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Assessing E-Governance Performance in Real Property Tax Administration: Insights from the Patas Experience in Bataan

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Abstract: This study evaluated the effectiveness of the Property Assessment and Tax Administration System (PATAS) implemented across Assessor and Treasury LGUs in the Province of Bataan. The evaluation focused on key dimensions: system risk manageability, transparency, productivity, and efficiency, aiming to formulate an Implementation Roadmap and System Optimization Framework. A mixed-methods approach was utilized, integrating quantitative data gathered from local assessors and treasurers with qualitative insights derived from interviews with PATAS focal persons. The findings indicate that PATAS is generally effective, scoring particularly high in usability due to its user-friendly design and minimal training needs. However, moderate ratings in system reliability, integrity, data quality, and transparency suggest operational challenges, including frequent disruptions, inconsistent updates, and limited audit features. The study's key output is a comprehensive Implementation Roadmap and System Optimization Framework offering actionable strategies to enhance PATAS sustainability and digital governance in Bataan.

Keywords: Security, Reliability, Integrity, System Transparency, Interoperability

Introduction

The modernization of local governance through information and communication technology (ICT) has become critical in the twenty-first century, particularly for fiscal management and revenue generation. Property taxation, a stable source of local revenue, increasingly relies on automated systems for assessment, billing, and collection. Systems like Computer-Assisted Mass Appraisal (CAMA) in the United States and e-Government initiatives globally have demonstrated technology's transformative role in property tax administration (*Savvas Papagiannidis Newcastle upon Tyne-2022, 2022*).

Historically, property tax administration in many developing economies, including parts of the Philippines, has been plagued by challenges such as reliance on manual paper-based systems, revenue leakages due to untimely collection, and inadequate property valuation data (Jibao & Prichard, 2015). To address this issue, the Provincial Government of Bataan, in partnership with Geodata Solutions Inc., implemented the Property Assessment and Tax Administration System (PATAS) in 2014 to address persistent challenges in property assessment and real property tax administration. Studies have shown that the strategic application of ICT, including e-tax administration systems, positively impacts tax

productivity, reduces fraud, and enhances revenue generation by streamlining processes (Adegbite et al., 2019; Olatunji & Ayodele, 2017). Successful digital interventions, such as those seen in certain African municipalities, have demonstrated significant gains in efficiency, transparency, and accountability (Fjeldstad et al., 2019).

Despite the recognized benefits, the implementation of e-governance at the local level in the Philippines faces significant structural and contextual barriers, including the digital divide, resistance to change, security concerns, and legacy system integration issues (Heeks, n.d.; Siar, 2005). LGUs have long struggled with outdated manual systems, incomplete tax maps, delayed assessments, and high delinquency rates (Bayona et al., 2025). Local governments must navigate these challenges while ensuring that new systems like PATAS achieve their intended goals of increased efficiency and transparency (*Center for Technology in Government Realizing the Promise of Digital Government: It's More than Building a Web Site*, 2000). Although PATAS was designed to streamline processes and ensure data integrity, anecdotal reports suggest persistent challenges including technical glitches, limited training, and staff resistance to change. Without clear evidence of its effectiveness, questions remain whether PATAS has truly improved productivity, efficiency, and compliance in property tax administration. Thus, this study.

The findings will benefit multiple stakeholders. For the Provincial and Municipal Government of Bataan, insights may guide resource prioritization for system maintenance, upgrades, and human resource development, potentially increasing real property tax revenue to support social services, healthcare, education, and infrastructure. Local assessors would benefit from more efficient processing of tax declarations and accurate assessment rolls, while local treasurers would gain quicker and more accurate tax computations and delinquency identification. Real property taxpayers and the people of Bataan would experience fairer, more transparent tax administration and improved public services funded by enhanced revenue collection.

Beyond immediate stakeholders, the Department of Finance – Bureau of Local Government Finance (DOF-BLGF) may utilize findings to refine PATAS functionalities and prepare for integration with the Real Property Information System (RPIS) and CAMA under the Local Governance Reform Program. System developers can leverage identified bottlenecks and inefficiencies to create improved versions meeting end-user needs. Other LGUs may benchmark performance and identify actions to close gaps in their own systems, while the academic community gains empirical contributions to e-governance and fiscal management literature.

