

SOLANO WATERS CONNECT: A CONSUMER PORTAL FOR SOLANO NUEVA VIZCAYA RESOURCES DEVELOPMENT CORPORATION

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ABSTRACT

This study focused on addressing inefficiencies in water utility management at Solano Nueva Vizcaya Resources Development Corporation by developing Solano Waters Connect, a multi-platform consumer portal. The system was designed to enhance billing, payment processing, reporting, and customer feedback mechanisms. The primary objectives included streamlining data management processes, improving payment systems, ensuring real-time information dissemination, and resolving consumer support challenges efficiently. The proposed solution integrated three key components: a consumer portal, an inspector app, and a department portal, all synchronized in real-time to ensure accuracy and usability. The methodology involved system analysis, design, and iterative testing to develop a robust platform featuring secure payment gateways, automated notifications, integrated reporting tools, and interactive consumer feedback systems. Preliminary findings suggest that the proposed system can significantly reduce operational inefficiencies, improve consumer satisfaction, and enable seamless communication between stakeholders. Implications for scalability and future integration of additional services, such as consumption analytics and predictive maintenance tools, are discussed. This research concludes that Solano Waters Connect provides an effective framework for modernizing water utility services and fostering better consumer engagement.

Keywords: Billing, Feedback, Payments, Reporting, Utility

RATIONALE

An Information System (IS) is a structured arrangement of people, data, processes, and technology that helps collect, process, store, and disseminate information. It is a crucial component for organizations in managing their operations, making decisions, and gaining competitive advantages. Information systems provide critical data that supports effective decision-making.

Information systems provide scenario and sensitivity analysis through simulation and data analysis. This can control management that supports data-driven technologies, in which data collected from operations generates large volumes to be analyzed for trends, assessment, prediction, and more. Information systems can also help streamline data collection and analyze the collected data (Pearlson et al., 2024).

Digitalization, challenging traditional strategic frameworks, has reshaped the importance of IT/IS strategy. An extensive review of the literature from 2008 to 2018 reveals five evolving directions in IT/IS strategy research, highlighting shifts in definitions and approaches. The articles discussed the nascent debate on digitalization's impact, including digital innovation, ecosystems, and transformation. It offered insights into how IT/IS strategy might be redefined in the digital age (Teubner & Stockinger, 2020).

In contemporary organizations, the implementation and success of information systems are critical for development and competitive advantage. According to the literature, successful information system implementation is pivotal and involves substantial resources, time, and

finances. The DeLone and McLean IS success model is widely recognized and comprises six dimensions: information quality, system quality, use, user satisfaction, individual impact, and organizational impact. These dimensions collectively help measure the success and performance of information systems in organizations. The model emphasizes that system and information quality positively influence performance when end-users are satisfied and actively use the system (Pastor, 2020).

Customer Management System

Customer Management Systems (CMS) play a crucial role in strengthening customer relationships and enhancing overall business performance by integrating customer-related data and organizational processes. The incorporation of artificial intelligence (AI) into CMS has significantly enhanced its capabilities, enabling advanced data analysis to predict customer behavior, recommend suitable products, and personalize interactions, thereby improving satisfaction and operational efficiency (Holmlund et al., 2020). Furthermore, CMS platforms help maintain consistent customer experiences across channels, which is essential for achieving customer loyalty and sustained engagement (Verhoef et al., 2021). Previous studies emphasize that CMS supports personalized communication and integrated business operations, improving sales performance and addressing customer relationship management challenges (Loureiro et al., 2019; Bogor, 2024). Moreover, modern CRM systems offer self-service functionalities—such as online registration, appointment scheduling, and payment processing—that streamline processes, reduce waiting times, and improve customer convenience (Li, 2020; Rahayu et al., 2024). The integration of big data analytics into CMS further enables real-time data processing and informed decision-making, thereby helping organizations maintain a competitive advantage in a dynamic market environment (Ciampi et al., 2020).

E-Billing in Water Service Provision

E-payment refers to the online transaction system that uses different gateways to facilitate financial relationships between individuals and organizations (Hassan & Shukur, 2022). In the digital age, online billing has become increasingly prevalent. Bill.com (n.d.) explains that many businesses prefer e-billing as it streamlines their accounting process and reduces stress at the end of each billing cycle. Alam and Noor (2020) noted that this facilitates financial transactions through different mediums and payment gateways. Similarly, Bankrate (2022) suggested that online bill pay, an electronic payment service, allows consumers to make one-time or recurring bill payments through a website or app. The convenience and efficiency of online billing have made it a preferred choice for many. Using the latest technologies, such as online billing, can help the country develop economically (Alhosani & Tariq, 2020).

