

Comparative study on the manual and computer-assisted assessment of real property taxes in Victoria, Laguna

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Abstract

This study compared manual and computer-assisted real property tax assessment methods in Victoria, Laguna, analyzing their precision, efficiency, cost, and user experience. Real property tax assessment is a vital function of local government units, influencing revenue generation for public services and development projects. The study employed quantitative and qualitative surveys and interviews with property owners, residents, and tax assessors to evaluate the manual and computer-assisted tax assessment systems' precision, customer satisfaction, and effectiveness. Among 389 respondents, the manual system was noted for precision in data encoding, document maintenance, payment posting, and record updating, while the computer-assisted system showed greater overall accuracy. Taxpayers were satisfied with both, especially regarding efficiency, transparency, accountability, and accuracy, but rated the computer-assisted system higher for efficiency and accuracy. Customer satisfaction was positively correlated with key assessment processes in both systems. The computer-assisted system was ultimately more precise, highlighting the potential benefits of digital tax assessment for improving local government efficiency and taxpayer experience. The study also offered recommendations for enhancing the computer-assisted system in Victoria, Laguna, supporting the digital transformation of local government functions.

Keywords: Computer-assisted; manual assessment; real property tax

1. Introduction

The evaluation of real property taxes played a vital role for local government units (LGUs) in the Philippines, such as Victoria, Laguna. These taxes were crucial revenue streams supporting public services, infrastructure projects, and community development programs. Historically, property tax assessments were done manually, requiring physical inspections, paperwork, and calculations. However, with the rapid progress of technology, numerous local governments began implementing computer-assisted systems to enhance the assessment process's efficiency, transparency, effectiveness, accuracy, and speed.

This study compared manual and computer-assisted methods for assessing real property tax in Victoria, Laguna. It evaluated both approaches to identify their strengths and weaknesses, focusing on accuracy, time efficiency, cost-effectiveness, accountability, transparency, and broader effects on the community and local government operations. Additionally, the research investigated how implementing computer-assisted systems could overcome the limitations of the traditional manual process, potentially enhancing tax collection, public services, and governance.

The research examined critical aspects of the assessment process, such as property valuation, tax calculation, and record management. It evaluated the time spent, accuracy of assessments, and the human resources needed for manual and computer-assisted approaches. Additionally, the study explored the challenges and obstacles the local government unit (LGU) faced in adopting technology-driven solutions and the wider implications for public administration in the digital era. Ultimately, the study's goal was to provide

valuable insights that could assist policymakers, local government officials, and other stakeholders in making informed decisions about the future of real property tax assessment systems in Victoria, Laguna.

1.1. Background of the study

Historically, local government units (LGUs) in the Philippines, such as Victoria in Laguna, manually performed real property tax assessments. This process involved treasury and assessors physically inspecting properties, recording information by hand, calculating tax obligations, and preparing official documents like tax declarations.

Real property tax (RPT) collection is vital for LGUs in the Philippines, serving as a major revenue source for local development, infrastructure, and public services. Tax collection and assessment were carried out manually in Victoria, Laguna, as in many other municipalities. However, with technological advancements, local governments increasingly adopted computerized systems to enhance tax administration efficiency, accuracy, and transparency.

Preparing reports, such as the list of delinquent taxpayers per barangay, using a manual system was time-consuming and resulted in delayed submissions. However, with the introduction of the new system, data retrieval became much easier and time-saving. The system automatically generated the report, ensuring that the delinquent notices were served on time and submitted on time.

As technology became more accessible in the 1990s and early 2000s, various LGUs in the Philippines, including those in Laguna, began automating their real property tax systems. In Victoria, Laguna, this shift likely started with the introduction of basic computer systems for record-keeping and tax calculation, followed by the implementation of more advanced Geographic Information Systems.

Over time, LGUs recognized the growing need for more efficient, transparent, and modern systems for property tax assessments. With increasing awareness of information technology and the digital transformation of governance, several LGUs, including those in urban and semi-urban areas like Victoria, Laguna, began exploring computerized solutions for property tax assessments.

This study aimed to compare the manual and computer-assisted real property tax systems in Victoria, Laguna, evaluating the effectiveness and efficiency of these approaches based on the municipality's action plan to improve tax administration.

1.2. Theoretical Framework

The study's theoretical framework drew upon multiple theories related to the comparative analysis of manual and computerized real property tax (RPT) assessment in Victoria, Laguna. It served as a lens for evaluating both assessment methods' effectiveness, efficiency, and outcomes. This framework laid the groundwork for understanding the variables and directed the data analysis. The study was grounded in key theories concerning technology adoption, organizational efficiency, and administrative performance, which were crucial to understanding how these assessment methods impacted the overall system.

The study was anchored on Davis's Technology Acceptance Model (TAM) (1989), which was used to understand the factors influencing the acceptance of computerized systems in local government settings. According to TAM, perceived ease of use and usefulness were key system adoption determinants (Davis, 1989). The study examined how these factors impacted the adoption of computerized systems for property tax assessments in Victoria, Laguna, and compared them to manual assessment systems.

The Technology Acceptance Model (TAM) proposed that individuals' adoption of technology was influenced primarily by two factors: Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). According to TAM, if a technology was easy to use and perceived as useful, it was more likely to be accepted and utilized by its intended users (Davis, 1989). Several studies confirmed the validity of TAM in predicting technology acceptance across various sectors, including government services, education, and healthcare

(Venkatesh & Davis, 2000)."

The Theory of Reasoned Action (TRA), introduced by Fishbein and Ajzen in 1975, asserted that human behavior was driven by behavioral intentions, which reflected the likelihood of performing a behavior. These intentions were shaped by two key factors: (1) Attitudes toward the behavior, which referred to an individual's positive or negative assessment of performing the behavior, and (2) Subjective norms, which referred to the perceived social pressure to either perform or refrain from the behavior.

According to TRA, behavioral intentions were the primary predictors of actual behavior. This theory has been widely applied in health, marketing, and technology adoption. The Technology Acceptance Model (TAM) was an extension of the Theory of Reasoned Action, tailored specifically for technology adoption. In TAM, behavioral intention (as defined in TRA) was influenced by attitudes toward technology, which were shaped by perceived ease of use and usefulness. These factors, in turn, influenced the actual use of technology.

Everett Rogers' Diffusion of Innovations theory (2003) provided a framework to understand how a population adopted new technologies. This theory suggested that adopting an innovation, such as an online payment system, depended on factors like perceived attributes (relative advantage, compatibility, complexity, trialability, and observability). In the case of a third-class municipality, the innovation had to be perceived as advantageous (e.g., convenience, time-saving), compatible with local culture and needs, and not too complex for residents to use.

Rogers' Diffusion of Innovations theory helped explain the adoption process of computer-assisted property tax assessment systems by identifying key factors that drove or hindered innovation adoption. A recent study examined these factors and highlighted how adopter categories, innovation characteristics, and the influence of communication channels and social systems impacted the transition. T

The comparative study found that the manual system was gradually being replaced by computer-assisted systems and identified strategies to accelerate the transition, particularly among the Early Majority and Late Majority adopters.

These three theories offer complementary views on technology adoption. TRA explains how attitudes and social influences shape behavior, TAM focuses on ease of use and usefulness in technology acceptance, and IDT looks at social influence, communication channels, and technology characteristics. Together, they provide a comprehensive framework for understanding technology adoption.

1.3. Conceptual Framework

This study applied the three major models from Davis (1989), Fishbein and Ajzen (1975), and Everett Rogers (2003) within the context of Victoria, Laguna. By considering these key elements, local tax administrators could utilize the conceptual framework to improve the municipality's real property tax payment methods. This comprehensive approach provided deeper insights into the factors influencing taxpayer behavior, enabling the development of a payment system that better matched the needs and preferences of Victoria's residents.

This conceptual framework **offered** a systematic approach to evaluate and compare manual and computerized systems based on their efficiency, transparency, accountability, accuracy, and effectiveness in real property tax assessment. The framework highlighted each system's strengths and weaknesses to guide evidence-based improvements in tax administration. The ultimate goal **was** to enhance the process, making it more advantageous for both the local government and the taxpayers of Victoria, Laguna.

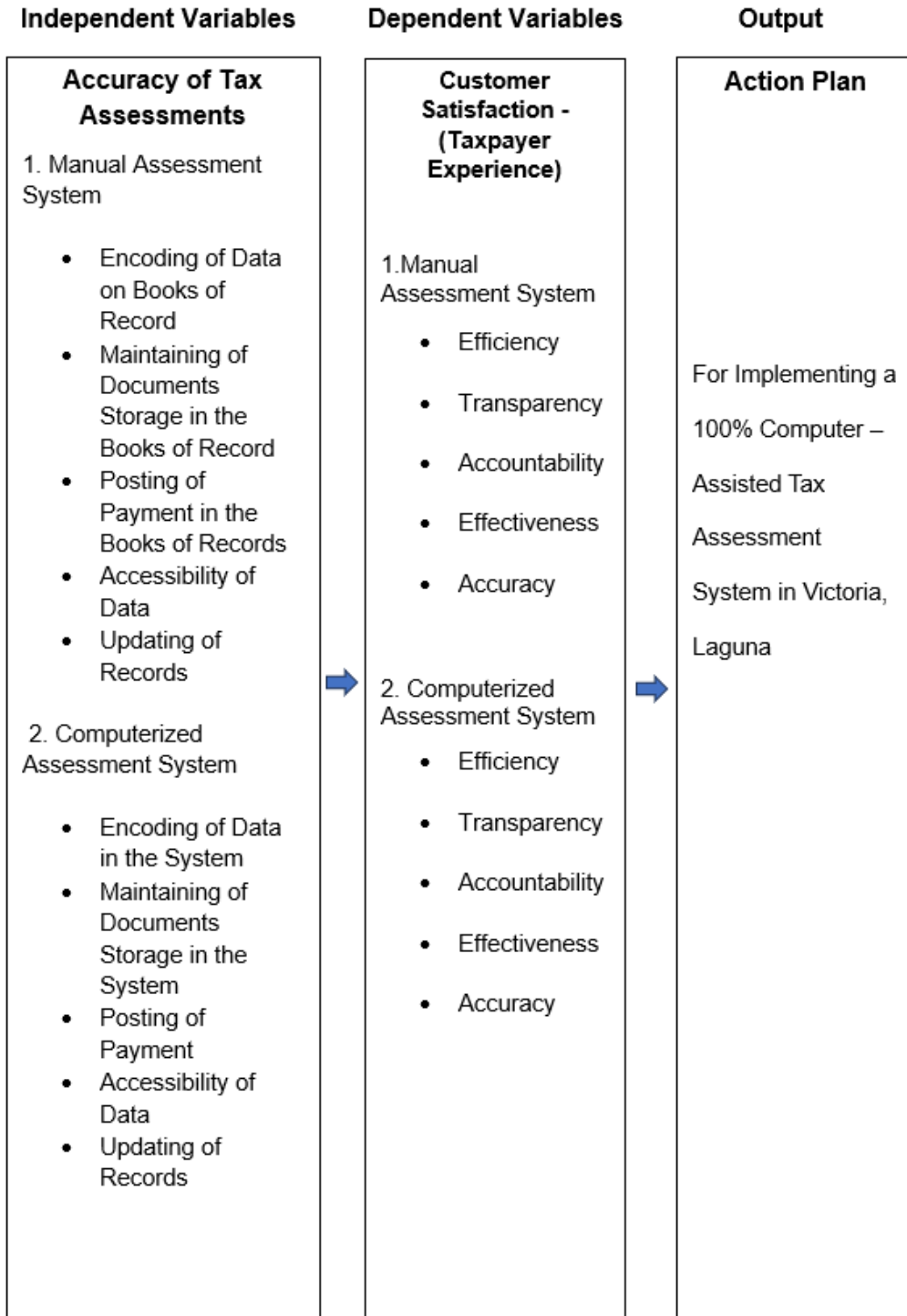


Figure 1- The Research Paradigm of the Study

1.4. Statement of the Problem

This study sought to compare the manual and computer-assisted methods used in assessing real property taxes in Victoria, Laguna. Assessing real property taxes was a crucial task for local government units, as it directly affected revenue generation for public services and development projects. By analyzing traditional and digital approaches, the research aimed to determine which method provided greater efficiency and accuracy. The findings are intended to guide policy improvements and support the modernization of local tax assessment practices.

Specifically, it answered the following questions:

1. What is the level of Precision of Manual Tax Assessment in terms of the following;
 - 1.1 encoding of data in the books of record
 - 1.2 maintaining of documents storage in the books of records
 - 1.3 posting of payment
 - 1.4 accessibility of data, and
 - 1.5 updating records?
2. What is the level of Precision of the Computerized Tax Assessment System in terms of the following:
 - 2.1 encoding of data in the system
 - 2.2 maintaining of documents storage in the system
 - 2.3 posting of payment
 - 2.4 accessibility of data, and
 - 2.5 updating records?
3. What is the level of Customer Satisfaction of the Manual Assessment System in terms of the following:
 - 3.1 efficiency
 - 3.2 transparency
 - 3.3 accountability
 - 3.4 effectiveness, and
 - 3.5 accuracy?
4. What is the level of Customer Satisfaction of the Computer-Assisted Tax Assessment System in terms of the following:
 - 4.1 efficiency
 - 4.2 transparency
 - 4.3 accountability
 - 4.4 effectiveness, and
 - 4.5 accuracy?
5. Is there any significant relationship between the Precision of the Tax Assessment Manual Assessment System and the Computer-assisted Assessment of Real Property Taxes?
6. Is there any significant relationship between the Customer Satisfaction (Taxpayer Experience) in the Manual Assessment System and the Computer-assisted Assessment of Real Property Taxes as perceived by the respondent?
7. Is there any significant difference between the precision of the tax assessment manual assessment system and the computer-assisted assessment of real property taxes as perceived by the respondent?
8. What action plan may be proposed based on the results of the study?

1.5. Hypotheses

Null Hypothesis (H₀): There is no significant relationship between the precision of the Tax Assessment Manual Assessment System and the Computer-assisted Assessment of Real Property Taxes.

Null Hypothesis (H_0): As respondents perceive, there is no significant relationship between customer satisfaction (taxpayer experience) regarding the Manual Assessment System and Computer-assisted Assessment of Real Property Taxes.

Null Hypothesis (H_0): There is no significant difference between the precision of the Tax Assessment Manual Assessment System and the Computer-assisted Assessment of Real Property Taxes as perceived by respondents.

These hypotheses were tested through appropriate statistical methods, such as correlation analysis for relationships and t-tests or ANOVA for differences.

Significance of the Study

This study's significance lies in its potential to provide valuable insights into the current practices and challenges of real property tax assessment in Victoria, Laguna. The study can improve the region's efficiency, accuracy, and transparency of real property tax assessment by comparing the traditional manual assessment system with the modern, computer-assisted approach.

Improvement of Tax Assessment Efficiency: The study illuminated the time and resources required in manual and computer-assisted assessment methods. By identifying inefficiencies in the manual system, the study recommended improvements to streamline processes and reduce delays in property tax assessments, ultimately benefiting local government units (LGUs) and property owners.