Grounded in the 1991 Local Government Code (RA 7160) and aligned with emphasis on robust property tax administration for local fiscal capacity (Bird, 2010; Sutherland, 2020), this study bridges theory and practice by providing actionable insights for system optimization and improved local governance.

Methodology

This study employed a mixed-methods convergent-parallel research design to evaluate PATAS effectiveness in Bataan Province. This approach allowed simultaneous collection and analysis of quantitative and qualitative data, providing comprehensive insights beyond what either method could achieve independently (Creswell, 2003.).

Using purposive and quota sampling, the study involved 48 respondents from twelve (12) Municipal Assessor Offices and twelve (12) Municipal Treasury Offices in Bataan, including the Provincial Office. Municipalities were classified by income level: First Class (Dinalupihan, Hermosa, Limay, Mariveles, Orani, and Provincial Office), Second Class (Orion), Third Class (Abucay, Bagac, Morong, Pilar), and Fourth Class (Samal). Two respondents from each LGU office were selected based on their ICT roles as PATAS end-users: focal person, local assessment operation, and local treasury operation personnel.

Quantitative data were collected through survey questionnaires with two sections: (1) demographic information capturing municipal income classification and end-user roles, and (2) evaluation of PATAS across three dimensions—System Risk Manageability (security, reliability, integrity), Transparency (system transparency, interoperability), and Productivity and Efficiency (data quality, usability).

Qualitative data were gathered through semi-structured interviews exploring participants' experiences with PATAS implementation. Interview questions were developed based on the Technology Acceptance Model (Ma & Liu, 2011), Technology-Organization-Environment framework (Baker, 2012), and Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003).

Quantitative responses were analyzed using mean scores categorized into four effectiveness levels: Very Effective (3.26-4.00), Effective (2.51-3.25), Ineffective (1.76-2.50), and Very Ineffective (1.00-1.75). Qualitative data from interviews were thematically analyzed. Both datasets were then integrated to identify convergence or divergence in findings, providing a holistic understanding of PATAS effectiveness.

Result and Discussion

Respondent Profile

The respondents were distributed according to their LGUs' income classification and their roles as end-users of PATAS. Almost half (47.92%) were from first-class municipalities, followed by third-class (33.33%), fourth-class (10.42%), and second-class (8.33%) LGUs. The strong representation from higher-income municipalities indicates greater access to the technical and financial resources necessary for sustaining system operations. In terms of user roles, 50% of the respondents served as PATAS focal persons, while 25% each were from Local Assessment Operations and Local Treasury Operations. This distribution reflects a balanced mix of participants engaged in both system management and frontline implementation.

Evaluation of PATAS in terms of System Risk Manageability

The evaluation focuses on the Property Assessment and Tax Administration System (PATAS) in Bataan, particularly on its risk manageability in terms of security, reliability, and integrity. These dimensions gauge the system's ability to sustain operations, safeguard data, and ensure consistent performance. The analysis reflects the perspectives of local assessors and treasurers regarding PATAS's effectiveness in addressing risks such as cyber threats, data inconsistencies, and system failures. The results reveal potential vulnerabilities that may impact the accuracy, efficiency, and credibility of real property tax administration, highlighting the system's importance in promoting reliable and resilient e-governance.

System Risk Manageability

1. **Security.** PATAS security achieved a composite mean of 3.17 (SD=0.66), indicating "Effective" performance. The highest ratings were for effectiveness in safeguarding data (M=3.29) and adequacy of security technologies (M=3.29), reflecting strong confidence in core protective mechanisms. However, regular security updates to address new threats received the lowest rating (M=3.02, SD=0.76), with the highest variability suggesting inconsistent update experiences across LGUs.
2. **Reliability.** System reliability yielded a composite mean of 2.97 (SD=0.64), the lowest among risk manageability indicators. While minor issues were quickly resolved (M=3.17) and technical support was accessible (M=3.08), the system's ability to operate smoothly without crashes scored lowest (M=2.70, SD=0.65), indicating stability concerns that pull-down overall reliability perception.
3. **Integrity.** Data integrity received a composite mean of 3.07 (SD=0.69), rated "Effective". Real-time validation checks scored highest (M=3.25), demonstrating strong confidence in automated controls. However, built-in error prompts (M=2.95) and troubleshooting tools (M=2.98) scored lowest, suggesting that proactive error detection features require enhancement.