An automated billing system aims to save time and money by consolidating data from multiple systems onto a single platform. Additionally, there is a positive association between e-payment systems and consumer satisfaction (Gurmu, 2019),

Consumer Service

It integrates various dimensions of service quality, including tangibles, reliability, responsiveness, assurance, and empathy. The study emphasizes the importance of understanding customer expectations and perceptions to enhance service delivery and improve customer satisfaction. According to Gupta, A., & Dhiman, R. (2019)

Customer service plays a pivotal role in business success, influencing customer satisfaction and loyalty. Meeting and exceeding customer expectations through effective communication, well-trained staff, and consistent service is essential. Gathering and acting on

customer feedback, embracing technology without sacrificing personal touch, and fostering a customer-centric culture are key strategies. Resolving issues promptly and continuously striving for improvement are vital for maintaining customer satisfaction and building long-term relationships. According to Ardvin Kester S. Ong (2023)

Mobile Application

Mobile phones have become essential tools in modern society, revolutionizing communication, information access, and daily activities. Technological advancements, particularly the introduction of 5G networks, have enhanced connectivity through faster data speeds, improved reliability, and reduced latency. Hardware innovations, including advanced camera systems, foldable displays, and efficient processors, have further expanded smartphone functionality. The widespread adoption of mobile phones has transformed social interaction and connectivity while also introducing challenges such as digital addiction and its implications for mental health (Smith et al., 2021). Despite these concerns, mobile technology has promoted digital inclusion, particularly in developing regions, by expanding access to information, education, and financial services (Donner & Locke, 2021). However, the growing dependence on mobile devices raises privacy and security concerns due to the large volume of personal data stored on them, necessitating stronger security measures and user awareness (Arora & Rahman, 2022). Additionally, environmental issues linked to mobile phone production and disposal underscore the need for sustainable practices and eco-friendly technologies to mitigate electronic waste and carbon emissions (Belkhir & Elmeligi, 2019).

In the context of Solano, Nueva Vizcaya, MAPDC entered into an agreement with the local government in 2013 to design, construct, and maintain a comprehensive waterworks system, completed in 2015 through a partnership with MacroAsia Corporation. The Solano Water Treatment Plant, which uses surface water from the Magat River, can process up to 10 million liters per day using a modern four-stage treatment process. By 2019, nine barangays within the town's center were fully serviced by the pipeline network, supplying a minimum pressure of 16 PSI to commercial and institutional establishments such as schools, hospitals, and restaurants. Solano Nueva Vizcaya Resources Development Corporation, which operates the system under a Certificate of Public Convenience issued by the National Water Resources Board, manages operations through facilities at Maddiangat Bridge and Barangay Bagahabag. To enhance customer interaction, the company developed Solano Waters Connect, a digital consumer portal composed of three integrated applications: the Department Portal, Inspector App, and Consumer Portal. These platforms streamline operations by enabling data-driven management, real-time water meter tracking, and online consumer services such as billing inquiries, feedback submission, and account management, thereby improving transparency, efficiency, and customer satisfaction.