Accuracy and Reduced Human Error: Manual assessment often involved a risk of human error, especially in large-scale property evaluations. The comparative study highlighted the potential for the computer-assisted system to reduce mistakes and increase the accuracy of assessments, ensuring fairness and preventing over taxation or underreporting of property values.

Cost Implications and Resource Allocation: The action plan behind this study revealed the financial and operational costs of maintaining a manual system versus adopting a computerized system. It provided a clear comparison of upfront costs, maintenance costs, and long-term savings, helping policymakers decide on resource allocation for upgrading the tax assessment infrastructure.

Enhanced Revenue Generation for LGUs: The study identified the most effective method for tax assessment and proposed systems that improved the collection process, increased revenue generation, and minimized tax evasion. This strengthened the local government's financial capacity to fund essential public services and development projects.

Better Decision Making and Policy Formulation: The findings offered the local government and policymakers' valuable data. The comparison guided decisions on whether transitioning to a fully automated system was beneficial regarding sustainability, cost-effectiveness, and service delivery.

Technological Advancements and Modernization: The study explored the adoption of computer-assisted methods and encouraged the modernization of local government operations. The insights gained were instrumental in encouraging other LGUs to embrace technology and digital transformation in administrative tasks, thereby enhancing governance across the country.

Public Satisfaction and Transparency: The local government improved public trust and satisfaction in the assessment process by implementing a more transparent, automated system. Property owners felt that their tax assessments were fairer and more transparent, which reduced disputes and fostered better communication between the local government and taxpayers.

Foundation for Further Research: This will serve as a foundation for future research in local governance, tax administration, and technology integration. It inspired further studies that analyzed other aspects of tax management or assessed the impact of automation on other administrative functions within local governments. Future studies may examine digital transformation's socio-economic impact in underserved areas.

This study's comparative approach provided a platform for evaluating Victoria, Laguna's most effective real property tax assessment system. It could have served as a model for other LGUs in the Philippines. Its significance extended beyond mere academic inquiry, offering practical benefits for improving

local governance, fostering efficient public administration, and enhancing the local economy.

1.6. Scope and Limitations

The study primarily examined real property assessment systems in Victoria, Laguna, comparing two methods, manual assessment and computer-assisted assessment. It reviewed the entire property assessment process, including data collection, property evaluation, tax calculations, and reporting. The study assessed the effectiveness of both systems in managing property data, such as land value, improvements, zoning, and usage.

A detailed comparison was made between traditional manual systems and computer-assisted systems. The research evaluated the software used for property assessments, focusing on factors like ease of use, speed, accuracy, and the level of automation. Additionally, the efficiency of both systems will be assessed in terms of time, human resources, and error rates.

Special attention was given to how each system affected the workflow of the treasury and assessors in Victoria, Laguna. The study also compared the efficiency, transparency of assessments, and the accuracy of each system, particularly regarding tax compliance, property evaluation, and public access to data. Interviews and surveys were conducted with key stakeholders, such as property owners who paid their taxes, to gather their views on each system. Additionally, the feedback collected helped identify potential areas for improvement in the current systems, providing valuable insights into the community's experience with tax-related processes.

Finally, the study considered the cost-effectiveness of both systems, examining setup costs, training expenses, long-term operational costs, and the resources needed for maintenance. The scope of the study is limited to Victoria, Laguna, and may not be relevant to other municipalities or regions, especially those with different regulatory frameworks or demographic factors. The study focused on the computer-assisted systems currently used in Victoria, Laguna. Any recommendations will be tailored to the specific context of Victoria, Laguna, and may require further adaptation for broader implementation.

1.7. Definition of Terms

Accountability refers to the obligation of individuals, organizations, or systems to answer for their actions, decisions, and performance. It involves being responsible for fulfilling duties and answering stakeholders, including the public, for how tasks are performed and resources are managed. In governance and administration, accountability ensures transparency, integrity, and the proper execution of policies, duties, and financial management.

Accuracy: The degree to which the assessment of real property taxes matches the true value of the property and the tax amount due. This term would be central in evaluating how the two methods, manual and computer-assisted, affect tax calculations.

Action Plan: A detailed plan that outlines the steps, strategies, and objectives needed to complete the comparative study. It would include timelines, data collection methods, resources required, and how the findings will be used to assess the effectiveness of manual versus computer-assisted tax assessments.

Automated data collection refers to gathering information using technology and tools such as sensors, software, web scrapers, or Application Programming Interfaces (APIs) without manual input. This method allows data to be collected continuously, efficiently, and often in real time.

Auditability refers to the ability of a system, process, or record to be examined and verified for accuracy, compliance, and transparency. It ensures that enough information is available to trace activities, decisions, or transactions back to their origins. This allows for an independent review, enabling auditors or reviewers to assess whether the system is functioning properly and by established standards, policies, or regulations.

Automation is the use of technology to perform tasks without human intervention. Computer-assisted assessment refers to how the system automatically processes and calculates taxes based on data input, reducing the need for manual calculation.

Comparative Study: A research methodology that involves comparing two or more systems, processes, or phenomena to identify their similarities, differences, advantages, and disadvantages. The study will compare manual and computer-assisted real property tax assessment methods in this case.

Computer-Assisted Assessment: A modern method of assessing real property taxes using computer software and digital tools to automate the process. This includes using databases, spreadsheets, and specialized tax assessment software to calculate property taxes and manage records efficiently.

Cost-Effectiveness: A measure of the financial resources used to perform real property tax assessments, considering the budget and expenses for implementing manual and computer-assisted methods. It looks at whether the benefits of one method justify the costs involved.

Customer satisfaction refers to measuring how well a company's products, services, or overall experience meet or exceed customer expectations. It reflects how happy customers are with what they have purchased or the service they have received. High customer satisfaction often leads to customer loyalty, repeat business, and positive word-of-mouth, while low satisfaction can result in complaints, customer loss, and negative reviews.

Data Management: The process of storing, organizing, and accessing data related to property assessments. Manual systems may rely on physical records, while computer-assisted systems use databases and digital records for faster retrieval and management.

Effectiveness refers to the degree to which a task or process achieves its intended outcome or goal. In the context of real property tax assessment, effectiveness involves how accurately and fairly properties are valued for tax purposes, ensuring that the tax burden is distributed equitably among property owners.

Efficiency: A measure of how effectively the property tax assessment process is carried out. This term could cover manual vs. computer-assisted systems' speed, accuracy, and overall performance.

Manual Assessment: A traditional method of assessing real property taxes that involves physical records, paperwork, and manual data entry. Assessors physically inspect properties, calculate the tax based on predetermined formulas, and maintain records by hand or in physical files.

Policymakers are individuals or groups responsible for creating, developing, and implementing policies that guide the actions of organizations, governments, or institutions. Policy makers make decisions that address societal, economic, or organizational issues, and their choices can have broad and long-lasting impacts.

Public Accessibility: The ease with which property owners and stakeholders can access information related to tax assessments. A computer-assisted system may provide better public access through online portals or digital records.

Public perception refers to how people interpret a person, organization, event, or issue. It's shaped by personal experiences, media coverage, social influences, and cultural context.

Real Property Taxes: These are the taxes levied by local government authorities (such as the municipal government of Victoria, Laguna) on the ownership or use of real property. The amount of tax is generally based on the property's assessed value, including land and buildings.

System Reliability: The consistency and dependability of the property tax assessment system. It measures whether the system (manual or computer-assisted) consistently provides correct and timely assessments without errors or failures.

Stakeholders are the individuals or groups affected by or interested in the real property tax assessment process. These may include local government officials, property owners, assessors, and taxpayers in Victoria, Laguna.

Tax Assessment: The process of determining the value of a property to calculate the amount of tax owed. This involves collecting data regarding the property's characteristics (e.g., size, location,

improvements) and applying the local tax rate to this value.

Tax Calculation: Tax collection refers to the process by which a government or tax authority gathers taxes from individuals, businesses, or other entities. It involves assessing, paying, and enforcing tax obligations based on a legal framework or tax laws.

Technology uses scientific knowledge, tools, systems, and processes to solve problems, increase efficiency, and enhance capabilities. In the context of a **comparative study on the manual and computer-assisted assessment of real property tax in Victoria, Laguna, technology** would primarily focus on the tools and systems used to assist in property tax assessments, such as **computer software, databases, and automation** technologies.

Valuation the systematic process of determining the monetary value of real property (land and improvements) for taxation purposes, using either traditional manual methods or computerized systems

Verification the process of checking and confirming the accuracy, completeness, and reliability of property data and valuation results used in the assessment of real property taxes, whether done manually or through computer-assisted systems.

Victoria, Laguna, is a municipality in the province of Laguna, located on the island of Luzon in the Philippines. It is approximately 85 kilometers south of Metro Manila and is part of the CALABARZON region. The town is known for its agricultural activities, particularly rice and coconut farming. Victoria is also home to various historical and cultural landmarks and natural attractions, making it a notable area within Laguna.

1.8. Review of Related Studies and Literature

This chapter presented the related literature and studies that supported the following literature review: It examined existing research and studies related to a comparative study on the manual and computer-assisted assessment of real property taxes in Victoria, Laguna. It entailed an analysis of previous research, literature, and existing studies that examined the use of technology in real property tax assessment.

1.8.1. Related Literature and Studies

Republic Act No. 7160, also known as the Local Government Code of 1991, regulates the real property tax system in the Philippines. This law enables local government units (LGUs) to assess and collect taxes on real estate within their areas. The tax assessment procedure involves evaluating the fair market value of properties and applying the appropriate tax rates.

Traditionally, many LGUs use manual systems for property tax assessment, which have faced criticism for inefficiency, lack of transparency, and susceptibility to human error. According to Arias (2015), although the legal framework for property tax assessment is clear, the manual process often leads to delays, inaccurate data recording, and miscalculations of property values, negatively impacting the tax base and local revenue generation.

The manual assessment process frequently results in inefficiencies and delays in property tax collection, as it is time-consuming to record property information, calculate tax assessments, and update records manually. According to Chaves (2016), many local government units (LGUs) face backlogs in tax assessments because they lack modern technological tools to streamline the process.

Manual assessments are inefficient and hinder local governments from maximizing tax revenue generation. Incorrect property evaluations can lead to over- or under-valuation, resulting in either revenue deficits or excessive taxation. Pangilinan (2016) pointed out that inaccurate property valuations, often caused by manual mistakes, impacted local government units' (LGUs) ability to finance public services. The reliance on manual tax assessments also reduces tax compliance rates, as without automation, LGUs struggle to send timely notices or updates on tax payments, causing delays in collections. As a result, municipalities face

considerable challenges in managing overdue and delinquent accounts.

Many local government units (LGUs) have begun incorporating technology to address the shortcomings of manual assessments. Pilot projects using automated systems and Geographic Information Systems (GIS) have been launched to enhance property data management and assessment precision. The Bureau of Local Government Finance (BLGF) has introduced efforts to digitize property databases to minimize manual errors and enhance the accuracy of property tax assessments (Bagabaldo, 2016).

The studies emphasized the need for expanded capacity-building programs for local assessors, focusing on property appraisal skills and technological tools to enhance assessment accuracy and efficiency. Many experts suggested improving coordination between the national and local governments to ensure consistency in property tax assessment practices. This would help eliminate discrepancies and promote a fairer distribution of tax burdens across regions (Ocampo, 2016). A key recommendation was to implement further the Philippine government's e-Government Master Plan, which includes automating local government processes such as real property tax assessments, thereby speeding up data processing and streamlining tax collection.

Both Taguig and Pasig Cities, located in Metro Manila, have been acknowledged for their initiatives in modernizing property tax assessments. These local governments adopted computerized systems and automated property tax databases, enhancing tax collection efficiency and reducing tax evasion cases (Sarmiento, 2016). Meanwhile, Davao City has utilized GIS technology to improve property tax assessments. By incorporating mapping tools into the assessment process, Davao successfully minimized errors and boosted the precision of its tax evaluations.

Calamba City, recognized as one of the more urbanized municipalities in Laguna, has effectively implemented a computerized system for property tax assessments. Chavez (2016) explains that this system combines automated tax assessment and collection, minimizing errors and delays in the property tax process.

As a 1st class municipality in Laguna, Calamba introduced a computer-assisted property tax system incorporating Geographic Information Systems (GIS) for property mapping and streamlining tax collection. According to Diaz and Tan (2021), the automation of property tax assessments resulted in a 25% increase in tax collection efficiency, enhanced accuracy in property valuations, and reduced processing times.

Similarly, Pangilinan (2016) highlights San Pablo City's successes in adopting a computerized property tax assessment system integrated with Geographic Information Systems (GIS). This technological innovation has significantly improved property valuation accuracy and streamlined tax collection processes, leading to a notable increase in the city's municipal revenue. The integration of GIS technology exemplifies the broader trend of using modern tools to enhance local governance and financial management, demonstrating the potential of technology to foster sustainable economic growth at the municipal level.

Many rural municipalities in Laguna, particularly in the first and second districts, depend largely on manual assessments. According to Ocampo (2016), these areas struggle to shift to digital systems because of limited budgets, a lack of technical expertise, and insufficient infrastructure to support automation.

Punzalan (2016) provides an overview of the shift toward automating real property tax assessments in various municipalities across the Philippines. The paper focuses on adopting Computer-Assisted Mass Appraisal (CAMA) systems, which aim to enhance the efficiency of tax assessments in local government units (LGUs). These systems are designed to simplify processes, reduce human errors in property valuation, and boost revenue collection. Despite these benefits, the study identifies ongoing challenges, including issues with data accuracy and difficulties in integrating CAMA systems with other municipal frameworks. Punzalan also highlights barriers such as insufficient skilled personnel, limited infrastructure, and budget limitations.

In the same year, Punzalan (2016) also investigates the use of Computer-Assisted Mass Appraisal (CAMA) systems in different municipalities across the Philippines, including some in Laguna. Although the study doesn't specifically focus on Victoria, it covers the implementation of CAMA in neighboring areas like Calamba and San Pedro. The research highlights how CAMA systems enhance the accuracy of property valuations, minimize human error, and simplify the tax collection process. It also emphasizes that

municipalities such as Victoria could greatly benefit from adopting these systems, particularly in improving transparency and efficiency.

The use of technology in local governance is becoming increasingly common, with Pangilinan (2016) highlighting a successful example through implementing a computerized property tax assessment system in San Pablo City. This system, which integrates Geographic Information Systems (GIS), has significantly improved the accuracy of property valuations and streamlined the tax collection process. As a result, the city has seen a notable boost in municipal revenue. This case exemplifies the broader trend of adopting modern technology to improve financial management and governance at the local level. It emphasizes the potential of technology to drive sustainable economic growth by enhancing efficiency, transparency, and revenue generation for local governments. This trend demonstrates how digital tools can act as catalysts for economic development, improving service delivery and empowering local governments to address the needs of their communities better.

Additionally, in the same 2016 study, Reyes examines the impact of CAMA systems on real property tax efficiency, focusing on municipalities in Laguna, such as Calamba and San Pablo. Although the study does not specifically cover Victoria, it offers valuable insights into how CAMA enhances valuation accuracy, reduces assessment time, and boosts revenue collection. These benefits could apply to Victoria as it aims to modernize its property tax system through automation.

