria, indicating a very great extent of compliance with ISO 25010 Software Quality Standards. The aggregate assessment of IT specialists indicates that the developed system is extremely well aligned with ISO 25010 Software Quality Standards. The continuously excellent results for functional appropriateness, performance efficiency, compatibility, usability, dependability, security, maintainability, and portability attest to the system's overall quality and compliance. These findings point to a strong and well-engineered system that satisfies the different requirements defined by ISO 25010, contributing to its dependability, security, and flexibility in real-world circumstances.

### DISCUSSION

Web-based malnutrition management system not only addresses the prevailing global health concern of malnutrition but also introduces a trans-formative solution to longstanding challenges in identification and management. The system's user-friendly interface empowers healthcare personnel to seamlessly record, identify, track, and monitor child malnutrition cases among 0-59 months old in diverse locations. Noteworthy features include real-time data entry, which minimizes errors associated with manual systems, and comprehensive tracking functionalities that facilitate prompt assessment and intervention.

The robust evaluation of the system's software quality characteristics, based on ISO/IEC 25010 standards, underscores its exceptional compliance, with an impressive overall mean of 4.5 across all criteria. Key features

contributing to this success include scalability and adaptability, making the system suitable for deployment in resource-limited areas as well as well-equipped clinics. The system's capacity to centralize and analyze data enhances accessibility, enabling healthcare providers to make informed decisions for improving patient outcomes.

In essence, this web-based malnutrition management system emerges as a cutting-edge tool poised to revolutionize the approach to child malnutrition, offering a comprehensive, efficient, and adaptable solution to healthcare providers worldwide.

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