Figure 1

Rapid Application Development Model

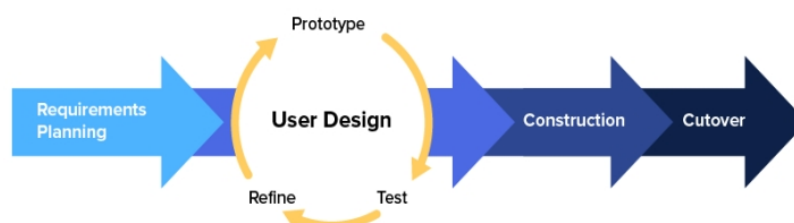
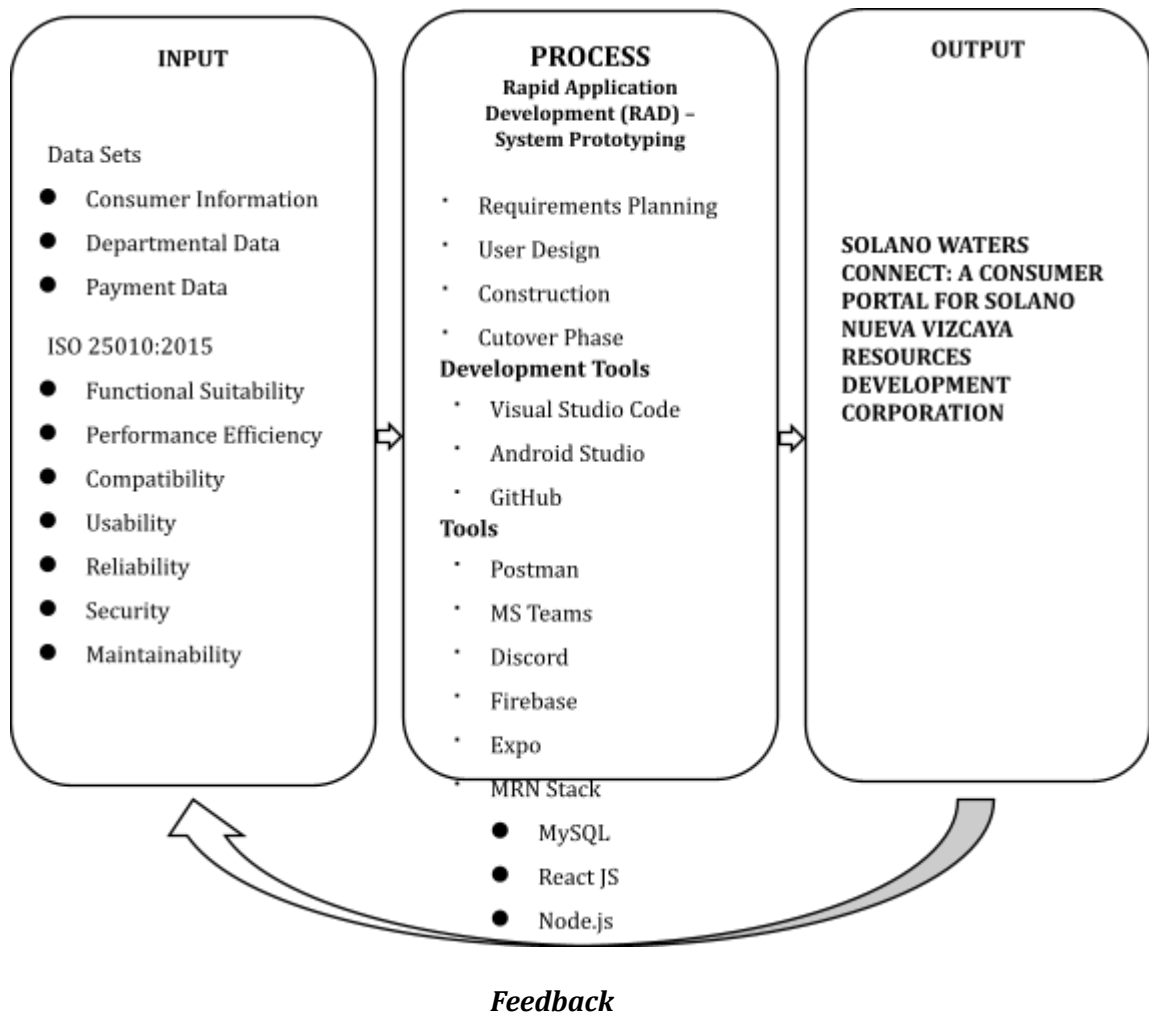


Figure 2
Conceptual Framework



Sustainable Development Goal Alignment

SDG 9: Industry, Innovation, and Infrastructure: The mobile platform provides a modern way for consumers to pay and manage their water bills. Additionally, the technology used to create the project could enable a modern renovation of the current system, providing the advantages of modern tech infrastructure.

Statement of the Problem

This study investigated the creation of a mobile app designed to help people keep track of their bills, receive instant notifications, and provide feedback for Solano Nueva Vizcaya Resources Development Corporation. The study spanned S.Y. 2023-2024, specifically from the 3rd year of the 2nd semester through the 4th year of the 1st semester. The allotted time allowed the researchers to collect data, analyze the findings, and complete the project outlined in the research goals. The RAD methodology was applied to allow the researchers to create a feasible timeframe within that period that aligned with and achieved the research objectives.

To ensure the relevance, responsiveness, and effectiveness of the proposed software system, the researchers adopted a structured approach to identify and recruit appropriate participants from the Solano Nueva Vizcaya Resources Development Corporation. This process was grounded on a comprehensive assessment of the corporation's existing operational workflows and the challenges encountered in its day-to-day transactions.