Lao (2016) examines the challenges faced in implementing computer-assisted systems for real property tax assessment in the Philippines. These challenges include insufficient technical training for personnel, the complexity of property tax laws, and the necessity for ongoing system maintenance. The study emphasizes the importance of strengthening institutional capacity to ensure the long-term success of these systems.

Lao emphasizes the significant challenges that Local Government Units (LGUs) face, especially technical issues like outdated data, lack of system integration, and infrastructure limitations. The study underscores the importance of technical training, data standardization, and the development of user-friendly interfaces to improve the effectiveness of computerized tax systems. Lao also identifies the hurdles LGUs and municipalities face in adopting these systems, such as inadequate infrastructure, limited financial resources, and a lack of technical expertise. Many municipalities rely on manual processes, resulting in inefficient property tax assessment and collection. Lao suggests successful automation requires LGUs to focus on capacity-building, secure adequate funding, and ensure ongoing technical support.

In his 2016 study, Lao examines the challenges municipalities like Laguna face when implementing computer-assisted tax assessment systems. For smaller municipalities such as Victoria, these challenges include limited financial resources, insufficient technical expertise, and resistance to adopting new technologies. The research highlights the need for targeted training programs, appropriate budgeting for technological upgrades, and continuous technical support to overcome these challenges and improve the efficiency of computer-assisted property tax assessment systems.

Tijam, R. D. (2016) explores the modernization of public sector management in the Philippines by integrating technology, including real property tax assessments. The study finds that while digital transformation provides considerable advantages in terms of efficiency and transparency, its adoption is slow, primarily due to resistance from traditional sectors and a lack of adequate technical support.

Mendoza, J. F. (2016): Mendoza's study examines the role of Local Government Units (LGUs) in reforming the real property tax system in the Philippines, emphasizing leveraging computer-assisted systems to improve transparency and reduce inefficiencies in tax collection. The research concludes that LGUs with integrated technology have experienced better tax compliance and increased revenue collection. However, it also highlights the importance of standardized policies and nationwide coordination in the rollout of these technologies. Mendoza's study also addresses the challenges municipalities encounter when adopting technological tools for property tax assessment, focusing on obstacles such as limited budgets, insufficient skilled personnel, and slow technological adoption, which can impede the successful implementation of

computerized systems.

Mendoza, J. F. (2016): In his research on technology adoption in local governance, Mendoza discusses the broader scope of e-government initiatives and the shift toward automation in property tax assessment across the Philippines. The study suggests that computer-assisted tax assessment systems could enhance administrative efficiency, minimize manual errors, and increase transparency in real property tax assessments for municipalities like Victoria. However, Mendoza points out that smaller municipalities tend to adopt these systems more slowly due to resource constraints and gaps in staff training.

Salazar and Santos (2019) investigated the use of geographic information systems (GIS) and automated valuation models (AVMs) in various local government units (LGUs) in the Philippines. They discovered that these computer-assisted technologies helped minimize errors, sped up assessments, and boosted tax collection efforts. In contrast, manual systems demand considerable human resources for data collection, processing, and auditing, leading to higher costs for LGUs (Santos & Salazar, 2020). In 2016, Davao City introduced a computer-assisted property tax system incorporating GIS for mapping property boundaries and determining valuations. According to Salazar and Santos (2019), this system significantly shortened the time needed for property assessments and improved the accuracy of tax collection.

Pangilinan (2016) and Salazar (2020) highlight the growing trend of incorporating technology into local governance, offering valuable perspectives on its influence on financial management. Pangilinan discusses successfully deploying a computerized property tax assessment system in San Pablo City, which integrated Geographic Information Systems (GIS). This system improved the accuracy of property valuations and made the tax collection process more efficient, significantly boosting municipal revenue. Similarly, Salazar observes that local government units (LGUs) that implemented computerized property tax systems saw substantial improvements in tax collection rates, with some municipalities experiencing a 20-30% increase in revenue. These automated systems make it easier for citizens to pay their taxes on time and reduce the administrative workload for LGUs.

Traditional manual assessments rely on human judgment and physical records. Still, research has shown that this process can be susceptible to human error, time-consuming, and ineffective when managing large amounts of data. Ocampo (2017) highlights the inefficiencies of manual property assessments in smaller local government units (LGUs) and their impact on tax collection and governance. These inefficiencies stem from outdated records, slow processing speeds, and challenges in tracking property updates or changes over time.

Bello and Garcia (2017) studied the automation of real property tax systems by local governments in the Philippines. Their research revealed that local government units (LGUs) that implemented automated systems saw a 30-40% improvement in tax collection efficiency and a significant decrease in assessment errors. Similarly, Lorenzo (2016) showed that incorporating GIS into tax administration systems enhanced the visualization of property data, leading to better tax assessments and more informed urban planning decisions. Bello and Garcia (2017) also noted that manual systems often result in slow processing and data entry errors, leading to inaccurate assessments and uncollected taxes.

Balisacan (2017) highlighted that high initial costs, resistance from local government employees, and technical difficulties in implementing complex systems often impede the adoption of these technologies. Additionally, Mendoza (2022) pointed out that issues like inconsistent property records and a lack of standardization in data governance present major obstacles to successful implementation.

Liao (2017) argued that computer-assisted tax systems minimize human error by automating data entry and validation. These systems also improve the ability to manage large datasets, enabling faster and more accurate calculations. In the context of LGUs, especially in municipalities like Laguna, these systems can significantly accelerate processing times and lower administrative costs. This technological integration enhances efficiency and allows local governments to reallocate resources more effectively, focusing on improving services and infrastructure rather than manual administrative tasks. Additionally, by reducing errors and processing time, these systems can improve compliance rates and reduce the chances of tax-related

disputes, contributing to more streamlined governance and financial management in local government units.

Historically, local governments have used manual systems for assessing real property taxes. In these systems, assessors evaluate property values based on established guidelines, relying on paper records, ledgers, and physical inspections. Ayo and Gundo (2017) noted that this method is simple and has low initial costs. However, it is prone to errors in data entry, delays in processing, and a lack of transparency in the assessment process. In Laguna's second-class municipalities, studies have shown that inefficiencies arise from the over-reliance on paper records, which increases the workload of assessors and can result in discrepancies in tax calculations (Mendoza, 2019).

In Quezon City, implementing an automated system to monitor and assess real property taxes marked a significant step towards increasing efficiency and accuracy in tax administration. Utilizing an Automated Valuation Model (AVM) streamlined the process of determining property values, reducing the potential for human error and subjectivity that often accompanies manual valuations. This innovative approach not only enhanced the reliability of property assessments but also provided a more transparent and objective method for tax calculation, contributing to fairer tax policies, as highlighted by Lorenzo (2017)

In addition to the advancements in Quezon City, Lorenzo (2017) highlighted the successful implementation of a computer-assisted property tax system in Tagbilaran City. This system integrates Geographic Information System (GIS) technology to map properties and automate tax assessment and collection processes, further improving operational efficiency. By leveraging GIS, the city enhanced the accuracy and efficiency of its tax administration, leading to a remarkable 30% increase in tax revenues during its first year. Together with the Quezon City initiative, these cases demonstrate the transformative impact of automated systems and modern technology in optimizing property tax assessments, improving revenue generation, and reducing error.

Expanding on the successes seen in Quezon City and Tagbilaran City, Cruz and Borja (2018) highlighted how automation facilitates the integration of property data from various sources, leading to more accurate property valuations. This integration also optimizes the tax collection process by automating tasks such as generating reports, sending reminders, and updating assessments. Additionally, Javier (2020) pointed out that computer-assisted systems help minimize human bias and subjectivity in the assessment process, fostering greater transparency in tax administration. Together, these insights emphasize the significant role of automated systems in improving the accuracy and fairness of property tax assessments, contributing to a more efficient and just tax system.

Villanueva's (2018) argument can be integrated with broader perspectives on technological adoption and local governance. Villanueva (2018) highlights the significant benefits of computerized systems in streamlining government operations, but also points out the substantial challenges local governments face in the Philippines. These challenges include high implementation costs, inadequate infrastructure, and insufficient technical expertise, which hinder these systems' full adoption and effectiveness.

This viewpoint aligns with existing literature emphasizing the importance of technological investment and supportive infrastructure for successful implementation. For instance, other studies on developing countries suggest that without sufficient local expertise and robust infrastructure, even well-designed systems may struggle to meet their intended goals. These challenges illustrate a broader issue in digital transformation, where the benefits of technology can be overshadowed by logistical and financial barriers, especially in areas with limited resources. Consequently, a more holistic approach is required for modernization efforts to succeed, combining technological innovation with substantial investments in capacity building and infrastructure development.

Santos and Garcia (2018) found that first-class municipalities in Laguna, such as San Pedro, Calamba, and Biñan, heavily rely on real property taxes due to their urbanized and industrialized characteristics. They emphasized that the transition to computerized systems is crucial for accurately assessing properties and ensuring efficient revenue collection.

This finding can be synthesized with Villanueva's (2018) perspective on the challenges of

implementing computerized systems. While Villanueva highlighted the obstacles faced by local governments, such as high costs and lack of infrastructure, Santos and Garcia illustrate a clear example where urbanized municipalities with more complex revenue streams, like property taxes, can significantly benefit from computerized systems. The need for accuracy and efficiency in property assessment in these municipalities underscores the importance of overcoming the barriers to technology adoption that Villanueva discusses. In this case, the modernization of revenue collection systems becomes a benefit and is necessary to support the growing urban landscape.

Thus, combining both studies, we see that while the transition to computerized systems is essential for municipalities like San Pedro, Calamba, and Biñan to optimize revenue generation, addressing the challenges of infrastructure, technical expertise, and costs, as Villanueva points out, will be crucial for ensuring that such transitions are successful and sustainable in the long.

Hernandez & Ramos (2019) highlight that manual assessments, though still prevalent, have significant limitations in scalability, especially in rapidly expanding urban areas. Local Government Units (LGUs) in these regions face difficulty accurately assessing property values as the demand for tax services grows. This issue, particularly in urbanized areas, underscores the need for more efficient and scalable systems to handle the increasing workload.

When synthesizing Hernandez & Ramos (2019) with the works of Villanueva (2018) and Santos and Garcia (2018), we see a clearer picture of the challenges and opportunities facing local governments in the Philippines. While Villanueva (2018) discusses the barriers to adopting computerized systems, Hernandez & Ramos (2019) provide a practical example of why such systems are urgently needed in urbanized municipalities. The limitations of manual assessments in rapidly growing areas like those in Laguna, as discussed by Santos and Garcia (2018), only exacerbate the problem, making it more difficult for LGUs to accurately assess properties and collect taxes.

The research conducted by Mendoza (2019) highlights a significant limitation of manual systems, namely, their restricted access to property tax records, which can create difficulties during audits or when citizens inquire about their information. This issue is compounded by Delos Reyes (2015), who noted that the slow processing times inherent in manual systems further exacerbate taxpayer dissatisfaction and diminish overall collection efficiency. Together, these findings underscore the pressing need for more modern, automated systems that can provide quicker access to data and improve the efficiency of tax processing, ultimately enhancing both the taxpayer experience and government revenue collection.

Traditionally, property tax assessments in the Philippines, including Sta. Cruz, Laguna, has been carried out manually. In Mendoza's (2019) study on the administrative challenges of property tax collection in local government units, the author points out that manual methods can often lead to inconsistent assessments, delays in processing, and inefficiencies, especially in large, densely populated areas like Sta. Cruz. Similarly, Gomez (2019) analyzed the long-term effects of introducing computerized property tax assessment systems in municipalities like Calamba and Sta. Cruz. The study found that over time, computerized systems not only improved efficiency but also increased tax compliance due to the transparency and clarity of the automated system.

Sta. Cruz, Laguna, has seen efforts to implement automated property tax assessment systems, though these efforts are relatively recent. The study by Bautista and Morales (2019) explored the early stages of such implementation in Sta. Cruz. Additionally, Cordero and Villanueva (2019) conducted a study that examined the success of LGUs, including Sta. Cruz, Laguna, in adopting electronic tax assessment systems. Their findings corroborated earlier studies, showing that while there were initial setbacks, computerized systems significantly enhanced the overall tax collection process. Moreover, the data provided by the system allowed the local government to track properties more effectively, reducing tax evasion and under-assessment.

Implementing computerized or assisted systems has become increasingly common in local government units, aiming to improve efficiency and transparency in tax assessment. The computerized system uses technology such as Geographic Information Systems (GIS) and automated software to assess properties

more quickly and accurately. This transition has been studied for its effectiveness in improving the assessment process.

As Mendoza (2020) described, Victoria's action plan is implemented in stages, starting with digitizing current property tax records and setting up required hardware and software. The next stage involves training tax assessors and rolling out the system for real-time property assessments. The final stage focuses on evaluating the system's performance and adjusting to resolve any issues. The primary objective of the action plan is to enhance the accuracy, efficiency, and transparency of property tax assessments, resulting in improved tax compliance and more effective public service delivery.

Integrating computer-assisted systems in local government units (LGUs) across the Philippines has significantly enhanced transparency and efficiency in property tax administration. Ayo's (2018) study highlighted that these digital systems enable taxpayers to monitor their property tax obligations and understand the valuation process, fostering greater transparency. Moreover, LGUs adopting automated systems have reported increased revenue generation by improving property tracking and identifying previously under-assessed or undeclared properties.

Integrating computer-assisted systems in local government units (LGUs) has enhanced tax compliance and equity. Liao's (2018) report indicated that municipalities employing such systems experienced significant improvements in tax compliance, as property owners could easily access their tax records, fostering transparency and timely payments. Additionally, integrating databases enabled local governments to more effectively identify and track properties, reducing under-assessment and ensuring a fair distribution of the tax burden.

This finding aligns with studies in other regions; for instance, research in Thailand demonstrated that digital workflows significantly increased compliance rates among taxpayers. The study concluded that adopting digital solutions in tax collection enhances operational efficiency and contributes to more robust local governance and financial outcomes.

Liao's (2017) research highlighted that while the initial investment and training for computer-assisted systems may be substantial, the long-term advantages surpass these challenges. The study pointed out that local government units (LGUs) in areas like Laguna that invest in technology-driven solutions benefit from enhanced financial stability, driven by better tax compliance and more efficient resource distribution.

However, despite these clear benefits, adopting computer-assisted assessment systems presents difficulties. Research by Mendoza (2019) and De Guzman (2020) identified technical problems, such as software issues and system incompatibilities, that can complicate the transition from traditional methods to computerized ones. There are also concerns regarding the lack of technical skills among local government employees to operate and maintain these advanced systems. Additionally, the high costs of purchasing hardware, software, and training personnel can be a barrier, especially for smaller municipalities.

The challenges identified by Gonzales (2018) and Bautista (2020) regarding manual systems in local government units (LGUs) are well-documented in existing literature. Studies have highlighted that manual property valuation processes often lead to inconsistencies and difficulties keeping pace with rapid property development. For instance, the Philippine Journal of Public Administration (2021) notes that property valuation in LGUs suffers from deficiencies in technical manpower, monitoring systems, and information technology infrastructure, resulting in outdated schedules of market values and potential revenue losses.

