Running head: CENTRALIZATION MANAGEMENT SYSTEM

**DEVELOPMENT OF A MID-LEVEL CENTRALIZATION**

**MANAGEMENT SYSTEM FOR CITY OF MANILA**

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**Abstract**

This study that is set to develop a mid-level centralization management system for city of Manila aims to build a system that will centralize and automate manual processes in the City Hall of Manila to simplify them and make the transactions between the government and its citizens much easier. The system is currently being developed in Visual Studio Code that uses Hypertext Markup Language, Cascading Style Sheet, Tailwind CSS, Javascript, and React.js for the frontend while uses Node.js, Express.js, Vite, and MySQL Workbench for the backend.

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* The Researchers

# TABLE OF CONTENTS

**Page**

Title Page i

Approval Sheet ii

[Abstract iii](#_TOC_250013)

[Acknowledgment iv](#_TOC_250012)

[Table of Contents v](#_TOC_250011)

Chapter 1 THE PROBLEM AND ITS SETTING 1

[Introduction 1](#_TOC_250010)

[Objectives of the Study 3](#_TOC_250009)

[Scope and Limitation of the Study 5](#_TOC_250008)

[Chapter 2 CONCEPTUAL FRAMEWORK 8](#_TOC_250007)

Review of Related Literature 8

[Related Studies 29](#_TOC_250006)

[Conceptual Model of the Study 33](#_TOC_250005)

[Operational Definition of Terms 34](#_TOC_250004)

[Chapter 3 METHODOLOGY 35](#_TOC_250003)

[Project Design 35](#_TOC_250002)

[Project Development 41](#_TOC_250001)

[Operation and Testing Procedures 43](#_TOC_250000)

|  |  |  |
| --- | --- | --- |
| Evaluation Procedure |  | 49 |

|  |  |  |
| --- | --- | --- |
| **References** |  | 82 |

**Chapter 1**

# THE PROBLEM AND ITS SETTING

# Introduction

The rapid advancement of technology in the modern period has an influence on practically every aspect of our lives. Technology's widespread spans numerous fields, influencing our professional undertakings, leisure activities, communication channels, and core worldviews.

It is crucial to become aware of the wide-ranging effects of this worldwide technological spread as we move toward a future where technology is essential. Municipal systems and governmental activities are one of pivotal points in this complicated tapestry of global technological transformation (Marcos, M., 2021). Significant advancements have been made as a result of the digital revolution, including increased administrative effectiveness, service delivery optimization, and civic engagement. We can observe the substantial effects of digital innovation on community management and governance in this dynamic technological environment.

Competency and transparency of municipal governance are critical to increasing a community's prosperity and quality of life. Municipalities are significant organizations tasked to keep the city, provide services, and protect all of the persons residing inside their boundaries. As towns grow and take on more duties, the requirement for durable systems that maximize various activities like revenue collection becomes critical.

Based on the study “The right tools for digitizing government payments”. Improving payment practices can help improve government and municipality efficiency, public welfare, and economic activity. Governments can encourage financial inclusion by influencing how receivers receive payments, such as requiring payments to be made into an account or a pre-paid card. Digitizing government payments and collections can assist policymakers in achieving these objectives. (Sarkar, A., 2017).

Rapid digital transformation is increasing the demand for faster, easier, and data-rich business solutions. Local governments are likewise embracing this changing trend to meet the needs of their growing communities. As a result, several towns are looking for ways to transition into the future with updated payment solutions (Brick, M. Di Paolo, G., Sagan A., 2021). According to the article Municipality Management System by (MultiFrames, 2023), implementing an integrated and comprehensive solution for municipal operations offers numerous benefits. It increases efficiency and effectiveness in day-to-day operations, improves decision support by integrating asset management data, and enhances service to constituents despite limited resources. The flexibility and affordability of starting with a few areas or implementing a comprehensive solution that spans all aspects of operations are advantageous. By integrating organizational data into a single, user-friendly database, the system enables easy access to information and empowers users with robust GIS capabilities. It facilitates faster insight into assets through map queries, improves interdepartmental coordination, and aids regulatory compliance. Streamlining communications, document management, and data maintenance results in more efficient work processes. The system provides a centralized point of access to integrated data and enables coordination with other departments. Additionally, it enhances output by generating high-quality maps and facilitating the preparation of standard reports quickly and easily.