The study was therefore anchored on the following inquiry:

1. What are the existing processes and problems encountered by the Solano Nueva Vizcaya Resources Development Corporation? What are the target groups for participant recruitment?
 - 1.1. Data Management
 - 1.2. Payment
 - 1.3. Information Dissemination
 - 1.4. Reporting
 - 1.5. Feedback and Consumer Support
2. What system will be developed to address the challenges encountered by the Solano Nueva Vizcaya Resources Development Corporation?
3. What is the extent of compliance of the proposed "Solano Waters Connect: A Proposed Consumer Portal for Solano Nueva Vizcaya Resources Development Corporation" with ISO 25010:2015 Software Quality Standards, as evaluated by employees and consumers, in terms of: functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability?

METHODOLOGY

Research Design

This study used a descriptive and developmental research design to collect the data needed for the project. Descriptive research was employed to understand the current state of Solano Nueva Vizcaya Resources Development Corporation. Particularly in commercial operations for consumers, such as payments, billing, announcements, and water meter readings, as well as in other departments whose workflows align with commercial operations. Moreover, the data-gathering procedures used interviews, observation, and document review, which provided them with experience and insight into the current state of the system. The departments conducted interviews to describe current procedures for commercial operations and to gain insight into their own experiences. The observation was conducted across all departments to understand how they operate and to analyze whether there are ways to improve them. Additionally, the researchers gathered feedback from consumers who shared their experiences with Solano Waters.

Developmental research was used to develop the system, which consumers use as a consumer-centric application to provide online services and announcements.

It was guided by the Rapid Application Development (RAD) methodology, as the researchers needed customer input at numerous stages for iterative development, which facilitated faster system development, a specialty of RAD. Consumer input from data gathering provided the necessary information, requirements, and feedback to refine the system. In

addition to prototyping, the system's development involved ensuring it met the objectives and needs of the stakeholders.

Research Locale

The researchers undertook the study at the Solano Waters office at the intersection of Dupan Street and Yogad Street, situated in Barangay Quirino, Solano, Nueva Vizcaya. The Solano Waters office was chosen as the study location, given that most consumer interactions with the company occur there. Moreover, many of the commercial processes crucial for data gathering are located there.

Figure 3

Solano Waters Office of Solano, Nueva Vizcaya



Research Participants

The participants in the study were selected because they have specific knowledge and insights into consumer service operations. The following are mostly the individuals overseeing the departments that interact most with consumers in Solano Waters.

Table 1

Participants of the Study

Participants	Population	Percent
Manager	1	11%
Finance	1	11%
Customer Support	1	11%
IT administrator	1	11%
Meter Reader Inspector	1	11%

Consumers	5	45%
Total	10	100%

The participants in the study were 10 individuals, five unique individuals from Solano Waters who interact with consumers the most, and the rest of the consumers of Solano Waters. The five individuals included were the commercial operations manager, accounting supervisor, customer development, and meter reader inspector, because their departments support most of the customer services available, including reading water meters, padlocking, billing, water notice interruptions, announcements, and payments. Additionally, the other departments' processes converge and interact with this department, providing better insights into the overall workflow of the current system.

RESULTS AND DISCUSSION

This chapter presents the results, discussions, and insights obtained by the researchers during the study.

1. Existing Processes and Practices by Solano Nueva Vizcaya Resources Development Corporation

1.1. Data Management

For data management, employees use multiple systems across different departments.

a. Manual Data Entry:

The current process involves manual data handling at multiple stages. Water meter readings and transaction records are collected at the end of the day and then manually entered into the database. Once data is recorded, it is automatically processed by their system; this is repeated until all collected records have been manually processed.

b. IT Maintenance and Outsourcing:

The IT specialist at Solano Waters, as management has stated, is responsible for maintaining the database.

1.2. Payment

Payments are processed through both over-the-counter methods and third-party electronic systems, creating a multi-faceted approach to managing financial transactions.

a. Over-the-Counter Payments and Preferences:

Payment is given either over the counter or electronically; once payments are received, the teller manually inputs the payment details into the system on the same day to ensure records are kept up to date.

b. Third-Party Payment Systems:

Solano Waters uses EC Pay to manage electronic transactions. EC Pay generates daily

reports, which are then integrated into Solano Waters' internal system to update the financial records.