Furthermore, the lack of experienced assessors contributes to significant backlogs in data entry and assessment, impeding timely tax collection and potentially leading to revenue shortfalls. The same journal article emphasizes that the shortage of skilled staff and inadequate resources hinder the effective implementation of revenue generation programs in LGUs. Gonzales (2018) pointed out that manual property tax assessments in Laguna, as in many parts of the Philippines, have resulted in inefficiencies, delays, and errors in tax calculations. Bautista (2020) stressed that reliance on paper records causes discrepancies in property valuations, with backlogs arising from many properties needing assessment, particularly in growing municipalities like Calamba and Biñan.

Martinez (2019) further discussed how manual assessments have become increasingly problematic as urbanization grows and the number of properties rises. Local tax assessors often struggle to keep pace with new developments and ownership changes, impacting the accuracy and timeliness of tax assessments.

Johnson et al. (2016) suggest that computer-assisted systems enhance the efficiency of tax collection by automating valuation tasks, reducing human errors, and boosting transparency within the system. These systems can handle large datasets, track property value trends, and update assessments more regularly, leading to improved and fairer property tax systems. Lopez & Martinez (2013) highlighted that automation can lower operational costs for local governments, allowing them to allocate resources to other community services.

In the United States, several states have incorporated GIS into property tax assessments, simplifying the process of mapping and visualizing property values, locations, and zoning rules. Brown (2015) notes that GIS applications have greatly reduced the time and resources required for property tax assessments, enabling more precise and up-to-date valuations.

Property tax assessment is vital in financing local governments in the United States. Historically, real property taxes were assessed through manual processes, which required significant effort to evaluate property values and calculate tax obligations. However, with the growth of information technology, numerous jurisdictions have adopted computer-assisted property tax assessment systems to enhance efficiency, accuracy, and minimize human error (Graves & Denning, 2016).

Many local authorities have traditionally depended on manual property tax assessment systems. These systems require appraisers to physically inspect properties, input data, and use paper records to determine tax liabilities. Jackson and Patel (2016) note that this manual approach is susceptible to inconsistencies caused by human error and limited access to real-time information. Additionally, the administrative workload and inefficiencies make it challenging for local governments to manage tax assessments fairly and on time.

The move to computer-assisted property tax assessment systems has been motivated by the promise of greater efficiency and accuracy. For example, Computer-Assisted Mass Appraisal (CAMA) systems automate the processing of property data, using advanced models that factor in market trends and property features to determine fair market value. According to a study by Williams et al. (2016), CAMA systems greatly reduce the time and effort needed for property assessments, resulting in a more transparent and consistent process across different jurisdictions.

Numerous studies have evaluated the effectiveness of manual versus computer-assisted assessment methods. The findings show that computer-assisted systems generally exceed manual methods in accuracy and efficiency. For example, Clark et al. (2016) researched several U.S. counties and discovered that computerized systems reduced assessment errors by 15% while enhancing the speed of tax assessments. However, they also noted that the upfront costs of implementing these systems could be significant, potentially discouraging smaller jurisdictions from adopting them.

Although computer-assisted systems offer various benefits, challenges still exist. Thomas and Richards (2016) highlight that adopting CAMA systems demands substantial initial investments in technology and training. There are also ongoing concerns regarding data security and the risk of technical failures. Moreover, while these systems improve efficiency, they might not fully capture the detailed, localized expertise that human appraisers contribute to the assessment process (Harrison, 2016).

Many comparative studies have evaluated the effectiveness of manual versus automated property tax systems. Cameron and White (2016), in their analysis of Australia's tax assessment systems, found that manual systems in some rural areas suffered from inefficiency, lack of transparency, and delays. On the other hand, urban areas with automated systems saw notable improvements in the speed and accuracy of tax assessments, leading to higher tax revenue collection.

In a study conducted in South Africa, Olivier (2016) compared manual and computer-assisted property assessment methods used by municipalities. The findings showed that manual systems had a greater margin of error in property valuations, resulting in dissatisfaction among property owners. On the other hand,

computer-assisted assessments proved to be more accurate, minimizing property disputes and boosting public confidence in the tax system.

Although there are many advantages, switching to computer-assisted property tax systems presents certain challenges. Additionally, Chavez & Adams (2017) emphasized that these systems' success relies on the accuracy of data input, as incorrect data can result in inaccurate valuations and mistakes in tax calculations.

Conversely, Zhang & Li (2017) showed that the long-term advantages, including more precise valuations, enhanced transparency, and decreased administrative workload, greatly surpass the initial costs. Nations that have successfully implemented computer-assisted assessment systems have experienced higher tax compliance and a general boost in local government revenue collection efficiency.

Real Estate and Land Property Automated Valuation Systems" (2018): This study examines the use of automated valuation models (AVMs) in property assessments for real estate and land. It focuses on the implementation and effects of computer-assisted mass appraisal (CAMA) systems and examines how they influence property valuation practices.

Traditional manual assessments depend largely on human judgment and physical record-keeping, which can be time-consuming. Research indicates that errors in data entry, miscalculations, and inconsistent application of assessment criteria by humans can result in inaccuracies in tax assessments (Ashton, 2016).

Research has shown that computer-assisted systems enhance accuracy by utilizing standardized algorithms, automating data processing, and providing easy access to historical records (Liu & Wang, 2017). These systems minimize human errors and deliver more reliable outcomes.

Automated systems dramatically reduce the time needed for property valuations, tax computations, and bill generation (Garrison & Chu, 2018). Furthermore, they can integrate geospatial data, enabling more accurate assessments of property values based on factors like proximity to commercial zones. Although the initial investment in computer-assisted systems can be high, municipalities can save on labor costs and enhance service delivery over time. These systems also allow faster tax rate updates and property assessment updates (Williams & Ford, 2019).

Research comparing manual and computer-assisted property tax assessments has shown that technology improves accuracy and reduces human involvement (Zhang & Song, 2016). Computer-assisted systems were more efficient, with fewer errors and quicker processing times.

A study on adopting computer-assisted tax assessment in various municipalities found that regions using automated systems had higher on-time tax collections, greater customer satisfaction, and more accurate property valuations (Peterson et al., 2020). Despite the clear benefits of computer-assisted assessments, several studies have pointed out obstacles during implementation. Issues such as a lack of technical skills, employee resistance to change, and the costs of updating outdated infrastructure can delay the shift to digital systems (Ravi & Kumar, 2018).

Multiple studies have found that computer-assisted systems significantly improve processing time, accuracy, and the efficiency of tax revenue collection (Jones, 2017). These advantages are especially noticeable in large cities or areas with high transaction volumes.

Despite the many benefits, studies highlight several drawbacks of computer-assisted systems. Key concerns include issues related to data security, where sensitive information might be vulnerable to breaches, and the risk of system downtime, which can disrupt operations. Furthermore, the continuous need for updates and maintenance is an ongoing challenge, as outdated systems or software may become less effective and require significant resources to keep current (Howard & Williams, 2019). These factors emphasize the importance of balancing technological advancements with proper safeguards and ongoing support.

Olawale, O. (2016). "The Role of GIS and Computer-Assisted Systems in Efficient Property Taxation in Nigerian Local Governments." This paper explores how Geographic Information Systems (GIS) and automated technologies can enhance property tax assessments in Nigerian municipalities, advocating for the broad adoption of computer-assisted methods.

Gonzales et al. (2018) explored the implementation of automated tax systems in municipalities across Metro Manila. Their findings revealed that municipalities using computer-assisted systems experienced higher tax collection rates, attributed to improved data management and decreased tax evasion. However, they also noted significant challenges, including the high initial setup costs and the necessity for comprehensive staff training. These insights align with broader trends observed in other regions, where digitalizing tax systems has often led to increased efficiency and reduced corruption, but at the cost of initial investment and a learning curve for local authorities. Such findings underscore the importance of balancing technological advancements with adequate support mechanisms, such as funding and training, to ensure sustainable and equitable outcomes in tax administration.

The integration of computer-assisted systems in the assessment of real property taxes has become increasingly popular. In a study by Pangilinan (2017), municipalities in Metro Manila, including San Juan, were observed to be transitioning towards automated property tax systems. Pangilinan found that computer-assisted systems improved the accuracy of tax assessments and reduced the time spent on manual record-keeping. His study noted that the system's ability to analyze property information and calculate taxes quickly and accurately helped municipal tax assessors save time and reduce human error.

Salazar's (2016) study on adopting computer-assisted systems in Mindanao's municipalities highlights successes and challenges. The research found that while tax collection efficiency improved, there was a need for consistent training and capacity-building programs for local government unit (LGU) staff. This finding aligns with observations from other regions in the Philippines, where computerization has increased revenue collection and enhanced transparency. However, challenges such as limited infrastructure, digital literacy gaps, and resistance to change have also been reported, underscoring the importance of comprehensive training and support programs to ensure effective implementation and sustained use of e-Government initiatives.

Real property taxation is one of the primary sources of revenue for local government units (LGUs) in the Philippines, including cities like Parañaque. According to a study by Cruz (2015), effective tax assessment and collection systems are crucial to municipalities' financial sustainability. Cruz emphasized the need for modernized systems to improve revenue generation and public service. Municipalities in Metro Manila, including Parañaque, have long relied on manual systems, but this approach has proven inefficient in managing growing urban populations and complex property data.

The manual system for assessing real property taxes has been the standard practice in many municipalities, particularly in the early years of tax collection. In Parañaque, as in other localities, real property taxes were manually assessed through physical ledgers and documents (Santos, 2016). According to a study by Santos (2016), while the manual system was cost-effective and simple to operate, it was also highly prone to human errors, data retrieval inefficiencies, and assessment process delays. Santos noted that such issues led to slower revenue generation, which affected public service delivery in municipalities.

In his research, Santos elaborated that manual systems often resulted in discrepancies in property valuations and delayed billing processes, affecting taxpayers' trust in the local government. The lack of automation also made tracking changes in property ownership or value difficult, thus impeding tax collection efforts.

Adopting computer-assisted systems has been widely recognized as a solution to the inefficiencies associated with manual property tax assessment. A study by Pangilinan (2017) noted that computer-assisted systems have the potential to streamline the entire assessment and collection process, reducing errors and speeding up processing time. Pangilinan's research focused on several municipalities, including Parañaque, which implemented digital systems for property tax assessment. He found that the shift towards computer-assisted assessment systems led to significant improvements in accuracy and efficiency in processing real property tax records. The computerized systems introduced in cities like Parañaque allowed for faster property valuations, automatic calculation of tax liabilities, and a more transparent tax collection process (Pangilinan, 2017). Moreover, these systems facilitated online tax payments, reducing the need for in-person

visits to the local tax office and improving taxpayer convenience and compliance.

Several studies have highlighted the advantages of computer-assisted tax systems. Villanueva et al. (2016) conducted a comparative study of manual versus computerized systems in Metro Manila municipalities, including Parañaque. Their findings confirmed that municipalities transitioning to digital tax assessment systems saw higher tax collection rates, reduced tax evasion, and increased public satisfaction. Computer systems also allowed local governments to generate real-time reports and data analytics, which helped in policy-making and tax enforcement. Despite the numerous advantages, transitioning from manual to computer-assisted systems poses several challenges. Abad (2016) pointed out that municipalities in the Philippines often face budget constraints that make the transition to computerized systems difficult. The initial costs of implementing such systems, including software, hardware, and training, can be prohibitive for smaller municipalities.

In the case of Parañaque, a study by Tan and Ramos (2018) found that the city initially faced resistance from municipal employees who were accustomed to the manual systems. The transition required substantial training and technical support to ensure all stakeholders could handle the new system. Tan and Ramos (2018) highlighted the importance of investing in capacity building and continuous support to ensure the successful adoption of digital tax systems. In the case of Parañaque, a study by Tan and Ramos (2018) found that the city initially faced resistance from municipal employees who were accustomed to the manual systems. The transition required substantial training and technical support to ensure all stakeholders could handle the new system. Tan and Ramos (2018) highlighted the importance of investing in capacity building and continuous support to ensure the successful adoption of digital tax systems.

2. Methodology

This chapter contains the research design, subject of the study, population, sampling techniques, data gathering procedure, research instrument, and statistical treatment.

2.1. Research Design

This study employed a quantitative approach using a descriptive research design that incorporated both correlational and comparative methods. The quantitative approach enabled objective analysis of numerical data to identify variable relationships and group differences through correlational and comparative methods, offering a comprehensive understanding of the phenomena.

The research methodology outlined the systematic approach and procedures used in conducting the study, detailing how data were collected, analyzed, and interpreted. This involved comparing two or more groups based on certain criteria, such as efficiency, accuracy, cost, and user experience. For the study titled 'Comparative Study on the Manual and Computer-Assisted Assessment of Real Property Taxes in Victoria, Laguna,' the following methodology was employed.

This study utilized a descriptive research design to systematically collect information comparing manual and computer-assisted real property tax assessments in Victoria, Laguna. This approach helped to identify which was more accurate: the manual or computer-assisted assessment. The research used both quantitative and qualitative approaches. By integrating these methods, the study gathered valuable insights into the accuracy of tax assessments and customer satisfaction (Taxpayer Experience).

According to Cresswell (2014), descriptive research is a study that describes the characteristics of a population or phenomenon being studied. It is primarily used to gain an understanding of group phenomena. This involves collecting data through surveys, interviews, or observation.

Sugiyono (2015) states that quantitative methods based on positivist philosophy are used to examine

a particular population or sample, collect data using research instruments, and perform quantitative analysis/statistics to test a hypothesis.

2.2. Respondent of the Study

In the study comparing manual and computer-assisted assessments of real property taxes in Victoria, Laguna, the "respondents" likely included individuals or groups involved in the area's real property tax assessment process.

These respondents could have included property owners, residents, or business owners in Victoria, Laguna, who were subject to the real property tax assessments. They could have offered perspectives on how they perceive tax assessments, the accuracy, transparency, and fairness under both methods (manual vs. computer-assisted).

2.3. Sampling Techniques

The study targeted real property tax assessments in Victoria, Laguna, specifically focusing on manual assessments and those processed using computer-assisted systems.

The Stratified Random Sampling method was used to ensure that different types of properties (e.g., residential, commercial, industrial) were proportionally represented in the sample. By dividing the population into strata, the study compared how each property type was assessed using both methods.

The sample size 389 was determined using the Raosoft sample calculator, based on the total number of real property taxpayers per barangay in Victoria, Laguna. A 3% sample size was applied to each barangay as follows:

Name of Barangay	Total Number of Taxpayer per Barangay	3% of Taxpayers per Barangay
Nanhaya	2,478	44
San Roque	2,782	45
Banca-Banca	1,404	44
Daniw	345	40
Masapang	2,596	44
San Benito	473	41
Pagalangan	406	41
San Felix	398	45
San Francisco	3,556	45
Total	14,435	389

The number of respondents needed from each subgroup was determined based on the overall population distribution within each stratum. This was done using proportional allocation or equal allocation:

2.4. Research Procedure

Upon approval by the faculty of Laguna State Polytechnic University—Sta. Cruz Main Campus, the researcher first sought approval for the research procedure, which outlines the step-by-step process for conducting the study titled Comparative Study on the Manual and Computer-Assisted Assessment of Real Property Taxes in Victoria, Laguna.