Transparency

1. **System Transparency.** With a composite mean of 3.09 (SD=0.67), system transparency was rated "Effective". Users were most satisfied with interface accessibility to transparent information (M=3.29), but transparency features like audit logs and records tracking were rated lowest (M=2.95), highlighting weaker confidence in back-end audit capabilities.
2. **Interoperability.** This dimension received the lowest overall rating with a composite mean of 2.96 (SD=0.78). Integration with other local government systems (M=3.03) and server synchronization (M=3.02) showed moderate satisfaction, but support for future government systems (M=2.81, SD=0.91) and multi-platform compatibility (M=2.90) revealed significant integration gaps. Respondents reported partial or failed interoperability, data synchronization issues, and incomplete integration between municipal and provincial offices.

Productivity and Efficiency

1. **Data Quality.** Data quality achieved a composite mean of 2.99 (SD=0.66). While users agreed that assessment records positively impact payment accuracy (M=3.21) and real-time updates improve quality (M=3.19), data accuracy and freedom from errors scored significantly lower (M=2.63, SD=0.73), indicating substantial concerns about data reliability.
2. **Usability.** Usability received the highest composite mean across all dimensions at 3.33 (SD=0.61), rated "Very Effective". All items exceeded 3.25, with user-friendly interface (M=3.45) and ease of learning (M=3.38) scoring highest. Even the lowest-rated item—enhanced efficiency in workflow (M=3.27)—remained in the "Very Effective" range, confirming strong user agreement on system accessibility and intuitiveness

Comparative Analysis by Profile

Figure 1 shows that the statistical analysis of PATAS effectiveness across municipal income classifications and end-user role revealed a consistent pattern of non-significant differences across all seven effectiveness factors. The Kruskal-Wallis H test produced p-values ranging from 0.142 to 0.893, all substantially exceeding the conventional significance threshold of 0.05.