1.3. **Information Dissemination**

The dissemination of information, particularly regarding service interruptions, follows a structured communication chain.

a. **Urgent Communication:**

The cases of unexpected service issues or emergencies, the current communication only has Facebook to relay the information.

b. **Structured Communication Chain:**

Planned interruptions are communicated through a structured chain of command, starting with the network manager, who informs the commercial operations department. Customer service is then responsible for distributing the announcement to consumers.

1.4. **Reporting**

The financial department is responsible for generating reports, a process that is heavily reliant on manual data entry and system integration.

a. **System Integration:**

Water meter readings are processed separately and then manually input into Auditpal for financial reporting and bill processing.

b. **Manual Reporting for Commercial Operations:**

According to the commercial operations manager, weekly reports are generated for each DMA to monitor cubic meter consumption, costs, and the number of accounts involved.

1.5. **Feedback and Consumer Support**

Customer service plays a crucial role in handling complaints and concerns.

a. **Complaint Resolution Process:**

The process of handling complaints involves printed forms that are manually categorized as pending or resolved. According to the staff, if a complaint isn't resolved within a set timeframe, it is followed up on for further investigation.

2. **Existing Problems and Challenges by Solano Nueva Vizcaya Resources Development Corporation**

2.1. **Data Management**

a. **Manual Data Entry:**

Manual data processes introduce a risk of human error and inefficiency, potentially delaying the overall process, which typically takes about four days from meter reading to billing. These delays could lead to consumer dissatisfaction and billing issues.

b. **IT Maintenance and Outsourcing:**

Since third-party vendors originally developed the database, external support is reliant, as highlighted in the interviews, and can cause delays, especially when immediate data management interventions are needed to address issues in consumer accounts.

2.2. Payment

a. **Over-the-Counter Payments and Preferences:**

Manual entry of payment data into the system introduces potential inefficiencies, as each entry is entered individually; this manual process can be time-consuming.

b. **Third-Party Payment Systems:**

Reliance on third-party systems can create delays, as the financial department must wait for these daily reports to update its records, increasing the risk of financial data discrepancies.

2.3. Information Dissemination

a. **Urgent Communication:**

The current system lacks communicating any struggles to provide time updates to consumers, which leaves consumers frustrated due to the lack of immediate updates.

b. **Structured Communication Chain:**

Any breakdown in this communication chain can cause delays in delivering important information to consumers, potentially leading to confusion or dissatisfaction due to the lack of timely updates.

2.4. Reporting

a. **System Integration:**

Lack of integration between the water meter reading process and the financial reporting system creates inefficiencies, which can lead to delays and discrepancies in the final reports; this disjointed process can result in inaccuracies in billing and financial analysis.

b. **Manual Reporting for Commercial Operations:**

Reports are manually created using Excel due to the lack of an automated reporting system, further increasing the risk of human error.

2.5. Feedbacking and Consumer Support

a. **Complaint Resolution Process:**

Since the process is done manually, there isn't a way to efficiently track all the feedback for follow-ups

3. Proposed System to Address Challenges

3.1. **Addressing Data Management Issues:**

Solano Waters Connect is a two-way system that primarily serves as a consumer portal, allowing consumers to access services such as bill viewing, payment options, consumer support, and news. The proposed system addressed the challenges identified in Solano Waters' current operations. It focused on enhancing payment processing, information dissemination, reporting, and consumer support feedback. To minimize human error and inefficiencies associated with manual data entry, the system introduced a mobile interface that enables meter readers to submit reports directly to the finance department. Moreover, the system included an anomaly detection feature that flagged readings that appeared unusually high or inconsistent. These flagged readings will be reviewed before the bills are finalized. Although the goal is to shorten the billing cycle from four days to one, this review step ensures accuracy, improving consumer satisfaction. Solano Waters Connect

incorporated a user-friendly database management interface for IT specialists. This interface allows IT personnel to make necessary changes to the system used by consumers without requiring external intervention. Built-in safeguards, such as logs and rollback features, ensured data integrity. This will enable quicker resolution of data-related issues, improving Solano Waters' responsiveness in addressing consumer account problems.

3.2. Addressing Payment Issues:

To address potential delays and discrepancies caused by third-party payment systems, Solano Waters Connect integrated a real-time payment synchronization feature. This allows the financial department to receive payment data from EC Pay as soon as transactions are completed. A daily report backup will remain in place to mitigate issues with the real-time feature, reducing the risk of discrepancies and improving financial tracking reliability.