The following outlines the procedure for conducting a comparative study between the manual and computer-assisted assessment of real property taxes in Victoria, Laguna, based on an action plan framework. The study aimed to evaluate the effectiveness, efficiency, accuracy, and challenges of both approaches, with a

focus on improving the real property tax (RPT) system.

The study sought to assess Victoria, Laguna's current real property tax assessment method, comparing the traditional manual approach with the computer-assisted assessment system. It aimed to determine the impact of these methods on the accuracy, time efficiency, and resource use in tax assessment.

2.5. Research Instrument

The primary instrument consisted of a structured survey questionnaire and semi-structured interview guides for qualitative data collection. Below is a detailed description of the research instrument components.

A research instrument for a comparative study between manual and computer-assisted assessment of real property taxes in Victoria, Laguna, was designed to effectively capture data related to the process and outcomes of these two assessment methods. The following sections provide a detailed framework for the research instrument, including qualitative and quantitative aspects.

Part I. Precision on Tax Assessment on Manual Assessment System- Encoding of Data on Book of Records, Maintaining Documents, Posting of Payment, Accessibility of Data, Updating Records. Part II. Precision on Tax Assessment on Computer-assisted Assessment System Part III. Customer Satisfaction – (Taxpayer Experience) on Tax Assessment on Manual Assessment System-Efficiency, Transparency, Accountability, Effectiveness, Accuracy. Part IV. Customer Satisfaction – (Taxpayer Experience) Efficiency, Transparency, Accountability, Effectiveness, Accuracy.

The research instrument was designed to collect data from tax assessors and taxpayers, comparing their experiences with manual versus computer-assisted real property tax assessment methods. It included a blend of surveys, checklists, and observational guides that covered the main variables of efficiency, accuracy, satisfaction, and cost. The results from this comparative study provided valuable insights into the effectiveness of digital transformation in local government services.

2.6. Statistical Data

The statistical treatment of data involved applying appropriate statistical methods to analyze the collected data, ensuring valid and reliable results that can support the research objectives. This section outlines the statistical techniques that will be utilized to analyze both quantitative and qualitative data obtained from the survey and interviews in the study titled "Comparative Study on the Manual and Computer-Assisted Assessment of Real Property Taxes in Victoria, Laguna."

The statistical treatment of data in this study utilized a combination of descriptive and inferential statistics to analyze quantitative survey responses, while qualitative data will be thematically analyzed. This comprehensive approach enabled the research to draw meaningful conclusions about Efficiency, Transparency, Accountability, Effectiveness, and Accuracy in Victoria, Laguna, ultimately contributing to recommendations for improvements. This comprehensive approach enabled the research to draw meaningful conclusions about Efficiency, Transparency, Accountability, Effectiveness, and Accuracy in Victoria, Laguna, ultimately contributing to recommendations for improvements.

The study utilized a mixed-methods approach, combining both quantitative and qualitative data analysis to explore key governance dimensions Efficiency, Transparency, Accountability, Effectiveness, and Accuracy in Victoria, Laguna. Descriptive and inferential statistics were employed to analyze the quantitative survey data, while thematic analysis was applied to the qualitative responses.

This comprehensive methodology allowed for a nuanced understanding of the governance landscape, providing a robust foundation for actionable recommendations. The integration of both statistical and thematic insights ensured a well-rounded exploration of the subject matter, enhancing the reliability and depth of the findings. By combining these complementary approaches, the study established an integrated analytical framework that brought together quantitative patterns and qualitative insights, enriching both the

interpretation and the practical applicability of the results.

Scale	Interval	Description	Verbal Interpretation
5	4.21-5.00	Strongly Agree	Very High (VH)
4	3.41-4.20	Agree	High (H)
3	2.61-3.40	Neutral	Moderately High (MH)
2	1.81-2.60	Disagree	Low (L)
1	1.00-1.80	Strongly Disagree	Very Low (VL)

3. Results and Discussion

This chapter presented, analyzed, and interpreted the data. The findings were tabulated and analyzed. The following data were interpreted using tables and figures to shed light on and better understand the study's results.

Table 1. Level of Precision of Tax Assessments in terms of Manual Assessment System for Encoding of Data in the Books of Record

Indicator	<i>M</i>	<i>SD</i>	Interpretation
1. The data encoded into the manual tax assessment system is accurate.	4.02	0.74	High
2. The manual data encoding process ensures that all tax-related information is recorded without errors during the encoding process	4.01	0.69	High
3. The manual encoding of data allows for quick retrieval and correction of information when needed.	3.94	0.78	High
4. The manual system data encoding process effectively minimizes discrepancies in tax assessments.	4.03	0.71	High
5. There is a transparency in the manual tax assessment process due to computer system data encoding.	2.07	0.74	High
Overall Mean	3.61		High

Legend: $n=389$. This means is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 1 presents the level of precision of tax assessments in terms of the Manual Assessment System, specifically focusing on the Encoding of Data in the Books of Record.

Among the specific indicators, the highest-rated statement was that the manual data encoding process effectively reduced discrepancies in tax assessments ($M = 4.03$, $SD = 0.71$), showing that respondents recognized the manual system's ability to reduce inconsistencies in tax-related data. Similarly, the statement, "Data entered into the manual tax assessment system is precise and accurate," received a rating of ($M = 4.02$, $SD = 0.74$). However, the statement, "Manual encoding of data allows for quick retrieval and correction of information when needed," received a slightly lower score ($M = 3.94$, $SD = 0.78$), which may have indicated some limitations in the speed and efficiency of data retrieval and correction within the manual system. Additionally, the statement, "There is transparency in the manual tax assessment process due to computer system data encoding," ($M = 2.07$, $SD = 0.74$) was interpreted as low, emphasizing that while the system was rated as precise, concerns about transparency persisted, possibly due to the absence of automated tracking features.

The overall mean of 3.61 indicated that while the manual tax assessment system was perceived as accurate and effective in recording tax-related data, it faced challenges regarding data retrieval, correction speed, and transparency compared to more automated systems. These insights highlighted the manual system's strengths while pointing to areas that could benefit from improvements or digital enhancements. In contrast to the results, Pangilinan (2016) pointed out that inaccurate property valuations, often caused by manual mistakes, impacted local government units' (LGUs) ability to finance public services. This underscored the need for a balanced approach, where the manual system's strengths were maintained. Still, digital solutions were introduced to mitigate the risks associated with human error and improve the accuracy of critical functions like property valuation.

Table 2. Level of Precision of Tax Assessments in terms of Manual Assessment System for Maintaining Document Storage in the Books of Records

Indicator	<i>M</i>	<i>SD</i>	Interpretation
1. The data encoded into the manual tax assessment system is accurate.	4.17	0.70	High
2. The manual data encoding process ensures that all tax-related information is recorded without errors during the encoding process	4.17	0.70	High
3. The manual encoding of data allows for quick retrieval and correction of information when needed.	4.14	0.74	High
4. The manual system data encoding process effectively minimizes discrepancies in tax assessments.	4.03	0.76	High
5. There is a lack of transparency in the manual tax assessment process due to computer system data encoding.	2.03	0.77	High
Overall Mean	3.71		High

Legend: $n = 389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 2 presents the level of precision of tax assessments in terms of the Manual Assessment System regarding document storage in the books of records.

The highest-rated statements were that data encoded into the manual tax assessment system was accurate and that all tax-related information had no errors in the encoding process ($M = 4.17$, $SD = 0.71$). It was also stated that the manual data encoding process allowed for quick retrieval and correction of information when needed ($M = 4.14$, $SD = 0.74$) and that it was still effective in reducing discrepancies in tax assessments ($M = 4.03$, $SD = 0.76$). The lowest-rated statement, described as low, was regarding transparency in the manual tax assessment process due to computer system data encoding ($M = 2.03$, $SD = 0.77$). This concern was echoed by Garcia and Mendoza (2017), who emphasized the inherent limitations of manual systems in promoting open and accountable tax processes. The absence of automated audit trails and real-time data access limits the ability of stakeholders to verify assessments, thereby reducing public trust in the system. Regarding the level of precision of tax assessments in the Manual Assessment System, specifically regarding the maintenance of document storage in the Books of Records, the overall weighted mean of 3.71 was considered a high level of precision. However, the transparency of the tax assessment process remained a problem.

In contrast to the result of maintaining documents storage in the books of records, Chaves (2016) claims that a lack of contemporary technology instruments to expedite the procedure is why many local government units (LGUs) experience backlogs in tax assessments.

Table 3. Level of Precision of Tax Assessments in terms of Manual Assessment System as well as the Posting of Payment

	Indicator	<i>M</i>	<i>SD</i>	Interpretation
1.	The manual payment posting process ensures that all payments are correctly recorded.	4.15	0.75	High
2.	Payment postings are completed promptly and accurately in the manual system.	3.94	0.72	High
3.	The manual system offers a reliable way to track and verify payments.	4.04	0.79	High
4.	I am satisfied with the level of accuracy in the manual system in both tax assessment and payment posting.	4.07	0.73	High
5.	Manual postings of payments are subject to regular checks to ensure accuracy.	4.01	0.75	High
Overall Mean		4.04		High

Legend: $n=389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 3 presents the Precision of Tax Assessments regarding the Manual Assessment System and the Posting of payments. All of the indicators had a high level of precision. The highest rated, with ($M = 4.15$, $SD = 0.75$), stated that the manual payment posting process ensures the correctness of the data. It also indicated that the respondents are satisfied with the manual system in terms of its level of accuracy, reliability for tracking ($M = 4.07$, $SD = 0.73$), verifying payments ($M = 4.04$, $SD = 0.79$), and regular monitoring ($M = 4.01$, $SD = 0.75$). The lowest rated among the indicators, but still with a high description, is about timely and accurate payment posting ($M = 3.94$, $SD = 0.72$). Although the result stated that the precision is high, contrary to the study of Arias (2015), manual systems are prone to poor administration, processing delays, and inconsistent data, which commonly result in lost revenue for local governments. Additionally, scalability and the ability to manage massive volumes of property tax data are limited by the reliance on human labor, especially in rapidly expanding urban regions.

Table 4. Level of Precision of Tax Assessments in terms of Manual Assessment System for Accessibility of Data

	Indicator	<i>M</i>	<i>SD</i>	Interpretation
1.	Data required for tax assessments is readily accessible in the manual assessment system.	4.11	0.68	High
2.	I can quickly retrieve the necessary information using the manual system.	4.03	0.68	High
3.	The process of retrieving tax records is efficient and time-saving in the manual system.	3.90	0.77	High
4.	The data presented in the manual system is organized in a way that is easy to navigate.	4.00	0.72	High
5.	I have no difficulties in accessing and understanding the data in the manual system.	3.93	0.75	High
Overall Mean		4.00		High

Legend: $n=389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 4 shows that the data required for tax assessments is readily accessible in the manual assessment system, which is the highest rated, with a mean = 4.11 ($SD = 0.68$). The manual system can

quickly retrieve needed information ($M = 4.03$, $SD = 0.68$), and the data presented is arranged simply to explore ($M = 4.00$, $SD = 0.72$). There are no challenges in reaching and understanding the information ($M = 3.93$, $SD = 0.75$), and retrieving tax records is efficient and time-saving in the manual system ($M = 3.90$, $SD = 0.77$).

The overall weighted mean of 4.00 signifies high precision in tax assessments regarding data accessibility within the manual system. While the data is generally considered accessible and organized well, the efficiency of retrieving tax Records and the time saved in the process are seen as slightly less optimal, particularly compared to more modern, digital systems. This suggests that while the manual system achieves a reasonable level of effectiveness in organizing and presenting tax data, there are inherent limitations in speed and ease of access compared to digital alternatives.

Therefore, improvements in data retrieval methods could enhance efficiency and further streamline the process. The level of precision of tax assessments in terms of the manual assessment system and accessibility of data, with an overall weighted mean of 4.00, is described as a high level. Bautista (2020) emphasized that dependence on paper documentation results in inconsistencies in property evaluations, with delays occurring due to the high volume of properties requiring assessment, especially in expanding municipalities such as Calamba and Biñan, which contradict the result.

This indicates that hidden inefficiencies remain despite the current system's perceived efficiency. This highlights the need to modernize data retrieval for greater consistency and scalability, especially in rapidly growing areas. Such modernization would streamline operations and enhance the system's ability to adapt to future demands.

Table 5. Level of Precision of Tax Assessments in terms of Manual Assessment System as well as Updating Records

	Indicator	<i>M</i>	<i>SD</i>	Interpretation
1.	The manual system promptly updates tax records when new information is provided.	4.00	0.74	High
2.	Tax records are regularly updated in the manual system to maintain accuracy.	3.94	0.76	High
3.	Errors in updating tax records using the manual system are corrected promptly, ensuring the accuracy of assessments.	4.11	0.76	High
4.	The manual system provides sufficient detail to ensure an accurate tax assessment for each taxpayer.	4.13	0.76	High
5.	The manual system process of updating tax records is done promptly to ensure tax assessments reflect the most current information.	3.93	0.75	High
Overall Mean		4.02		High

Legend: $n = 389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 5 presents the level of precision of tax assessments in terms of a manual assessment system focusing on updating records.

The table shows that the manual system provides sufficient detail to ensure an accurate tax assessment for each taxpayer ($M = 4.13$, $SD = 0.76$). Additionally, by using manual system the errors are corrected promptly ($M = 4.11$, $SD = 0.76$), updates tax records when new information is provided ($M = 4.00$, $SD = 0.74$), tax records are regularly updated ($M = 3.94$, $SD = 0.76$), and reflected the current information by updating records promptly ($M = 3.93$, $SD = 0.75$).

The overall weighted mean is 4.02, indicating that the respondents believed that the manual assessment system, as described, is highly precise regarding updating records. The manual assessment system

satisfied all of the indicators of accuracy, updated records, and sufficiency.

The result shows that a manual system effectively updates records despite its many challenges. Ocampo (2017) stated that conventional manual evaluations depend on human assessment and physical documentation when handling significant quantities of data.

Table 6. Level of Precision of Tax Assessments in terms of Computerized Assessment System for Encoding of Data in the System

Indicator	<i>M</i>	<i>SD</i>	Interpretation
1. The data encoded into the computer-assisted tax assessment system is accurate.	4.23	0.69	Very High
2. The computer-assisted assessment system ensures that all tax-related information is recorded without errors during encoding.	4.14	0.75	High
3. The computer-assisted system encoding of data allows for quick retrieval and correction of information when needed.	4.22	0.70	Very High
4. The computer-assisted assessment system data encoding process effectively minimizes discrepancies in tax assessment.	4.21	0.72	Very High
5. There is a transparency in the computer tax assessment process due to computer-assisted assessment data encoding.	1.98	0.75	High
Overall Mean	3.76		High

Legend: *N*= 389. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 6 presents the level of precision of tax assessments in terms of the computerized assessment system, specifically focusing on the Encoding of Data in the System.

Among the specific indicators, the highest-rated statement was that the data encoded into the computer-assisted tax assessment system is accurate ($M = 4.23$, $SD = 0.69$). This means that respondents strongly believe in the accuracy of the computerized system.