The centralization of the municipal system aims to provide much better efficiency, convenience, and transparency. By implementing the system, municipalities can improve service delivery by simplifying their financial operations, improving the citizen experience, and optimizing resource allocation. The system is a significant advancement in modernizing municipal management, ensuring sustainable growth, and strengthening communities.

**Objectives of the Study**

The general objective of the study is to modernize and eliminate the time-consuming and exhausting way of processing the city hall documents.

Specifically, it aims to:

1. Design and develop a Web-based system called Development of a Mid-Level Centralization Management System for City of Manila with the following capabilities:
2. Use verification module for verifying registered users online.
3. Provide a user profile to the users.
4. Centralized data management for city administration, enabling efficient access and organization of crucial information.
5. Provide SMS notification for users.
6. Use AI chatbots to assist users with their needs.
7. Provides E wallet module to users.
8. Enable residents to view and pay their bills and taxes online, integrating with various utility providers and municipal services.
9. Financial management and budget tracking to facilitate responsible fiscal oversight and planning.
10. Public communication and engagement features to promote transparency and interaction with residents.
11. Document and record management for easy storage, retrieval, and archival of important documents.
12. Geospatial mapping and data visualization to aid in decision-making based on location.
13. Customer support and issue resolution to address resident inquiries and concerns.
14. Integration with city services and utilities.
15. Create the system as designed;
    1. Programming Language:

JavaScript

* 1. Full Stack Framework:

Node Js, React Js

* 1. Front End Tools:

React Js, Vite, Tailwind

* 1. Back End Tools:

HTML, My SQL Workbench

* 1. Database Management System:

My SQL

* 1. Package Manager:

Node Package Manager

* 1. Version Control:

GitHub

* 1. IDE:

Visual Studio Code (VS Code)

* 1. Testing and Debugging:

React Query DevTools

1. Test and improve the system in terms of functionality and reliability.
2. Determine the level of acceptability of the system using ISO 25010 software evaluation instrument in terms of functional sustainability and reliability.

**Scope and Limitations of the Study**

This study aims to create a Mid-Level Centralization Management System for the City of Manila. Its overall goals include developing a customized MLCMS, the possibility of centralization, and conducting an in-depth analysis of its possible impacts on operational efficiency, cost-effectiveness, and service delivery. The research focuses on developing and implementing the MLCMS. It will analyze many variables such as which administrative functions can be centralized, the technology required, how government operations may change, the use of E-wallets on tax payments, and how this may affect city residents.

The study will take place solely in the city of Manila. Data will be collected from several departments of the city government as well as relevant stakeholders. The group under study will include employees and service recipients who are involved in or affected by administrative centralization to gather insights and obtain generalizable conclusions.

This study may face several limitations. First, the complex political and bureaucratic context in Manila may provide implementation issues that we may not fully address. Due to project difficulties, the schedule for our research may alter, affecting data collection. Because of the city's size and variety, generalizing our findings may be difficult, and the results may be influenced by data access and cooperation levels from government departments and stakeholders. Technical difficulties in constructing the MLCMS may limit our capacity to deliver a comprehensive solution.

**Chapter 2**

**CONCEPTUAL FRAMEWORK**

This chapter presents related literature and studies that the researchers have used to support and serve as valid bases of the study.

**Review of Related Literature**

***Centralization Management System***

According to Ford (2023), property managers can save time and money through centralization, particularly by using online payment solutions. The report underscores the benefits of centralizing key property management functions, such as tenant services and property upkeep, to enhance tracking and oversight, ultimately improving operational efficiency while controlling expenses.

Centralized management attributes can, in the meantime, provide you with the means to define the management dynamics in your workplace and improve your understanding of how it can positively impact your success (Indeed, 2022). Centralized management involves the exclusive delegation of planning and decision-making authority to the top executives of an organization. Its main features include the significant involvement of high-level management, a concentration of decision-making at the upper levels, and a structured framework tailored for smaller organizations.

According to MasterClass (2022), a centralized management system offers several advantages. It facilitates swift decision-making with reduced need for prolonged discussions or disputes, streamlines business procedures by cutting down on the time spent in developing and documenting decision-making processes, and minimizes the effort required for standardization in lower-level management systems. Additionally, centralization is conducive to fostering a shared vision and a unifying sense of purpose within the organization, simplifying the alignment of its objectives.