3.3. Improving Information Dissemination:

The Solano Waters system features an integration that links the system to the company's Facebook page and other communication platforms. This system will automatically generate and send notifications about water interruptions or other important announcements. By automating this process, the system will ensure that customers receive timely notifications regarding both scheduled and unscheduled interruptions.

3.4. Enhanced Reporting:

Solano Waters Connect resolved the issue of a heterogeneous system for meter reading and bill processing by unifying both processes into a single platform. Meter readings will be entered into the Solano Waters Connect mobile app, which will also verify any unusual input. Once the readings are completed, they will be sent directly to the financial department's system, where they will be reviewed for anomalies before processing. If the readings pass verification, bills will be automatically generated and sent to consumers via mobile app or printed for physical delivery.

3.5. Improving Feedback and Consumer Support:

To address incorrect meter readings that lead to high bills and other forms of consumer dissatisfaction, Solano Waters Connect introduced a feedback and resolution system. Consumers will be able to report issues through the portal and contact customer support via landline or email. Once an issue is addressed, consumers will receive a feedback survey to evaluate the service. This system will enhance customer satisfaction by providing a more transparent and responsive support process.

1. The extent of compliance of the proposed system with ISO 25010:2015 Software Quality Standards:

The developed Consumer Portal for Solano Nueva Vizcaya Resources Development Corporation system was evaluated using the 25010 Software Quality Standards as the instrument to measure the system's compliance with respect to functional suitability, efficiency, reliability, maintainability, probability, usability, security, and compatibility

A. The extent of Compliance with ISO 25010:2015 in terms of Functional Suitability

Table 2

The System's Compliance with Functional Suitability as Assessed by the IT Experts and Users

Functionality Suitability	IT Experts		User		Overall	
	Mean	Description	Mean	Description	Mean	Description
Functional Completeness	3	Moderate Extent	4.6	Very Great Extent	3.8	Great Extent
Functional Correctness	3.4	Moderate Extent	4	Great Extent	3.7	Great Extent
Functional Appropriateness	3	Moderate Extent	4.6	Very Great Extent	3.8	Great Extent
Category Mean	3.1	Moderate Extent	4.4	Great Extent	3.7	Great Extent

Table 2 presents the mean distributions of assessments by IT experts and users regarding the developed system's compliance with ISO 25010 Software Standards in terms of functional suitability.

IT experts rated the items with an average mean of 3.1. At the same time, system users provided a higher mean rating of 4.4, leading to an overall mean rating of 3.7. This indicates that the system complies with a "Great Extent" overall. Specifically, the ratings suggest that the system largely meets the expected functionalities, operates as required, and provides outputs that align with both the users' and IT experts' expectations. The results imply that the system is functionally suitable. However, there may be areas where performance could be further improved to fully meet the highest standards.

B. Extent of Compliance with ISO 25010:2015 in terms of Performance Efficiency

Table 3

The System's Compliance on Performance Efficiency as Assessed by the IT Experts and Users

Performance Efficiency	IT Experts		User		Overall	
	Mean	Description	Mean	Description	Mean	Description
Time Behavior	3.4	Moderate Extent	4.2	Great Extent	3.8	Great Extent
Resource Utilization	4	Great Extent	4	Great Extent	4	Great Extent

Capacity	3.8	Great Extent	3.8	Great Extent	3.8	Great Extent
Category Mean	3.13	Moderate Extent	4	Great Extent	3.9	Great Extent

Table 3 presents the mean distributions of IT experts' and users' assessments of the system's compliance with ISO 25010 Software Standards regarding performance efficiency.

The IT experts rated the system with a category mean of 3.13. At the same time, the users provided a mean of 4, resulting in an overall mean of 3.9. This overall rating indicates that the system complies with a "Great Extent" in terms of performance efficiency. The results suggest that the system performs well in managing time behavior, resource utilization, and capacity to meet the users' and experts' requirements. Although the system demonstrates good performance efficiency, the lower rating from IT experts on time behavior highlights a potential area for improvement to enhance overall system efficiency.

C. Extent of Compliance with ISO 25010:2015 in terms of Compatibility

Table 4

The System's Compliance on Compatibility as Assessed by the IT Experts and Users

Compatibility	IT Experts		User		Overall	
	Mean	Description	Mean	Description	Mean	Description
Co-existence	4	Great Extent	3.8	Great Extent	3.9	Great Extent
Interoperability	4	Great Extent	4.2	Great Extent	4.1	Great Extent
Category Mean	4	Great Extent	4	Great Extent	4	Great Extent

Table 4 presents the mean distributions of IT experts' and users' assessments of the system's compliance with ISO 25010 Software Standards regarding compatibility.