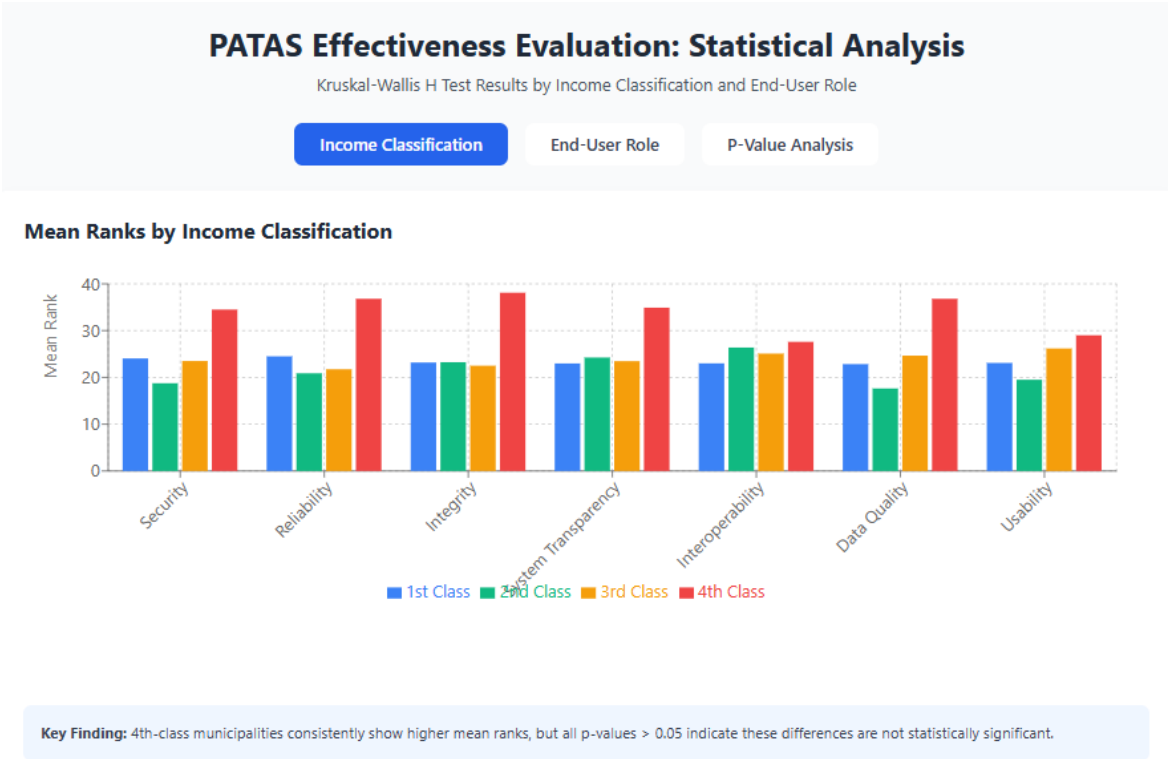

Figure 1. Comparative Analysis by Profile

Income Classification. Kruskal-Wallis H tests revealed no significant differences across all seven effectiveness factors when grouped by income classification (Table 12). All p-values exceeded .05 (Security: p=.323; Reliability: p=.177; Integrity: p=.142; System

Transparency: p=.358; Interoperability: p=.893; Data Quality: p=.152; Usability: p=.665). Although fourth-class municipalities consistently showed higher mean ranks (e.g., Integrity=38.10; Reliability=36.80), these differences were not statistically significant, suggesting uniform perceptions across income levels.

End-user Roles. Similarly, no significant differences emerged when respondents were grouped by role (Table 13). All factors showed p-values above .05 (Security: p=.290; Reliability: p=.351; Integrity: p=.566; System Transparency: p=.206; Interoperability: p=.596; Data Quality: p=.138; Usability: p=.466). While focal persons tended toward slightly higher mean ranks (e.g., Data Quality=28.25) compared to treasury staff (Data Quality=18.96), these variations were not statistically significant, indicating broadly similar perceptions across user roles.

Participants' experiences in using PATAS in the administration of real property tax

To gain deeper insight into how local assessors and treasurers of Bataan experienced the use of the Property Assessment and Tax Administration System (PATAS) in administering real property tax from 2019 to 2023, qualitative interviews were conducted. The analysis revealed key themes highlighting both the advantages and limitations of the system in practice.

In terms of data quality and integrity, participants recognized that PATAS helped centralize records and automate property assessments, improving accessibility and reducing manual errors. However, they also identified persistent data issues such as duplication, null values, and outdated entries that affect accuracy. One assessor shared, "When we update property information, the assessment values suddenly become null" (Participant D), reflecting how technical inconsistencies can undermine data reliability and user confidence in the system.

With regard to usability and efficiency, respondents commended PATAS for its convenience, particularly its search and auto-computation features that simplify encoding and reduce computation time. As one assessor noted, "The search and filtering functions speed up our encoding and we don't need calculators" (Participant A). Despite these benefits, technical glitches remain a recurring problem. System crashes and occasional incorrect computations hinder daily workflows, as a treasurer reported, "Sometimes the SOA generated does not reflect the correct amount" (Participant H).

Issues of interoperability and coordination also emerged. Participants pointed out that the limited integration between assessor and treasury offices prevents seamless transactions, forcing them to rely on manual coordination. One participant explained, "The treasury modules could not generate or compute real property tax due or print the Official Receipt" (Participant B). Several respondents attributed these challenges partly to financial constraints, as one shared, "Based on what I've heard, PATAS is not yet fully paid… we need to add payment" (Participant A).

Finally, training and technical support were identified as critical gaps in sustaining system use. Many participants cited the lack of consistent IT assistance and capacity-building initiatives. "There's minimal support from our IT Department," said one assessor

(Participant A), while another added, "Even though we follow security policies, we lack regular updates and comprehensive training" (Participant B). These concerns highlight the need for stronger institutional support to ensure long-term system reliability, user competence, and sustainability.

Integrated Analysis

This analysis merges quantitative perception ratings from surveys with qualitative operational insights from interviews to provide a comprehensive understanding of PATAS effectiveness across seven key dimensions.