In their 2022 work, Uster and Cohen delve into the delicate balance between centralization and local autonomy. Nevertheless, there is a scarcity of studies that critically examine how local authorities react when they are dissatisfied with policies coming from the central government. The results of their research shed light on the dynamics between local and central governments, underscoring the "do-it-yourself" approach. While this approach has the potential to bolster political participation and increase the local government's role in public policy, it also opens the door for local stakeholders to engage in activities of questionable legality. To address this, decision-makers at the central government level could take measures to curb such behaviors, which would result in the strengthening of administrative institutions, improved regulatory enforcement, and the enhancement of local autonomy, political culture, transparency, and integrity.

***Centralized Payment System***

The benefits of a centralized payment system are numerous. First, they stress how convenient such systems are for merchants because they are simple to integrate and manage. They can provide merchants with a variety of options, enabling them to choose solutions that meet their needs. Additionally, especially in small organizations, payers frequently find it simpler to administer the centralized system than receivers. The authors also point out that established payment methods are advantageous for centralized payment systems since they reduce the need for technical support and troubleshooting. However, there are drawbacks as well. Being trustworthy is a major concern since the centralized nature of these systems leaves them open to unauthorized changes or data tampering. The study's cost analysis shows that centralized solutions are typically more expensive than decentralized ones, which is another important disadvantage. A frequent issue is the delay in payment receipt, with manual processing contributing to lengthier processing times. Large-scale organizations that handle high payment volumes and a variety of payment methods may find this delay to be particularly bothersome. The literature also raises questions about the security of finances, arguing that larger organizations may not always be adequately protected by centralized methods (Hossain et al., 2020).

Jackson's (2023) study on centralized workforce management systems complements this theme by discussing the advantages of centralization in staffing management activities. It emphasizes how centralization can simplify processes and reduce errors that result from manual data transfer between systems. Centralizing data from various aspects of workforce management, including payroll, scheduling, compliance, and more, can lead to greater synergy across systems.

Small business proprietors may prefer a decentralized approach to company management, particularly when their operations heavily rely on employee creativity. With decentralized control, employees can actively engage in a more democratic structure, collaborating on refining ideas to enhance processes and products before presenting them to the business owner, as discussed in Bianca's 2019 article.

According to Sai et al.’s 2021, increasing integration of blockchain technology in information systems is evident. This article underscores the necessity for a more profound comprehension of centralization's socio-technical aspects.  The findings of this study, different means of measuring centralization, also point out the absence of measurement techniques in these research studies. Such an enriched understanding of centralization becomes pivotal for illuminating the security and performance consequences that arise when introducing a decentralized approach based on blockchain technology within established information systems. Moreover, the adoption of blockchain-driven decentralization introduces a distinct critical facet, specifically, the governance of the decentralized system.

Local government transaction management has risen to prominence in the field of public administration in recent years. The processing of numerous activities and services that local governments offer to their citizens, such as tax collecting, permit issuing, public services, and more, is referred to as transaction management. In the past, these activities were frequently spread out among several divisions or units within local government entities, which resulted in disjointed data and workflows. In the first place, centralization is seen as a potent tool for simplifying procedures. Local governments may get rid of overlaps and redundancy by combining various transaction activity. For instance, a centralized system can act as a single point of data collection and administration rather than several departments gathering and storing the same data. This consolidation streamlines the procedure and cuts down on inefficiencies and operating expenses (Smith, 2017).

The case study focuses on the initiatives taken by New York City to consolidate transactional procedures within the municipal administration. A difficult task, transaction management involves different functions including tax collecting, permits, and licensing in a metropolis as big and complicated as New York. In the past, these tasks were frequently handled by several departments and organizations, which might result in inefficiencies, incorrect data, and a lack of coordination in the provision of services. For other municipalities confronting comparable difficulties, New York City's effective centralization of transactional operations serves as a role model. It shows that centralization may result in significant benefits in productivity, data accuracy, and service quality even in big, complicated metropolitan areas. The case study also highlights how important it is to use change management techniques and technological investments to successfully make the switch to a centralized system (Harris, 2020).

Factors such as the benefits, user-friendliness, and individual confidence significantly influence how consumers perceive and adopt e-payment services. Interestingly, even though trust and security show a strong correlation, they do not significantly impact consumers' perceptions. Enhancing the advantages, usability, and self-assurance associated with e-payment systems, as recommended by Alyabes in 2018, can promote better consumer perception and adoption.