Both IT experts and users provided a category mean rating of 4, resulting in an overall mean of 4. This indicates that the system meets the "Great Extent" of compatibility. The high ratings across co-existence and interoperability suggest that the system effectively functions alongside other systems and communicates well within its operational environment. The consistent ratings reflect a reliable level of compatibility, fulfilling the requirements and expectations of both users and experts.

D. The extent of Compliance with ISO 25010:2015 in terms of Usability as Assessed

Table 5

The System's Compliance with Usability as Assessed by the IT Experts and Users

	IT Experts	User	Overall
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Usability	Mean	Description	Mean	Description	Mean	Description
Appropriateness	4.2	Great Extent	4.4	Great Extent	4.3	Great Extent
Learnability	4.4	Great Extent	5	Very Great Extent	4.7	Very Great Extent
Operability	4.6	Very Great Extent	4	Great Extent	4.3	Great Extent
User error protection	3.8	Great Extent	3.8	Great Extent	3.8	Great Extent
User interface aesthetics	4.2	Great Extent	4.4	Great Extent	4.3	Great Extent
Accessibility	3.6	Great Extent	4.6	Great Extent	4.1	Great Extent
Category Mean	4.13	Great Extent	4.36	Great Extent	4.25	Great Extent

Table 5 presents the mean distributions of IT experts' and users' assessments of the system's compliance with ISO 25010 Software Standards regarding usability.

The IT experts rated the system at 4.13. At the same time, users gave it a slightly higher mean of 4.36, resulting in an overall mean of 4.25. This rating indicates that the system meets a "Great Extent" of usability standards. The high ratings in appropriateness, learnability, operability, and user interface aesthetics indicate that the system is user-friendly, easy to learn, and visually appealing, fulfilling the expectations for efficient usability. The slightly lower rating in accessibility suggests an area for improvement, although it still meets the "Great Extent" compliance level. Overall, the system successfully supports user interaction and usability standards, as evaluated by both IT experts and users.

E. The extent of Compliance with ISO 25010:2015 in terms of Reliability

Table 6

The System's Compliance with Reliability as Assessed by the IT Experts and Users

Reliability	IT Experts		User		Overall	
	Mean	Description	Mean	Description	Mean	Description
Maturity	4	Great Extent	4.2	Great Extent	4.1	Great Extent
Availability	4	Great Extent	4	Great Extent	4	Great Extent
Fault Tolerance	3.8	Great Extent	4	Great Extent	3.9	Great Extent
Recoverability	4.2	Great Extent	4.2	Great Extent	4.2	Great Extent

Category Mean	4	Great Extent	4.1	Great Extent	4	Great Extent
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Table 6 shows the mean distribution of assessments by IT experts and users regarding the system’s compliance with ISO 25010 Software Standards in terms of reliability.

Both IT experts and users provided high ratings, with the IT experts’ category mean at 4, and the users’ mean at 4.1, resulting in an overall mean of 4. This indicates that the system meets the “Great Extent” standard for reliability. The high scores across maturity, availability, fault tolerance, and recoverability demonstrate that the system is dependable, available when needed, fault-tolerant, and able to recover effectively. Although the fault tolerance rating is slightly lower, it still falls within the “Great Extent” range, indicating robust performance. Overall, both IT experts and users regard the system as reliable and consistent with ISO reliability standards.

F. Extent of Compliance with ISO 25010:2015 in terms of Security

Table 7

The System’s Compliance with Security as Assessed by the IT Experts and Users

Security	IT Experts		User		Overall	
	Mea n	Descriptio n	Mea n	Description	Mea n	Description
Confidentiality	4	Great Extent	4	Great Extent	4	Great Extent
Integrity	4.2	Great Extent	4.2	Great Extent	4.2	Great Extent
Non-repudiatio n	4.2	Great Extent	3.6	Great Extent	3.9	Great Extent
Accountability	3.8	Great Extent	3.8	Great Extent	3.8	Great Extent
Authenticity	4.2	Great Extent	4.4	Great Extent	4.3	Great Extent
Category Mean	4	Great Extent	4	Great Extent	4	Great Extent

Table 7 presents the mean distributions of IT experts’ and users’ assessments of the system’s compliance with ISO 25010 Software Standards regarding security.