Similarly, the computer-assisted system encoding of data allows for quick retrieval and correction of information when needed ($M = 4.22$, $SD = 0.70$), and the computer-assisted assessment system data encoding process is effective in minimizing discrepancies in tax assessment ($M = 4.21$, $SD = 0.72$), also received very high ratings.

The computer tax assessment process also lacks transparency due to computer-assisted assessment data encoding scored ($M = 4.02$, $SD = 0.75$). This indicates that while respondents acknowledge the system's accuracy and efficiency, there may still be concerns regarding transparency in how data is processed and stored.

The overall mean score of 3.76 indicates that respondents generally perceive the computerized system as effective in ensuring accuracy, efficiency, and reliability in tax assessment data encoding. However, concerns regarding transparency suggest that further improvements in system accessibility and openness may enhance user confidence in the assessment process.

Based on the results, the computerized assessment system's data encoding is highly precise. That is why the Bureau of Local Government Finance (BLGF) has initiated measures to digitize property databases to reduce manual mistakes and improve the precision of property tax evaluations (Bagabaldo, 2016).

Table 7. Level of Precision of Tax Assessments in terms of Computerized Assessment System for Maintaining Document Storage in the System

Indicator	<i>M</i>	<i>SD</i>	Interpretation
1. The computer-assisted assessment system ensures that all tax documents are properly stored and easily accessible.	4.21	0.74	VH
2. The computer-assisted system has a systematic approach to organizing tax-related documents in the storage system.	4.19	0.76	H
3. The computer document storage system effectively safeguards important documents from loss or damage.	4.13	0.72	H
4. I am confident that the computer system automatically updates and maintains stored documents.	4.25	0.67	VH
5. The computer system has sufficient security features to protect stored tax documents from unauthorized access.	4.18	0.75	H
Overall Mean	4.19		H

Legend: $n = 389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 7 shows the precision of tax assessments regarding the computerized assessment system's maintenance of document storage

The respondents are confident that stored documents are automatically updated and maintained in the computer system ($M = 4.21$, $SD = 0.74$). The computer-assisted assessment system ensures that all tax documents are properly stored and easily accessible ($M = 4.21$, $SD = 0.74$).

Two indicators mark a very high description of maintaining document storage in the system. Additionally, with high descriptions, the computer-assisted system has a systematic approach to organizing tax-related documents in the storage system ($M = 4.21$, $SD = 0.74$), sufficient features to protect the data ($M = 4.18$, $SD = 0.75$), and enough capability to safeguard the stored data from loss or damage ($M = 4.13$, $SD = 0.72$).

The overall weighted mean of 4.19 indicates a very high description of the level of precision of tax assessment in terms of the computerized assessment system in maintaining document storage. This means the respondents highly believed the data is safe in the computerized assessment system.

The results are why numerous local government units (LGUs) have started integrating technology to overcome manual evaluation limitations. Initiatives utilizing automated systems and Geographic Information Systems (GIS) have been integrated to improve property data management and assessment accuracy (Bagabaldo, 2016).

Additionally, adopting digital tools has enhanced property tax collection efficiency and improved assessment process transparency, reducing human errors and minimizing fraud risks. Studies have shown that LGUs leveraging GIS technology can more accurately map properties, determine land values, and streamline data retrieval, leading to better planning and decision-making.

Furthermore, using automated systems allows for real-time updates, making it easier for local government officials to monitor changes in property data and quickly address issues such as discrepancies or under-assessments (Perez et al., 2018).

These technological advancements contribute to optimizing revenue collection and foster more informed and equitable urban development strategies. **In turn, this enhances transparency and public trust, as citizens are more likely to perceive property assessments as fair and data-driven.**

Table 8. Level of Precision of Tax Assessments in terms of Computerized Assessment System for Posting of Payment

	Indicator	<i>M</i>	<i>SD</i>	Interpretation
1.	The computer-assisted system ensures accurate posting of payments.	4.34	0.72	Very High
2.	Payment postings in the computer system are completed promptly.	4.15	0.67	High
3.	The computer system offers a reliable way to track and verify payments.	4.24	0.71	Very High
4.	I am satisfied with the level of accuracy in the computer system in both tax assessment and payment posting.	4.20	0.74	High
5.	Computer system postings of payments are subject to regular checks to ensure accuracy.	4.12	0.75	High
Overall Mean		4.21		Very High

Legend: $n=389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 8 presents the precision of tax assessments regarding the computerized assessment system for payment posting.

The table indicates that the respondents have confidence in the computer-assisted system in ensuring the accuracy of payment posting, with ($M = 4.34$, $SD = 0.72$), and consider it the highest rated among the indicators. Additionally, it offers dependable tracking and verifying payment ($M = 4.34$, $SD = 0.72$). The respondents are satisfied with the level of accuracy of both tax assessment and payment posting ($M = 4.20$, $SD = 0.74$). The payment postings are real-time ($M = 4.15$, $SD = 0.67$) and are monitored regularly to maintain the accuracy of the posting of payments ($M = 4.12$, $SD = 0.75$).

The overall weighted mean of 4.21 demonstrates a good result. This indicates that the tax assessments, in terms of the computerized assessment system and the posting of payments, are carried out with very high precision. For this reason, and to overcome the drawbacks of human assessments, numerous local government units (LGUs) have started implementing technology and shifting from traditional manual assessments to computer-assisted systems. Bagabaldo (2016) emphasized that shifting from traditional methods to digital platforms significantly improves the efficiency and reliability of tax operations.

Similarly, the integration of computerized systems in local government unit (LGU) tax administration has been shown to bring significant improvements. De Guzman and Magno (2019) emphasized that such systems enhance transparency and reduce human error in payment processing and assessment. Complementing this, Dela Cruz and Cabaluna (2020) noted that automation strengthens audit trails and accountability, essential for effective public financial management.

Building on these insights, Reyes and Morales (2021) highlighted that real-time data processing expedites transactions and fosters greater taxpayer trust and satisfaction. These findings underscore the critical role of automated systems in improving efficiency, accuracy, and public confidence in tax administration.

The literature suggests that integrating modernized, automated solutions with real-time capabilities can be a foundational strategy for addressing current inefficiencies and future scalability challenges. This strategic shift aligns with global best practices and positions tax administrations to be more responsive, transparent, and resilient in an increasingly data-driven environment.

Table 9. Level of Precision of Tax Assessments in terms of Computerized Assessment System as to Accessibility of Data

	Indicator	<i>M</i>	<i>SD</i>	Interpretation
1.	Data required for tax assessments is easily accessible in the computer-assisted system.	4.23	0.72	Very High
2.	I can retrieve the necessary information quickly when using the computer system.	4.23	0.77	Very High
3.	The process of retrieving tax records is efficient and time-saving in the computer system.	4.22	0.75	Very High
4.	The data presented in the computer system is organized in a way that is easy to navigate.	4.15	0.74	High
5.	I have no difficulties in accessing and understanding the data in the computer system.	4.17	0.73	High
Overall Mean		4.20		High

Legend: $N=389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 9 presents the Level of Precision of Tax Assessments in terms of the Computerized Assessment System regarding data Accessibility.

The table outlines the respondents' confidence in the computerized assessment system, since three of the five indicators are rated very high. Using this system, the data needed for tax assessment is easily accessible ($M = 4.23$, $SD = 0.72$), and the user can retrieve necessary information immediately ($M = 4.23$, $SD = 0.77$). The process of retrieving tax records is considered efficient and time-saving. Moreover, the data are organized ($M = 4.15$, $SD = 0.74$) and have no difficulties accessing and understanding the data ($M = 4.17$, $SD = 0.73$).

The positive consensus among respondents regarding data accessibility in computer-assisted systems is shown in the results with an overall weighted mean of 4.20. It is also the basis why the Philippine government's e-Government had a Master Plan, which calls for automating local government procedures, including real property tax assessments, to expedite data processing and simplify tax collection, to improve the accessibility of the data (Ocampo, 2016).

Table 10. Level of Precision of Tax Assessments in terms of Computerized Assessment System as to Updating Records

	Indicator	<i>M</i>	<i>SD</i>	Interpretation
1.	The computer system promptly updates tax records when new information is provided.	4.24	0.78	Very High
2.	Tax records are automatically updated in the computer system to maintain accuracy.	4.28	0.72	Very High
3.	Errors in updating tax records using the computer system are corrected automatically, ensuring the accuracy of assessments.	4.01	0.73	High
4.	The computer system provides sufficient detail to ensure an accurate tax assessment for each taxpayer.	4.12	0.73	High
5.	The computer system process of updating tax records is done promptly to ensure tax assessments reflect the most current information.	4.33	0.69	Very High
Overall Mean		4.20		High

Legend: $n=389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 10 depicts the respondents' evaluation of updating records in the computerized assessment system.

The indicator with the highest rating ($M = 4.33$, $SD = 0.69$) stated that tax records are updated in a timely manner to ensure tax assessments reflect the most current information. The second indicator, with a slightly lower score, stated that tax records are automatically updated in the computer system ($M = 4.28$, $SD = 0.72$).

Additionally, the computer system promptly updates tax records when new information arrives ($M = 4.24$, $SD = 0.78$), and the data are also sufficient to maintain the accuracy of the tax assessment for each taxpayer ($M = 4.12$, $SD = 0.73$). The lowest score, but still a positive result, reported errors are automatically corrected ($M = 4.01$, $SD = 0.73$).

Furthermore, respondents expressed positive feedback regarding using computer-assisted systems to update records with a high description and an overall weighted mean of 4.20. In this regard, the system effectively updates records regarding sufficiency, recent information, and accuracy. This positive sentiment is reflected in the enhanced functionality of automated systems, which streamline maintaining up-to-date records and provide real-time data for decision-making.

Moreover, the system guarantees accurate information capture, minimizing errors and enhancing data management quality. Integrating technology, particularly through automated property tax databases and computerized systems, has significantly improved tax collection efforts in some local governments in the Philippines.

These advancements have led to more efficient operations, reduced instances of tax evasion, and improved transparency (Sarmiento, 2016). By enhancing the accuracy and accessibility of records, these systems have facilitated better tax management and promoted greater accountability and trust in the tax collection process. As a result, these technological innovations contribute to more sustainable fiscal practices and improved governance at the local level.

Table 11. Level of Customer Satisfaction in terms of Manual Assessment System as to Efficiency

Indicator	M	SD	Interpretation
1. The manual tax assessment system process was clear and easy to understand.	3.98	0.77	High
2. The time it took for the manual tax assessment process was reasonable.	3.89	0.75	High
3. The manual tax assessment system provided accurate results.	4.01	0.77	High
4. I am confident that the manual system handles my tax information accurately and efficiently.	4.09	0.71	High
5. The manual assessment system meets my expectations.	4.00	0.70	High
Overall Mean	4.00		High

Legend: $n = 389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 11 presents the level of customer satisfaction regarding the Manual Assessment System's efficiency.

Among the specific indicators, the highest-rated statement about confidence in the manual system's ability to handle tax information accurately and efficiently ($M = 4.09$, $SD = 0.71$) reflects a strong trust in the system's ability to manage tax-related data effectively. However, slightly lower scores were observed for the process of the manual tax assessment system, which was clear and easy to understand ($M = 3.98$, $SD = 0.77$), and "The time it took for the manual tax assessment process was reasonable" ($M = 3.89$, $SD = 0.75$). These

results emphasize that some respondents may have experienced challenges with the clarity and timeliness of the manual tax assessment process. The overall mean score of 4.00 indicates that respondents are generally satisfied with the efficiency of the manual tax assessment system. However, minor concerns regarding clarity and processing time indicate potential areas for streamlining the process and improving communication to enhance customer satisfaction. This trust aligns with Alm's (2019) assertion that taxpayer confidence in a system's data accuracy significantly enhances voluntary compliance. Thus, even without automation, the system fosters a sense of reliability among its users. Alm (2019) emphasized that taxpayer confidence in a system's ability to manage data accurately increases voluntary compliance.

Furthermore, delays and a lack of procedural clarity may negatively affect user experience, as James and Alley (2017) suggested, who emphasized the importance of transparent and timely processes in tax administration. Accuracy in managing tax information is a fundamental expectation among taxpayers, as it directly affects their financial obligations and compliance behavior.

The highest-rated item in the findings, confidence in the manual system's ability to handle tax information both accurately and efficiently, aligns with this notion and suggests that, despite its manual nature, the system inspires a degree of trust among users, potentially due to familiarity, established routines, or consistent performance over time. Users' strong confidence in the manual tax system reflects trust built on familiarity, consistent performance, and a sense of transparency and control qualities they may find lacking in automated alternatives. Such preferences suggest that any shift toward automation must not only match but visibly demonstrate these valued qualities to gain similar levels of trust. This enduring trust may also indicate that users prioritize transparency and control, which manual systems are often perceived to offer more readily than automated alternatives.

Table 12. Level of Customer Satisfaction in terms of Manual Assessment System as to Transparency

Indicator	<i>M</i>	<i>SD</i>	Interpretation
1. The manual tax assessment process was clear and transparent.	4.12	0.71	High
2. The process of the manual assessment system was easy to follow.	4.00	0.75	High
3. I am confident that the manual assessment system process is fair and unbiased in handling tax assessments.	3.93	0.76	High
4. I felt that I was treated fairly during the manual tax assessment.	4.04	0.76	High
5. I am satisfied with the transparency of the manual assessment system.	4.10	0.75	High
Overall Mean	4.04		High

Legend: $n = 389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 12 shows customer satisfaction with the transparency of the manual assessment system.

The table underscores the customer satisfaction with the manual assessment. It was clear and transparent ($M = 4.12$, $SD = 0.71$). The customers are satisfied with the transparency of the manual assessment system ($M = 4.10$, $SD = 0.75$). The respondents felt treated fairly during the manual assessment ($M = 4.04$, $SD = 0.76$), and the process was easy to follow ($M = 4.00$, $SD = 0.75$). The lowest score among the indicators stated that the process is fair and unbiased in handling tax assessments ($M = 3.93$, $SD = 0.76$).

Interestingly, the customers are generally satisfied, with a weighted mean of 4.04 in terms of transparency, when using manual assessment. This implies that the generally high satisfaction with transparency indicates that the manual assessment process is perceived as fair and understandable. However,

the lower score for the perception of fairness and impartiality highlights the need to demonstrate objectivity and openness in assessments to maintain trust.

The above-mentioned findings are in congruence with the fact that transparency in tax administration improves taxpayer confidence and compliance by reducing perceptions of bias and corruption (OECD, 2020). Similarly, Feld and Frey (2007) stressed that perceived fairness and clear procedures are directly linked to higher taxpayer morale.

Table 13. Level of Customer Satisfaction in terms of Manual Assessment System as to Accountability

	Indicator	<i>M</i>	<i>SD</i>	Interpretation
1.	The tax assessments are consistent and fair on manual assessment.	3.98	0.79	High
2.	Tax authorities are more accountable for manual assessment.	4.09	0.76	High
3.	The manual system ensures that the tax assessment is fair and free from bias.	4.04	0.73	High
4.	I am more satisfied with the level of accountability in the tax assessment on the manual assessment system.	4.12	0.77	High
5.	The manual system allows me to access relevant tax assessment information.	4.01	0.75	High
Overall Mean		4.05		High

Legend: $n=389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 13 presents the level of customer satisfaction regarding accountability in the manual assessment system.