Payment systems play a crucial role in enhancing transaction efficiency and facilitating cross-border digital service sales. The COVID-19 pandemic has underscored the importance of digitized tax administration for the safety of tax authorities and taxpayers, as well as efficient tax collection for economic recovery. However, challenges like internet connectivity, reliable payment infrastructure, and public attitudes toward digital payments need to be addressed for successful implementation. Overcoming these challenges is essential to maximize the benefits of centralized payment processes and ensure efficient tax collection in municipalities ("The Role of Payment Systems in Philippine Tax Administration," 2020).

***E-Government Website Features***

It stated that eGovernment initiatives offer governments a fantastic opportunity to provide better and faster services to their users from the public in the age of information and communications technology. However, several crucial factors, including website usability, play a significant role in whether these projects succeed in meeting their objectives. The purpose of their study is to assess how usable Taiwan's present e-government websites are. The findings show that the target e-government websites have a variety of usability issues. These findings can direct designers' focus toward developing more usable e-government websites by assisting them in identifying the usability requirements of users (Chang & Almaghalsah, 2020).

The drawbacks associated with e-government encompass issues such as unequal accessibility to the internet, information reliability, concealed government motives, excessive surveillance, financial implications, and restricted access for specific demographics. These potential disadvantages, including unequal internet access, information reliability, hidden government agendas, heightened surveillance, financial concerns, and limited access for certain groups, should be carefully considered (E-Spin, 2023).

***Online Government***

Government services have typically been provided in person, by several departments at various places, and frequently using paper forms. Government can now provide citizens with information and services whenever, whenever, and on any platform or device thanks to digital services. Benefits of switching from traditional to digital services for corporations go beyond service provision. Government employees are no longer restricted to a phone or service desk, which frees them to think and act strategically on other projects. For instance, they could spend time enhancing hiring and recruitment procedures, optimizing backend procedures, and implementing technology standards (Granicus, 2023).

According to Kumari, R (2023) “the government provides services online to make it more convenient and accessible for citizens to access important services. By offering services such as filing taxes, applying for benefits, or checking the status of applications, the government can make these services more efficient and reduce the need for physical visits to government offices. Additionally, providing services online can also help to reduce costs for the government and taxpayers”.

Based on the article made by The Digital Economy (2018) “For governments, this divide could hamper their well-intended digital-transformation efforts. It is hard to justify spending tax-payer money on initiatives that benefit only part of the population - or even worse, only those at the top of the pyramid who can afford 24/7 connectivity. Pre-paid mobile is the most popular way to connect to the internet, accounting for more than 75% of mobile users in Africa, Asia and Latin America. But when users run out of pre-paid credits, they cannot access digital government services on their phones”.

***Benefits of Online Government***

There are hundreds of websites owned by various governmental departments and groups among the approximately 2 billion websites available today. Unfortunately, local governments may not leave a favorable first impression on individuals who visit their website if they have been reluctant to modify and update it. This is only one of the key benefits of having a successful government website. A government website's primary goal may be these two things, and effective websites excel at both (GovOS, 2023).

E-government makes important strides toward updating bureaucratic procedures for the internet era. E-government technologies can also greatly enhance communication within government agencies and between levels of government. The needs of the government can readily be met by cloud-based tools. This offers a single, unified platform where trustworthy data and efficient communications virtually eliminate errors and duplications. The majority of the benefits connected to private-sector CRM are equally applicable to e-Government. The ideal template for this has already been given by the business sector (Apkarian, A. 2022).

A global network connecting computers and networks is known as the internet. It enables communication and information sharing over large distances. The internet offers several advantages, such as messaging services like WhatsApp and online shopping. Along with leisure options like online games and movies, it also provides self-improvement through online classes. Additionally, it helps government organizations offer the general public services that are quicker and more convenient (Surya, 2023).

***Implementation of MySQL, Express, React, Node, & Visual Studio***

In the software development domain, technology and tools assume a central role in the creation of efficient and user-friendly applications. Node.js and React.js, as elucidated by Simple learn in 2023, exemplify two distinctive yet complementary technologies. Node.js takes on the primary responsibility of managing the backend of applications, functioning as a JavaScript framework for robust construction. Conversely, React.js is exclusively dedicated to the development of an immersive and responsive user interface, shaping the front end of the program. Despite their divergent roles, both these technologies collaborate to enhance the speed and user-friendliness of applications.