Both IT experts and users rated the system’s security highly, with both groups rating it 4, resulting in an overall mean of 4. This rating indicates compliance with security standards to a “Great Extent.” High scores across confidentiality, integrity, non-repudiation, accountability, and authenticity demonstrate that the system meets security expectations, ensuring data protection, consistency, and verification of actions. The slightly lower score in non-repudiation suggests a minor area for improvement. However, it still achieves a “Great Extent” rating. Overall, both IT

experts and users consider the system secure, effectively safeguarding data and maintaining integrity.

G. The extent of Compliance with ISO 25010:2015 in terms of Maintainability

Table 8

The System’s Compliance with Maintainability as Assessed by the IT Experts and Users

Maintainability	IT Experts		User		Overall	
	Mean	Description	Mean	Description	Mean	Description
Modularity	4	Great Extent	4	Great Extent	4	Great Extent
Reusability	4	Great Extent	4.2	Great Extent	4.1	Great Extent
Analyzability	3.8	Great Extent	3.8	Great Extent	3.8	Great Extent
Modifiability	3.6	Great Extent	4.6	Great Extent	4.1	Great Extent
Testability	4.2	Great Extent	3.6	Great Extent	4.1	Great Extent
Category Mean	3.9	Great Extent	4	Great Extent	4	Great Extent

Table 8 presents the mean distributions of IT experts’ and users’ assessments of the system’s compliance with ISO 25010 Software Standards for maintainability.

The IT experts gave the system a category of 3.9. At the same time, users rated it slightly higher at 4, leading to an overall mean of 4. This result indicates compliance to a “Great Extent” in maintainability. High ratings in modularity and reusability suggest that the system components are well-organized and can be reused effectively. The scores for analyzability and modifiability are slightly lower, particularly among IT experts, indicating areas that could benefit from further improvements to streamline analysis and modification processes. However, the overall ratings reflect a maintainable system that meets both IT experts’ and users’ expectations for ease of modification, testing, and upkeep.

H. The Extent of Compliance with ISO 25010:2015 in terms of Portability

Table 9

The System’s Compliance with Portability as Assessed by the IT Experts and Users

Portability	IT Experts		User		Overall	
	Mean	Description	Mean	Description	Mean	Description

Adaptability	4.2	Great Extent	4.2	Great Extent	4.2	Great Extent
Installability	4	Great Extent	4.2	Great Extent	4.1	Great Extent
Replaceability	4.2	Great Extent	4	Great Extent	4.1	Great Extent
Category Mean	4.1	Great Extent	4.1	Great Extent	4.1	Great Extent

Table 9 shows the mean distribution of assessments by IT experts and users regarding the system's compliance with ISO 25010 Software Standards in terms of portability.

Both IT experts and users reported a category mean of 4.1, indicating that the system falls within the "Great Extent" for portability. High ratings in adaptability, installability, and replaceability demonstrate that the system is flexible and can be installed and replaced with ease across different environments. The consistent scores across both groups indicate that the system meets portability standards effectively, ensuring it can be transferred and used in various settings without significant issues. Overall, the ratings highlight the system's capability to adapt and function in different operational contexts, as expected by both IT experts and users.

CONCLUSION AND RECOMMENDATIONS

Conclusion

The developers conclude that to address the operational challenges at Solano Nueva Vizcaya Resources Development Corporation, a centralized system, Solano Waters Connect, was developed to replace the existing processes. This system provides an integrated platform through a website and mobile application, allowing real-time data entry, payment processing, and service notifications. Managed by an administrator with specific staff roles, the system enables efficient handling of tasks that previously caused delays and inaccuracies. Additionally, integrating a mobile app for water meter readers and consumers enhances data collection and communication. The compliance assessment confirmed that Solano Waters Connect meets quality standards to a very great extent, ensuring the system's reliability, safety, and efficiency. This system not only improves operational processes but also provides a more streamlined experience for both staff and consumers.

Recommendations

1. Future developers should integrate report-generation functions for administrative and billing access to improve financial tracking and management.
2. The system can be further developed using TypeScript for improved code maintainability, readability, and type safety while also allowing easy editing, upgrading, or revising with low-cost maintenance.
3. The system should include a feature to support compliance with the Bureau of Internal Revenue (BIR), such as accepting Expanded Withholding Tax (EWT) transactions.

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