The results show that customers using manual assessment are more satisfied with the level of accountability ($M = 4.12$, $SD = 0.77$), feel that tax authorities are more accountable ($M = 4.09$, $SD = 0.76$), and feel that tax assessments are unbiased ($M = 4.04$, $SD = 0.73$). Additionally, with a slightly lower score, the respondents can easily access relevant information regarding tax assessments through the manual system ($M = 4.01$, $SD = 0.75$) and still believe the system is consistent and fair ($M = 3.98$, $SD = 0.79$). Based on the results, it is evident that respondents are highly satisfied with the manual assessment system, particularly in terms of accountability, which garnered a general mean of 4.05. This high level of satisfaction indicates that the system is perceived as transparent and just, responsible for handling tax-related concerns. Such positive feedback highlights the trust respondents place in the manual assessment process, especially regarding the integrity and accountability of the authorities involved. While the manual assessment system received high satisfaction ratings overall, information accessibility emerged as an area needing further improvement. Enhancing information access is crucial to fostering greater transparency and empowering taxpayers. This aligns with Kirchler's (2007) findings that perceived fairness and accountability significantly influence tax compliance. Braithwaite (2017) also emphasized that improved access to tax information boosts satisfaction and encourages compliance. Together, these studies highlight that when taxpayers perceive the system as fair and well-informed, they are more likely to comply voluntarily, suggesting that transparency and equity are key drivers of cooperative tax behavior. Users' confidence in manual tax systems stems from familiarity, consistent performance, and a sense of transparency and control qualities often seen as lacking in automated alternatives. This suggests a strong preference for systems perceived as fair and transparent. Braithwaite (2017) similarly found that better access to tax information increases satisfaction and compliance. Together, these insights indicate that transparency and equity drive cooperative tax behavior, and any move toward automation must uphold these values to sustain public trust.

Table 14. Level of Customer Satisfaction in terms of Manual Assessment System as to Effectiveness

	Indicator	<i>M</i>	<i>SD</i>	Interpretation
1.	I feel confident that the manual system's tax calculations are correct.	4.02	0.74	High
2.	The manual system for tax assessment is more efficient than the computer-assisted assessment system.	3.88	0.77	High
3.	I trust the security and privacy of my personal information in the manual system.	4.17	0.74	High
4.	The manual tax assessment system provided me with adequate support and assistance when needed.	4.13	0.72	High
5.	I am satisfied with the effectiveness of the manual tax assessment system.	4.07	0.73	High
Overall Mean		4.05		High

Legend: $n=389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 14 shows the level of customer satisfaction regarding the manual assessment system's effectiveness. Among the indicators, the table shows that the highest score reflects customers' trust in the security and privacy of personal information within the manual system ($M = 4.17$, $SD = 0.74$). The second-highest rating emphasizes the adequacy of support and assistance provided by the manual system ($M = 4.13$, $SD = 0.72$). Notably, customers also express satisfaction with the system's overall effectiveness ($M = 4.07$, $SD = 0.73$) and demonstrate confidence in the accuracy of its tax calculations ($M = 4.02$, $SD = 0.74$). The lowest score indicates a belief that the efficiency of the manual assessment system surpasses that of the computerized system. With an overall weighted mean of 4.05, it is evident that respondents remain highly satisfied with the manual assessment system, particularly its effectiveness.

However, the lower score regarding efficiency compared to digital systems highlights a potential openness to incorporating technology. As noted by Alm (2019), confidence in the privacy and accuracy of tax systems plays a critical role in fostering compliance.

Similarly, the OECD (2020) emphasizes that integrating digital solutions can enhance efficiency while maintaining strong data security, indicating that a balanced approach combining manual and digital systems may be the most beneficial path forward.

Table 15. Level of Customer Satisfaction in terms of Manual Assessment System as to Accuracy

	Indicator	<i>M</i>	<i>SD</i>	Interpretation
1.	The Manual Assessment System provides accurate tax calculations.	3.96	0.75	High
2.	I have not experienced any errors in the Manual Assessment System's calculation.	3.87	0.75	High
3.	The data entered into the manual system is consistently processed with accuracy.	3.98	0.77	High
4.	I trust the accuracy of the tax assessment results from the Manual Assessment System.	4.10	0.72	High
5.	I am satisfied with the overall accuracy of the Manual Assessment System.	4.09	0.74	High
Overall Mean		4.00		High

Legend: $n=389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 15 presents a level of customer satisfaction regarding the accuracy of the manual assessment system.

The table indicates that the customers believed the accuracy of the tax assessment results ($M = 4.10$, $SD = 0.72$) is the highest rated among the indicators. Consistent with a slightly lower score, the customers were satisfied with the overall accuracy of the manual assessment system ($M = 4.09$, $SD = 0.74$). In connection with the second-highest score indicator, the manual assessment system provides accurate tax calculations ($M = 3.96$, $SD = 0.75$), and the data entered is processed with accuracy consistently ($M = 3.98$, $SD = 0.77$). The customers did not experience any errors in using the manual assessment system ($M = 3.87$, $SD = 0.75$), which ranked lowest among all of the indicators regarding accuracy.

Accurate tax assessment is vital in ensuring customer satisfaction, as inaccuracies risk compliance complications and erode trust in tax authorities (Kira, 2017). This highlights the importance of precision in fostering a reliable tax environment. The high mean score for tax assessment accuracy ($M = 4.10$, $SD = 0.72$) indicates that customers trust the manual system's precision in processing tax results.

However, lower scores for error-free experiences suggest areas for further quality checks and validation. Users' confidence in manual tax systems stems from familiarity, consistent performance, and a sense of transparency and control qualities often seen as lacking in automated alternatives. This suggests a strong preference for systems perceived as fair and transparent. Braithwaite (2017) similarly found that better access to tax information increases satisfaction and compliance.

This implies reinforcing procedural accuracy while gradually integrating error-detection protocols to enhance trust and operational reliability. Accordingly, accuracy in tax assessment is a critical determinant of customer satisfaction, as errors may lead to compliance issues and reduced trust in tax authorities (Kira, 2017). **Such measures not only improve operational efficiency but also foster greater confidence in the fairness and consistency of the tax system.**

Table 16. Level of Customer Satisfaction in terms of Computer-Assisted Assessment System as to as to Efficiency.

Indicator	<i>M</i>	<i>SD</i>	Interpretation
1. The process of computer-assisted assessment system was clear and easy to understand.	4.19	0.75	High
2. The computer system minimizes the time required for me to complete the tax assessment.	4.28	0.73	Very High
3. The computer-assisted assessment system provided accurate results.	4.21	0.73	Very High
4. I am confident that the computer system handles my tax information both accurately and efficiently.	4.16	0.75	High
5. The computer-assisted assessment system meets my expectations.	4.21	0.74	Very High
Overall Mean	4.21		Very High

Legend: $n = 389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 16 presents the level of customer satisfaction regarding computer-assisted systems and efficiency.

Among all indicators, the highest rated statement indicates that the computer-assisted system lessens the time required to complete tax assessment ($M = 4.28$, $SD = 0.73$). Secondly, the computer-assisted system provides accurate results ($M = 4.21$, $SD = 0.73$). Additionally, the customers believed it met all expectations ($M = 4.21$, $SD = 0.74$). The respondents were convinced that the computer-assisted assessment system process was clear and easy to understand ($M = 4.19$, $SD = 0.75$) and had confidence that the system handled tax

information accurately and efficiently ($M = 4.16$, $SD = 0.75$).

Based on the results, the respondents have positive responses about the efficiency of the computer-assisted system. The weighted mean of 4.21, which is described as very high, indicates that customers are highly satisfied. The high overall mean ($M = 4.21$) confirms that computer-assisted systems deliver faster, clearer, and more reliable service than manual systems. Customers appreciate time savings and efficiency improvements, highlighting the value of digitizing tax services. This is in congruence with a study by Shareef et al. (2011), which found that e-government systems significantly improve operational efficiency and customer satisfaction in public services.

Table 17. Level of Customer Satisfaction in terms of Computer-Assisted Assessment System as to Transparency.

Indicator	<i>M</i>	<i>SD</i>	Interpretation
1. The computer-assisted assessment was clear and transparent.	4.19	0.77	High
2. The process of computer-assisted assessment system was easy to follow.	4.37	0.67	Very High
3. I am confident that the computer-assisted assessment system process is fair and unbiased in handling tax assessments.	4.13	0.73	High
4. I felt that I was treated fairly during the computer-assisted assessment.	4.14	0.75	High
5. I am satisfied with the transparency of the Computer-assisted Assessment System.	4.15	0.69	High
Overall Mean	4.20		High

Legend: $n = 389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 17 presents the customer satisfaction regarding the computer-assisted system and its transparency.

The statement “The process of the computer-assisted assessment system was easy to follow” was rated highest ($M = 4.37$, $SD = 0.67$). Secondly, the computer-assisted assessment system was clear and transparent ($M = 4.19$, $SD = 0.77$). The customers are satisfied with the transparency ($M = 4.15$, $SD = 0.69$). The customers also felt treated fairly ($M = 4.14$, $SD = 0.75$) and consistently believed the fairness and unbiasedness of the computer-assisted system ($M = 4.13$, $SD = 0.73$). Overall, the results indicate a high level of satisfaction with the computer-assisted assessment system. The highest-rated statement was “The process of the computer-assisted assessment system was easy to follow” ($M = 4.37$, $SD = 0.67$), suggesting that users found the system intuitive and user-friendly. Additionally, respondents agreed that the system was clear and transparent ($M = 4.19$, $SD = 0.77$), with a similar level of satisfaction reflected in their perception of transparency ($M = 4.15$, $SD = 0.69$). Furthermore, users felt they were treated fairly throughout the process ($M = 4.14$, $SD = 0.75$) and consistently believed in the system's fairness and impartiality ($M = 4.13$, $SD = 0.73$). These results collectively highlight a strong trust in the system's clarity, fairness, and ease of use. Furthermore, it clearly shows that the customers are satisfied with the computer-assisted system, with an overall weighted mean of 4.20, which is considered high. This indicates that digitization increases openness and public confidence in tax assessment processes. In a similar trend, Grimmelikhuijsen (2012) found that perceived transparency in online systems enhances citizen trust and satisfaction.

Table 18. Level of Customer Satisfaction in terms of Computer-Assisted Assessment System as to Accountability.

	Indicator	<i>M</i>	<i>SD</i>	Interpretation
1.	The tax assessments are consistent and fair on computer-assisted assessment.	4.13	0.70	High
2.	I feel that tax authorities are more accountable on computer-assisted assessment.	4.15	0.67	High
3.	The computer system ensures that the tax assessment is fair and free from bias.	4.02	0.76	High
4.	I am more satisfied with the level of accountability in the tax assessment on computer-assisted assessment system.	4.05	0.74	High
5.	I can easily access relevant information regarding my tax assessments through the computer system.	4.20	0.71	High
Overall Mean		4.11		High

Legend: $n=389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 18 presents the customer satisfaction with the computer-assisted system regarding accountability.

The customers depict perceptions regarding the accountability of the computer-assisted system. The highest-rated indicator stated that any relevant information regarding tax assessment through a computer-assisted system is highly accessible ($M = 4.20$, $SD = 0.71$), suggesting that transparency is a key strength of the system. Closely following this, respondents believe that tax authorities demonstrate greater accountability through the use of computer-assisted assessments. The second-highest-rated statement follows it, "I feel that tax authorities are more accountable on computer-assisted assessment" ($M = 4.15$, $SD = 0.67$).

Additionally, the system is consistent and fair ($M = 4.13$, $SD = 0.70$), which is why the respondents are more satisfied with its level of accountability ($M = 4.05$, $SD = 0.74$). The lowest score, but still in the category of high description, stated that the computer-assisted system is fair and unbiased ($M = 4.02$, $SD = 0.76$), indicating that while there is slight variation, public confidence in digital accountability remains strong. Collectively, these results point to the positive impact of digital tools on fostering transparent, reliable, and equitable public service processes. The results show customer satisfaction, with an overall weighted mean of 4.11 in the computer-assisted system regarding accountability. This implies a shift toward digital accountability as a driver of public service satisfaction. Jaeger and Bertot agree that "digital systems foster accountability by enhancing record-keeping, traceability, and accessibility of public information" (2010).

Table 19. Level of Customer Satisfaction in terms of Computer-Assisted Assessment System for Effectiveness

	Indicator	<i>M</i>	<i>SD</i>	Interpretation
1.	I feel confident that the computer system's tax calculations are correct.	4.15	0.75	High
2.	The computer-assisted assessment system for tax assessment is more efficient than the manual assessment system.	4.22	0.66	Very High
3.	I trust the computer system's security and privacy of my personal information.	4.14	0.70	High
4.	The computer tax assessment system provided me with adequate support and assistance when needed.	4.14	0.75	High
5.	I am satisfied with the effectiveness of the computer-assisted tax assessment system.	4.15	0.69	High
Overall Mean		4.16		High

Legend: $n=389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 19 underscores the effectiveness of the computer-assisted system in terms of customer satisfaction.

The customers believed that the computer-assisted tax assessment was much better than the manual assessment ($M = 4.22, SD = 0.66$), and it is the only indicator with a very high description. There are two indicators with the same mean but slightly different standard deviations. The customers are confident in the correctness of the tax calculations ($M = 4.15, SD = 0.75$) and satisfied with their effectiveness ($M = 4.15, SD = 0.69$).

There are also two indicators with the lowest scores. The first indicator in the lowest stated that “The computer tax assessment system provided me with adequate support and assistance when needed” ($M = 4.14, SD = 0.75$) and followed by slightly consistent in terms of scores is the trust of the customers in the security and privacy of the personal information of the customers ($M = 4.14, SD = 0.70$). While these scores remain relatively high, their position at the lower end of the spectrum suggests that users value not just performance, but also support and data protection, highlighting potential areas for enhancement.

The results depict the customers' positive responses with an overall weighted mean of 4.16, which is in the high level category. This means that the customers are highly satisfied with the effectiveness of the computer-assisted system. Carter and Weerakkody (2008) stressed that effectiveness and perceived usefulness are key determinants of citizen satisfaction in digital service contexts. The high satisfaction level reflects the system’s ability to meet customer expectations, reinforcing the importance of these factors in driving positive user experiences. Therefore, the system's effectiveness ensures users feel satisfied and confident in its utility.

Table 20. Level of Customer Satisfaction in terms of Computer-Assisted Assessment System as to as to Accuracy

Indicator	<i>M</i>	<i>SD</i>	Interpretation
1. The Computer-assisted Assessment System provides accurate tax assessment results.	4.14	0.72	High
2. I trust the accuracy of the computer-assisted tax assessments the system generates.	4.17	0.73	High
3. The data entered the computer system is consistently processed with accuracy.	4.19	0.71	High
4. I trust the accuracy of the tax assessment results from the Computer-assisted Assessment System	4.26	0.68	Very High
5. I am satisfied with the overall accuracy of the Computer-assisted Assessment System.	4.34	0.67	Very High
Overall Mean	4.22		Very High

Legend: $n = 389$. This mean is interpreted as follows: 4.21-5.00 (Very High); 3.41-4.20 (High); 2.61-3.40 (Moderately High); 1.81-2.60 (Low); 1.00-1.80 (Very Low)

Table 20 presents the level of customer satisfaction in terms of computer-assisted assessment system and accuracy.