Furthermore, within the collaborative landscape of software development, developers frequently come together to address coding projects and rectify errors. They commonly rely on robust platforms like Visual Studio, a versatile development tool that streamlines the entire coding process within a unified environment. As highlighted by Murali in 2023, Visual Studio enjoys a well-deserved reputation for its exceptional capacity to identify and resolve coding errors. It empowers users to generate high-quality code, offers access to a diverse array of testing tools, and comes equipped with additional coding features. Furthermore, it facilitates real-time collaboration, effectively mitigating redundant work and bolstering the overall efficiency of software development initiatives.

MySQL stands as a widely embraced open-source SQL database management system, developed, distributed, and backed by Oracle Corporation, as detailed in Christudas' 2019 publication. It excels in the management of structured data collections. Within a MySQL database, you can seamlessly add, retrieve, and manipulate the stored data, which is organized into distinct tables. These database structures are optimized for enhanced performance and efficiency. The logical model of MySQL, featuring components like databases, tables, views, rows, and columns, provides a flexible programming environment.

In the meantime, Express.js serves as a rapid, unbiased, and streamlined web framework designed for Node.js, offering a comprehensive array of capabilities for both web and mobile applications. Express.js is highly adaptable, empowering developers to craft applications tailored to their specific configurations and demands. According to Kumar (2023), the primary strengths of Express.js lie in its straightforward and user-friendly nature. This stems from its minimalist framework, which intentionally lacks an extensive array of pre-built features. Such simplicity enables developers to selectively incorporate only the necessary components, culminating in a more streamlined and agile application.

**Related Studies**

***Online Systems***

The research conducted by Whitell et al. (2020) highlights the use of electronic permitting (e-permitting systems) of municipalities in Ontario, Canada. As Ontario's municipalities expand and experience higher population densities, managing the growing number and complexity of building permits has become increasingly challenging. They introduced e-permitting systems, which use technology to make the permitting process easier. Moreover, it demonstrated the potential to enhance efficiency, accelerate permit processing, improve transparency, and optimize document reviews and revisions. In addition, modern e-permitting systems can combine building information models (BIM) and geographic information systems (GIS) to help with smart city planning and management. However, the diverse landscape of Ontario, encompassing 440 distinct municipalities, presents a significant challenge due to the absence of standardized practices and information sharing methods. Consequently, the widespread adoption of e-permitting systems becomes laborious. By analyzing a real-life case of permit handling in an Ontario city, their study reveals invaluable insights that can serve as a reference for other municipalities wanting to implement electronic permitting systems.

***Municipal Digitalization***

Municipal digitalization is increasingly prevalent, driven by a desire among many cities to leverage digital technologies for achieving their environmental objectives, as highlighted by Ringenson et al. (2018). Despite this, there remains a notable gap in understanding how to effectively implement these digital solutions among both municipalities and information and communication technology (ICT) developers. To address this knowledge gap, the authors organized workshops and conducted a review of relevant literature to ascertain the advantages of employing digital technology. They also studied two European Union directives intended to help local environmental goals and linked their usage of digital technology with the actions and objectives described in these directives. They propose a systematic approach that can be applied to any city plan, involving two key steps: (1) Identifying the objective, which is typically determined by EU directives or other relevant guidelines. (2) Determining the activities necessary or generated to achieve the established objective. This approach not only aids cities and municipalities in understanding how digital technologies can facilitate their goal attainment but also helps in devising effective strategies for their implementation.

Kalinichenko et al. (2021) undertook this research with the aim of enhancing municipal administration by highlighting municipal services as a cornerstone of local self-governance. The study underscores the importance of state and local governments adopting systematic scientific methodologies and devising fresh criteria to support local government personnel in fulfilling their community obligations. Additionally, the research delves into the potential of digital technology in elevating the efficiency of local government operations, considering these emerging digital tools as pivotal in fortifying the scientific and informational foundation of local management practices. To enhance overall efficiency, the study recommends the digitalization of both state and municipal government activities.

Abramitov and Dneprovskaya (2021) emphasized the importance of local governments giving top priority to providing online services to their residents. This shift holds great significance due to the manifold advantages it offers, and online services are increasingly varied and accessible to a broader population. They particularly highlighted the utilization of the "Unified portal of state and municipal services (functions)," managed by the Ministry of Digital Development. This information system streamlines the electronic delivery of municipal services. Abramitov and Dneprovskaya underscored the essential understanding that people prefer electronic services for their convenience, particularly when dealing with government agencies or service providers. To ensure that these tools are user-friendly, it is crucial to clearly define the requirements for service operations in laws or regulations. These requirements should encompass elements such as user-friendly interfaces, convenient identification and authentication methods, effective navigation and search features, as well as comprehensive information regarding available services, especially within specific life situations.