Table 1. *Comparison of Quantitative & Qualitative findings*

Content Area	Quantitative Findings	Qualitative Insights	Interpretation
Security	Moderate agreement that PATAS incorporates basic security features.	Expressed confidence in securing records & audit logs, but limited technical support & absence of real-time security monitoring.	While foundational protections are in place, security measures remain reactive rather than proactive.
Reliability	User perception generally leans toward agreement, but rating is lower than security & integrity, shows that reliability is a moderate concern.	Consistent performance in supporting daily tasks, but issues during peak usage and system downtime.	Underscores the need for improved stability under heavy demand of daily transactions
Integrity	Indicates a generally positive but moderately varied perception among users.	Built-in controls minimized errors, but data synchronization issues between LGUs raises integrity concerns.	Integrity is maintained for each office but challenged in inter-LGU operations.
System Transparency	Generally favorable and moderately consistent across respondents.	Appreciated audit trails and digital logs but limited tax-payer access and real-time visibility into processes.	System transparency is stronger internally than for external stakeholders.
Interoperability	Least favorably rated among all performance system indicators evaluated.	Integration between PATAS and other local systems, such as treasury or GIS platforms, were not functional.	Significant gaps in cross-system integration.
Data Quality	Generally agreed moderately on the quality of the system's data.	Exposed challenges, such as null values & active records for approval which leads to manual verification.	Data accuracy is adequate but hampered by inconsistencies.
Usability	Highest composite means across all dimensions, indicating strong user agreement and a relatively consistent perception.	Participants described the interface as intuitive, but some modules required modification to optimize efficiency.	Reflects strong and consistent user agreement, but expresses concerns to certain inefficient modules.

Table 1 presents a convergent analysis of quantitative and qualitative findings. Security showed moderate quantitative agreement on basic features, corroborated by

qualitative confidence in audit logs, though limited technical support and reactive (rather than proactive) measures were noted. Reliability quantitatively rated as a moderate concern was confirmed by qualitative reports of issues during peak usage and system downtime, underscoring the need for improved stability.

Integrity received generally positive ratings quantitatively, with qualitative data affirming that built-in controls minimize errors. However, data synchronization issues between LGUs emerged, suggesting integrity is maintained within offices but challenged in inter-LGU operations. System transparency was quantitatively favorable, and qualitatively participants appreciated audit trails, though limited taxpayer access and external visibility indicate transparency is stronger internally than externally.

Interoperability, the least favorably rated dimension quantitatively, was confirmed by qualitative findings of non-functional integration with treasury and GIS platforms, revealing significant cross-system integration gaps. Data quality received moderate quantitative agreement, but qualitative insights exposed null values and manual verification needs, confirming data accuracy is adequate but hampered by inconsistencies.

Usability achieved the highest quantitative ratings and was affirmed qualitatively as intuitive post-training, though some modules require modification. This convergence reflects strong user agreement on interface design while expressing concerns about specific inefficient modules.

Discussion

The findings reveal that PATAS is most effective in usability (M=3.33), confirming its user-friendly design and ease of navigation align with the Technology Acceptance Model's emphasis on perceived ease of use (Ma & Liu, 2011). The high ratings in usability were a direct reflection of its user-friendly design and minimal training requirements (Davis, 1989). This high acceptance level is critical for the success of any e-governance initiative (Bertot et al., 2010). This strength facilitates user adoption and minimizes training requirements, critical factors for technology acceptance in local government contexts.

However, interoperability represents the weakest dimension (M=2.96), contradicting the system's intended design for seamless data exchange. This aligns with the Technology-Organization-Environment framework (Baker, 2012), suggesting that organizational barriers (budget constraints, incomplete payments to developers) and environmental factors (lack of standardization across LGUs) impede technological integration. The qualitative finding that treasury modules cannot generate tax computations or official receipts indicates critical functional gaps requiring immediate attention.

Reliability concerns (M=2.97) centered on system crashes and stability under heavy usage echo findings from international e-governance studies emphasizing the importance of robust infrastructure for sustained adoption (E-Government Survey 2022, n.d.). The discrepancy between high satisfaction with technical support responsiveness and low ratings for system stability suggests issues lie in the system architecture rather than human resource capacity. The moderate ratings in system reliability and integrity points directly to issues such as frequent disruptions and inconsistent updates. In the context of property tax

administration, where accuracy is paramount for valuation defensibility, these challenges severely undermine public trust and the defensibility of assessments (International Association of Assessing Officers, 2019). Furthermore, poor data integrity has tangible financial costs and can negatively impact confident decision-making (The Importance of Data Integrity in Property Management, 2025.). The intermittent nature of the system reflects a common barrier in LGU digital projects: integration issues with legacy systems and a lack of shared standards, which were identified as key challenges by the OECD early in the e-governance push (OECD, 2003; HIVO, 2025).