Two indicators are in the category of very high description. Firstly, the customers were satisfied with the overall accuracy of the computer-assisted assessment system ($M = 4.34, SD = 0.67$). The second indicator stated that the customers trusted the accuracy of the system's results ($M = 4.26, SD = 0.68$). The other three indicators are also in the category of high description.

One of the three statements, “The data entered into the computer system is consistently processed accurately” ($M = 4.19, SD = 0.71$). The fourth one is the customers’ trust in the accuracy of the tax assessment using the computer-assisted assessment ($M = 4.17, SD = 0.73$). The lowest scores among all indicators stated that the respondents believed in the accuracy of the tax assessment results provided by the system ($M = 4.14, SD = 0.72$). Overall, the synthesis of these findings suggests that users generally perceive the computer-

assisted assessment system positively, particularly its accuracy and reliability. The consistently high scores across all indicators reflect strong user trust and satisfaction, suggesting the system effectively meets its intended goals. Interestingly, the computed overall weighted mean of 4.22 depicts the customers' satisfaction with the accuracy of the computer-assisted tax assessment, implying that consistency in data processing and belief in accurate tax assessments reflect growing public trust in digital systems.

These results align with existing studies indicating that digital systems enhance accuracy and reduce human error in tax administration (Kebede et al., 2020). Automation minimizes calculation mistakes and improves data integrity (OECD, 2019). Similarly, Devas and Delay (2006) argued that using computerized systems in tax operations leads to better service quality, higher satisfaction, and improved public confidence in government processes. These findings emphasize the critical role of digital accuracy in shaping positive user perceptions, suggesting that sustained investment in reliable automated systems can significantly strengthen institutional trust and service delivery in the public sector. Strengthening accuracy in these systems can boost user trust and satisfaction, leading to more efficient and transparent governance.

Table 21. Test of the Relationship Between Manual Precision of Tax Assessment on Customer Satisfaction

Manual Assessment System	Customer Satisfaction				
	Efficiency	Transparency	Accountability	Effectiveness	Accuracy
Encoding of data	.960** Very Strong	.935** Very Strong	.931** Very Strong	.950** Very Strong	.945** Very Strong
Maintaining of documents	.926** Very Strong	.915** Very Strong	.939** Very Strong	.953** Very Strong	.922** Very Strong
Posting of payment	.951** Very Strong	.944** Very Strong	.951** Very Strong	.963** Very Strong	.944** Very Strong
Accessibility of data	.944** Very Strong	.932** Very Strong	.949** Very Strong	.934** Very Strong	.934** Very Strong
Updating Records	.963** Very Strong	.933** Very Strong	.946** Very Strong	.968** Very Strong	.951** Very Strong

Note: *Significant at $p < .05$, ** Significant at $p < .01$, *** Significant at $p < .001$

Table 21 presents the correlation coefficients between different aspects of the manual assessment system and five dimensions of customer satisfaction, such as efficiency, transparency, accountability, effectiveness, and accuracy. The correlation coefficients are tested for significance, with $p < .001$ indicating a highly significant relationship. The findings indicate that encoding of data, maintaining of documents, posting of payment, accessibility of data, and updating records all exhibit very strong relationships with customer satisfaction metrics ($p < .001$), showing that these factors play a crucial role in ensuring an efficient and reliable manual assessment system. The consistently high correlation values imply that improvements in these areas enhance customer satisfaction by increasing efficiency, transparency, accountability, effectiveness, and accuracy. These results highlight the importance of accurate data encoding, proper document management, timely posting of payments, accessible records, and consistent record updates in delivering a well-functioning and satisfactory tax assessment process. According to Bird and Zolt (2008), the integrity of manual administrative processes plays a pivotal role in citizen satisfaction and compliance. Even in manual settings,

well-maintained records, timely updates, and accessible services are fundamental to fostering public trust (Fjeldstad & Heggstad, 2012).

Table 22. Relationship Between Computerized Precision of Tax Assessment of Customer Satisfaction

Computerized Assessment System	Customer Satisfaction				
	Efficiency	Transparency	Accountability	Effectiveness	Accuracy
Encoding of data	.922** Very Strong	.883** Very Strong	.913** Very Strong	.938** Very Strong	.945** Very Strong
Maintaining of documents	.963** Very Strong	.893** Very Strong	.896** Very Strong	.933** Very Strong	.935** Very Strong
Posting of payment	.933** Very Strong	.874** Very Strong	.908** Very Strong	.936** Very Strong	.935** Very Strong
Accessibility of data	.966** Very Strong	.932** Very Strong	.936** Very Strong	.943** Very Strong	.954** Very Strong
Updating Records	.959** Very Strong	.923** Very Strong	.924** Very Strong	.947** Very Strong	.947** Very Strong

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

Table 22 presents the correlation coefficients between different aspects of the computerized assessment system and five dimensions of customer satisfaction, such as efficiency, transparency, accountability, effectiveness, and accuracy.

The correlation coefficients are tested for significance, with $p < .001$ indicating a highly significant relationship. The findings indicate that computerized encoding of data, maintaining documents, posting of payment, accessibility of data, and updating records all exhibit very strong relationships with customer satisfaction metrics ($p < .001$).

The consistently high correlation values emphasize that the computerized system enhances efficiency, transparency, accountability, effectiveness, and accuracy in tax assessment.

Among the different aspects, Accessibility of Data shows the highest correlations across multiple customer satisfaction dimensions, particularly with Efficiency ($r = .966$) and Accuracy ($r = .954$). This implies that the computerized system significantly improves data retrieval and precision, improving overall customer satisfaction. These results emphasize the benefits of automation in tax assessment, particularly in improving data accuracy, record maintenance, and transaction efficiency, ultimately leading to a more effective and transparent assessment process. These findings support the growing evidence that digital tax systems improve operational efficiency and customer satisfaction (Kasipillai & Liew, 2005; OECD, 2019). As Kloeden (2011) noted, accessible, accurate, and timely tax information enhances taxpayer compliance and public service delivery.

Moreover, integrating advanced technologies in tax administration ensures greater transparency, enabling authorities to offer clearer communication and more accurate reporting, further strengthening automated systems' overall effectiveness in promoting fair and reliable tax systems."

Table 23. Relationship Between Computerized Precision of Tax Assessment of Customer Satisfaction

Variables	Manual		Computerized		t crit	t	P
	M	SD	M	SD			
Encoding of data	3.99	0.73	4.16	0.73		-3.68	0.001**
Maintaining of documents	4.10	0.74	4.19	0.73		-1.93	0.054**
Posting of payment	4.04	0.75	4.21	0.72	1.65	-3.47	0.001**
Accessibility of data	4.00	0.72	4.20	0.74		-4.27	0.001***
Updating of records	4.02	0.76	4.20	0.74		-3.58	0.001**

Note: $n = 389$. * $p < .5$, ** $p < .01$, *** $p < .001$

Table 23 compares the precision of tax assessment between the Manual Assessment System and the Computer-Assisted Assessment System for real property taxes, as respondents perceive. The analysis examines differences across five key variables such as encoding of data, maintaining of documents, posting of payment, accessibility of data, and updating of records.

The results indicate that the computerized assessment system is perceived as significantly more precise than the manual assessment system across multiple variables. In terms of encoding of data ($t = -3.68$, $p < .001$), respondents rated the computerized system ($M = 4.16$, $SD = 0.73$) higher than the manual system ($M = 3.99$, $SD = 0.73$), emphasizing improved data accuracy. Similarly, for posting of payment ($t = -3.47$, $p < .001$), the computerized system ($M = 4.21$, $SD = 0.72$) was considered significantly more precise than the manual system ($M = 4.04$, $SD = 0.75$).

Among all variables, Accessibility of Data ($t = -4.27$, $p < .001$) exhibited the largest difference, with the computerized system ($M = 4.20$) rated notably higher than the manual system ($M = 4.00$), emphasizing the advantage of digital records in providing easier and faster access to tax assessment information. Updating of Records ($t = -3.58$, $p < .001$) also showed a significant difference, with the computerized system ($M = 4.20$, $SD = 0.74$) outperforming the manual system ($M = 4.02$, $SD = 0.76$), highlighting the efficiency of automated updates.

However, for maintaining documents ($t = -1.93$, $p = .054$), the difference was marginally significant, with respondents showing only a slight preference for the computerized system ($M = 4.19$) over the manual system ($M = 4.10$). While this concludes that automation contributes to better document management, the improvement may not be as pronounced as in other areas.

This is consistent with international studies noting that e-government systems improve data access and tax processing efficiency (Bird & Zolt, 2008; OECD, 2019). Computerized assessments minimize delays and errors, improving service quality and user satisfaction (Kloeden, 2011). Nonetheless, as Fjeldstad and Heggstad (2012) argue, digitization alone does not guarantee success; operational controls and user training are equally critical to realizing its full benefits.

Description

The **Action Plan for Implementing a 100% Computer-Assisted Tax Assessment System in Victoria, Laguna**, aims to transition the Local Government Unit (LGU) from a manual to a fully digital tax assessment process. This shift is necessary to enhance accuracy, efficiency, transparency, and security in tax-related transactions.

The plan includes procuring and integrating digital tax assessment tools, digitizing existing tax records, training LGU personnel in technology and data management, and establishing a monitoring system to ensure sustainable implementation.

The LGU seeks to improve service delivery, minimize errors, and safeguard critical tax data by adopting a computer-assisted system.

Objectives

1. **Enhance Precision in Tax Assessment** – Fully implement a digital tax assessment system to ensure accuracy in data encoding, record maintenance, payment processing, and data accessibility.
2. **Secure and Preserve Tax Records** – Convert all existing tax records into digital format and establish a secure backup system to prevent data loss or damage.
3. **Improve Staff Competency in Digital Systems**—Conduct comprehensive training for LGU employees to enhance their technical skills and ensure smooth system operation and data standardization.
4. **Increase Efficiency and Transparency** – Streamline the tax assessment process to reduce processing time, improve taxpayer experience, and enhance accountability in revenue collection.
5. **Ensure Long-Term System Sustainability** – Establish a monitoring and evaluation framework to assess system performance, gather feedback, and implement necessary upgrades for continuous improvement.

Action Plan for Implementing a 100% Computer-Assisted Tax Assessment System in Victoria, Laguna

Component	Action Steps	Responsible Unit	Timeline	Budget Allocation (PHP)
1. Full Implementation of Computer-Assisted Tax Assessment System	Procure necessary hardware and software for a fully digital tax assessment system. Integrate all tax-related records into the system. Conduct testing and troubleshooting before full implementation.	LGU Victoria, IT Department, Finance Office	6–12 months	2,000,000 (Software & Hardware) + 500,000 (Implementation & Troubleshooting) = 2,500,000
2. Digitization of Tax Records	Scan and convert all existing tax records into digital format. Establish a secure cloud-based or local backup system. Implement cybersecurity measures to protect digital data.	LGU Victoria, Records Management Office, IT Department	4–8 months	1,000,000 (Digitization Equipment & Storage) + 300,000 (Cybersecurity & Maintenance) = 1,300,000
3. Training for LGU Staff on Technology and Data Standardization	Organize training sessions on using the new system, cybersecurity, and data management. Partner with IT experts or institutions to facilitate training. Develop a standardized procedure for data entry and maintenance.	LGU HR Department, IT Department, External Training Providers	3–6 months	500,000 (Training Modules & Trainers) + 200,000 (Allowances & Materials) = 700,000
4. Monitoring and	Conduct regular	LGU Victoria, IT	Ongoing	200,000 (System

Component	Action Steps	Responsible Unit	Timeline	Budget Allocation (PHP)
Evaluation	assessments of the system’s efficiency and security. Gather feedback from staff and taxpayers. Adjust policies and procedures based on evaluation results.	Department, Internal Audit Team	((Quarterly Reviews)	Upgrades & Assessments) + 100,000 (Survey & Feedback Mechanism) = 300,000
				Total Estimated Budget: PHP 4,800,000

4. Summary of Findings, Conclusion, and Recommendations

This chapter presents the researcher's summary of findings, conclusion, and proposed recommendations.

4.1. Summary Findings

This research study compared the manual and computer-assisted methods used in assessing real property taxes in Victoria, Laguna. Real property tax assessment is crucial for local government units, as it directly affects revenue generation for public services and development projects.

Most of the respondents were still satisfied with the level of precision of tax assessment using the manual assessment system in terms of encoding data in the books of record, maintaining document storage in the books of records, posting of payment, accessibility of data, and updating records. However, the computer-assisted system’s tax assessment level of precision had much higher scores in terms of encoding data in the books of record, maintaining document storage in the books of record, posting of payment, accessibility of data, and updating records.

The customers were highly satisfied with the taxpayer experience regarding the manual assessment system, efficiency, transparency, accountability, effectiveness, and accuracy. Additionally, the taxpayer experience using the computer-assisted system was very highly satisfied with efficiency and accuracy. Transparency, accountability, and effectiveness marked high satisfaction in the computer-assisted system.

The research findings showed that data encoding, document maintenance, payment posting, data accessibility, and record updating exhibit strong positive relationships with customer satisfaction when accessing tax using a manual assessment system.

The study's results demonstrate that customer satisfaction with the computer-assisted tax assessment system positively correlates with data encoding, document maintenance, payment posting, data accessibility, and record updating. All of the variables have very strong positive relationships.

The results indicate that the computerized assessment system is perceived as significantly more precise than the manual assessment system in terms of encoding data in the books of record, maintaining document storage in the books of record, posting payment, making data accessible, and updating records.

4.2. Conclusions

The study confirms that real property tax assessment is essential for local government revenue and development.

While respondents were satisfied with the precision of the manual assessment system, the computer-assisted system showed higher precision across all key aspects: data encoding, document maintenance, payment posting, data accessibility, and record updating.

Customer satisfaction was high for the manual system, particularly regarding efficiency, transparency, accountability, effectiveness, and accuracy. However, satisfaction was very high for efficiency and accuracy in the computer-assisted system.

There is a very strong positive relationship between customer satisfaction and key factors of tax assessment (data encoding, document maintenance, payment posting, data accessibility, and record updating) in both manual and computerized systems. The computerized assessment system is perceived as significantly more precise than the manual one, reinforcing automation's advantages in tax assessment processes.

4.3. Recommendations

Based on the research findings, the following recommendations can be proposed:

- 1) The LGU of Victoria, Laguna, encouraged the shift to a 100% computer-assisted assessment system since it is more precise than the traditional one.
- 2) All of the LGU of Victoria, Laguna's data regarding tax records are suggested to have digital copies as duplicates to protect the existing data.
- 3) The staff and employees of the LGU of Victoria, Laguna, are encouraged to attend training on improving technological skills and data standardization.

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