Chatterji (2018) pointed out that India's new urbanization plan has a primary goal of enhancing data, services, and communication within cities through technology. These initiatives entail collaborations among government bodies, corporations, and international entities to foster digital advancements. However, this technology-driven approach faces challenges due to the digital divide, where some individuals have access to technology while others do not. Additionally, local government units in India have been overlooked, resulting in ineffective management and a shortage of IT expertise. Chatterji argued that, for the urbanization plan to thrive, city administrations must proactively employ electronic tools for governance; otherwise, they risk ceding control and limiting public participation in local decision-making.

Diegtiar et al. (2020) explore innovative approaches to enhance the information and communication system of Ukraine's local government. The research aligns with the objective of centralizing city hall operations, as centralization often involves making information management and communication more efficient. The concept of creative municipal management corresponds with the goal of centralizing city hall procedures, emphasizing the use of inventive methods to enhance service delivery, resource management, and community welfare.

Malodia et al.'s (2021) study emphasizes the absence of a holistic perspective in comprehending the field of e-government. Identifying this deficiency offers an opportunity to explore and amalgamate different facets of e-government, including customer-centric approaches, channel-focused strategies, and technology-driven elements. This insight can guide the establishment and execution of streamlined procedures within municipal government structures.

In their 2018 study, Manoharan and Ingrams delved into the use of information and communication technology (ICTs) by governments to streamline internal procedures and improve service delivery. This resonates with the goal of centralizing city government functions, as centralization frequently entails leveraging ICTs to refine and augment the efficiency of internal processes and the provision of services.

The 2020 research by Liwanag and Wyss delves into the Philippine government's pivotal decision in 1992 to delegate greater authority to local governments for healthcare delivery. Public satisfaction with the outcomes of this devolution of power has evolved over time. To unravel the intricacies of this transformation, the study employed surveys to collect insights from research participants encompassing a range of domains, including planning, healthcare financing, resource management, human resources for health, healthcare service provision, and data management and monitoring. A noteworthy portion of the survey respondents expressed support for re-centralization. The interview findings suggest that these preferences likely stem from the belief that re-centralization holds the potential to address concerns related to the perceived politicization of decision-making and the local governments' dependency on central support.

The research of Nita ang Goga (2018) focuses on analyzing the strategic management system in the local public administration. The study also outlines the main aspects characterizing organizational management and strategic planning. This aligns with the system as centralizing government processes often involves strategic planning and management to improve efficiency, effectiveness, and overall performance.

According to Yusop et al. (2019), the current system is less open, which might lead to mismanagement between cops and offenders. By creating systems that give clear standards and standardized procedures, centralizing local government processes can increase openness and accountability while limiting the possibility for mismanagement or corruption. The paper also suggested a comparison study, which involves comparing multiple methodologies or systems to find the best solution. This comparative study can provide useful insights into best practices and lessons gained from different contexts, which can assist inform the creation and implementation of your system for centralizing city hall processes.

Mahula et al. (2022) investigate different technologies for enhancing local government processes. It focuses on the digital transformation (DT) activities of Western European local government organizations, notably their experimentation with blockchain technology. The authors conducted a multi-case study in three municipalities to explore the DT procedures and outcomes connected with blockchain adoption. The overall purpose of this article is to provide insight into the DT procedures utilized by local government organizations, with a focus on the adoption and experimentation of blockchain technology. It enhances understanding of how local governments use blockchain to better operations and services while dealing with technological developments.

Verkijika and De Wet's (2018) thesis looks at the usability of e-government websites in Sub-Saharan Africa (SSA). This region has the least developed e-government development. The study looked at 279 e-government websites from 31 SSA nations. The outcomes of the survey found that the majority of the SSA's e-government websites are difficult to use. The websites' total usability scores ranged from 36.2% on average to 64.8% for the highest-scoring website. This suggests that utilizing and navigating the websites correctly is challenging.

In their 2020 research, Nani and Ali evaluated the impact of many components such as strategy, technology, organizational aspects, human resources, and the environment on the adoption of electronic procurement (e-procurement) among Indonesian local government agencies. Their main goal was to see if introducing e-procurement will promote accountability, transparency, efficiency, and effectiveness in various government departments. They conducted an extensive investigation, gathering data from 96 procurement services, and discovered that well-defined strategies, integration of various organizations and systems, and enough human resource support were crucial in achieving these improvements.