Data quality issues—particularly accuracy concerns (M=2.63)—pose significant risks to fiscal management. As Bird, (2010)emphasizes, reliable property tax administration depends on accurate, complete data. The emergence of null values during updates and inconsistencies requiring manual verification undermines PATAS's automation objectives and may perpetuate the inefficiencies it was designed to eliminate (Bayona et al., 2025).

In terms of productivity and efficiency, while the system generally performed well, the need for manual intervention due to reliability issues likely caps the potential gains (Drucker, 1999). Achieving true productivity gains requires maximizing automation and minimizing the need for manual data reconciliation, which is hampered by low data quality and integrity scores (Yuda, 2013).

The absence of significant differences across income classifications and user roles suggests that PATAS challenges are systemic rather than context-specific. This uniform perception across diverse LGUs indicates that improvements should target the core system architecture, vendor support mechanisms, and integration protocols rather than localized adaptations.

Qualitative insights reveal that while assessors describe PATAS as "transformative," treasurers exhibit more cautious use, restricted to verification due to computational issues. This role-based divergence in actual usage patterns, despite statistically similar ratings, suggests the quantitative measures may not fully capture operational realities. The reliance on provincial offices for technical support and delayed developer responses indicate sustainability concerns aligned with the Unified Theory of Acceptance and Use of Technology's emphasis on facilitating conditions (Marikyan, D.& Papagiannidis, S., 2025).

The convergence of quantitative and qualitative findings validates the mixed-methods approach, with interviews contextualizing statistical patterns and revealing implementation barriers not captured in surveys. The conditional trust in PATAS—requiring human oversight and manual validation—indicates the system functions as a support tool rather than a fully autonomous solution, contrasting with the transformative potential envisioned in international Computer-Aided Mass Appraisal (CAMA) implementations (McCluskey et al., 2013).

These findings hold significant implications for the Bureau of Local Government Finance's planned integration of PATAS with Real Property Information System (RPIS) RPIS and CAMA systems under the Local Governance Reform Program. Without addressing current interoperability failures, data integrity issues, and reliability concerns, adding

complexity through system integration may exacerbate rather than resolve existing challenges.

Conclusion

The implementation of the Property Assessment and Tax Administration System (PATAS) in Bataan demonstrates meaningful progress toward digital transformation in real property tax administration. The system has enhanced efficiency, accuracy, and transparency in property data management, particularly in first-class municipalities with greater fiscal and technical capacity. Users generally trust PATAS's security features and appreciate its user-friendly interface and automated functions. However, recurring issues such as data inaccuracies, system instability, incomplete module integration, and limited training continue to hinder full optimization across all Local Government Units (LGUs).

To strengthen PATAS implementation, several key actions are recommended. Provincial and municipal governments should prioritize improving ICT infrastructure and organizational readiness, particularly in lower-income LGUs. Enhancing security through regular updates and reliable technical support, improving system reliability and integrity with stronger validation mechanisms, and promoting transparency via audit trails and activity logs are essential. Furthermore, developing standardized interoperability protocols will ensure seamless integration with future national systems such as the Real Property Information System (RPIS) and Computer-Aided Mass Appraisal (CAMA).

Improving data quality through validation tools, trained data personnel, and real-time synchronization will help maintain accuracy, while sustained user training programs and responsive IT support are critical to enhancing usability. Optimization efforts should focus on system-wide improvements rather than group-specific interventions to ensure consistent experiences among assessors and treasurers. Finally, the long-term sustainability of PATAS may be secured through either full technology transfer to the Provincial Information Technology Office (PITO) or contractual revisions that obligate the system provider to deliver necessary updates and technical enhancements.

Collectively, these measures will ensure that PATAS evolves into a more secure, efficient, and adaptive system capable of supporting transparent, data-driven governance and sustainable local fiscal administration.

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