In these networks, local governments endeavor to address a multitude of policy issues, work towards reaching a shared understanding on potential remedies, and grapple with the persistent task of upholding agreements among the involved stakeholders, as elucidated by Mota et al. 2023 study. An underexplored dimension within the current body of literature pertains to the impact of central government intervention on these networks. This intervention can have repercussions on the range of participants, the intensity of interactions among them, and their approaches to coordination. This evaluation assumes distinct importance in the context of centralized governance.

Many services and solutions were presented. One can get the conclusion that many municipal governments do not give their web presence significant consideration. In order to save money and time in the future, the author advises city governments to specify their services in detail and decide how to make them available online Such judgments ought to be supported by documented analysis that links the objectives and the techniques employed (Schmuk, R. 2011).

***Digitalization of Payment Process***

The effect of economy to transition, adopt, and use digital payment systems instead of going into manual processes is very beneficial according to the conclusion of Baghla (2018) even though it faces different challenges such as lack of knowledge and awareness of the public can be a hindrance to the adoption of digitalization of payments, many people still choose to use digital payment methods because according to their respondents, they shift through digital payments because it offers benefits such as having not to carry huge cash, cashback offers, easy and fast way to make payments, easy to track the record of payments, 24/7 transfer, discounts and reward points, and time saving.

The City of San Marcos one City that will gain great benefits when payments are centralized. Even though they have a payment software system which is called “Payment Central”, it is not yet deployed to all departments. It was found out that digitalizing processes of their local government can lead them to greater service delivery and will enhance their fiscal sustainability. The City of San Marcos “Payment Central” shows the opportunity for a more advanced technology in terms of payment systems. Their payment system has the potential to reduce the margin of errors committed by manual processing, convenience of transactions will be greatly experienced, and will smoothen the manual processes. The instance of the City of San Marcos is a reflection of a number of findings in this study, which is to address issues of manual processes, and to enhance service quality that the city government can offer (Beutler et al., 2020).

An alternative solution to pay national road tax with the use of blockchain technology is proposed to improve the emphasized time and cost inefficiencies that are interconnected with the traditional payment processes. It is also accentuated to the security concerns traditional payment systems have that can be a threat to the user’s information and their data protection. Efficiency and security are a very important focal point of payment processes that need to be focused on in terms of improving. The importance of accessibility in having your payment processed anytime 24/7 is also crucial for taxpayers in different locations and time zones (Zinca & Negrean, 2018).

According to the study conducted by Lailiyah and Sebayang (2020), e-Billing systems have two categories in terms of constraints: internal and external. Internal constraints talk about the lack of technological proficiency and the lack of accuracy in handling tax-related activities. On the other hand, External constraints is something that is beyond from the control of the taxpayers themselves such as facility limitation, server downtime, and the internet connection instability. E-Billing systems effectiveness is not the only thing affected by these said constraints but also the affects the experiences and outcomes of the taxpayer. Understanding the obstacles needed to be faced by the taxpayers and the constraints of e-Payment systems is very important in considering the implementation of centralized payment systems. To improve the effectiveness of e-Billing systems, it is recommended that system quality should have increased attention by the relevant authorities. Minimizing system downtime, putting deadlines of payment based on the type of tax to be paid, and enhancing the socialization efforts among taxpayers are proposed to address to improve the overall e-Billing system payment experience.

It is important to select the right technology in ensuring the cost-effectiveness and efficiency while considering the potential trade-offs that are related to decentralization. The research of Hlaing and Nyaung (2019) shows the decrease in transaction costs and improvement in efficiency. Nevertheless, the study also raises the potential negative effects due to the storage mechanism that is used in their proposed system.

India experienced a great transformation following the demonetization initiative of their government. This policy shift required individuals in India to adopt methods of digital payments since there is a lack of alternatives. The increased use of the internet, mobile penetration improvement, and government initiatives such as “Digital India” became a catalyst for the aggressive growth of digital payments in India. The findings in the research paper of Singhal (2021) raises the importance and applications of digital payment services in India. These digital payment services include transactions through digital modes without the use of physical cash and these transactions are done online offering convenient and instant payment solutions. Compared to cash transactions which require payees to withdraw cash and visit banks on-site, digital payments revolve around the transfer of money from the account of the person who will pay to the payee’s account instantly.

The introduction of online payment systems especially the one in Muntinlupa, Philippines, shows the great shift towards transparent and efficient governance. In alignment with the national directives and ordinances, Muntinlupa City launched its online tax payment facility. The City of Muntinlupa is not alone in this adoption of online payment systems because other LGUs in the National Capital Region also initiated similar systems just like one in Manila City called “Go Manila,” an application that can be used to pay such as real property tax online, Caloocan Online Payment, QC E-Services, Marikina Online Payment Portal, etc. The shift towards online tax payment systems has a large scope of implications for both the government and its taxpayers. Muntinlupa City’s online payment facility called “BeST” addressed the past challenge of the pandemic and the lockdowns associated to it. This online payment system introduced a new extent in terms of efficiency, convenience, and safety in conducting government transactions (Vibora & Mandigma, 2022).

Paul et al. (2021) proposed smart metering system include a web application to monitor and analyze information to monitor their information and gain control over their energy consumption expenses. The smart metering system proposed is realized to be cost-effective and economically viable. The adoption of smart metering eliminated most of the challenges that are associated with traditional reading metering. On the other hand, smart meters are accommodating in prepaid and postpaid billing systems that is very beneficial to the convenience of its customers.

Traditional approaches of paying essential services such as electricity, water, and property taxes have been defaced by their routine nature that results users for their payment to be delayed because of the tediousness of the process. Traditionally, customers are required to go to on-site payment centers to pay for their bills which is inconvenient, making users have a hard time tracking and managing their payments. A web application proposed to have three main domains for electricity bill, water bill, and property tax payments are eyed to eliminate the tedious process associated with traditional approaches in paying bills and services (Ranjitha & Chethana, 2019).

***Use of the Internet on a Local Government***

According to Bent (2016) “The purpose of this study was to examine how municipalities are using the Internet to "open" local government. Traditionally, local government has, for the most part, been more open than other levels of government. Furthermore, increases in the size of local government have also necessitated re-evaluation of the ways in which municipalities provide information to the public. The opportunity to disseminate large volumes of information and to increase public access and public participation have been the forces driving municipalities to establish a presence on the Internet”.

Based on the study conducted by E-governance (2008) the local level, e-governance and the appropriate use of ICT can boost and assist social and economic development, especially in terms of empowering officials and municipal representatives and providing links, networking, timely, efficient, transparent, and accountable services. E-local governance refers to utilizing ICT to improve public service accessibility, quality, and cost-effectiveness as well as to help revitalize the relationship between customers, citizens, and the public entities that work for their benefit. The development of the information society is largely a concern of local governments because they are closer to the people than central governments. It is a significant difficulty to provide those services in a traditional manner and alongside e-services as municipalities offer new, wider varieties of services for citizens after decentralization. According to a European study, local governments in developed nations are offering up to 77% of public e-services. Often local government portal is the first stop to reach also central government services.

**Conceptual Model of the Study**

Figure 1 shows the conceptual model of the study which outlines the flow of the research and development. The input enumerates all the requirements such as knowledge, software, and hardware requirements which are necessary for the development. In the process, it shows a series of models and diagrams which represent the operations of the development. Lastly, the output will be the City Hall’s Management System, which will then be evaluated.

**INPUT PROCESS OUTPUT**

**Knowledge requirements:**

1. File and Data Management
2. Information of Manila City Hall’s Processes
3. Hypertext Markup Language
4. Cascading Style Sheet (CSS)
5. Tailwind CSS
6. Javascript
7. React.js
8. Node.js
9. Vite
10. MySQL Workbench

**Software requirements:**

1. Web browser
2. Visual Studio Code
3. Node Package Manager
4. GitHub
5. Figma

**Hardware requirements:**

* 1. Laptop/Computer

**Project design**

* Entity Relationship Diagram
* Unified Modelling Language – Use Case Diagram
* System Flowchart

**Project development**

**Operation and testing**

**Development of a Mid-Level Centralization Management System for City of Manila**

Evaluation

***Figure 1.*** Conceptual Model of the Study

**Operational Definition of Terms**

To facilitate understanding of this study, the following terms are operationally defined:

**API** refers to an acronym for Application Programming Interface, it is a software middleman that allows two applications to communicate with one another.

**Component** refers to an identifiable part of a larger program.

**IDE** refers to an acronym for Integrated Development Environment, it is an application that facilitates the development of other applications.

**Middleware** refers to a software that provides common functions and capabilities to applications outside of what the operating system delivers.

**RPTAX** refers to a module that processes tax transactions such as tax clearance and tax payment regarding Real Property Tax.

**Tax Clearance** refers to a tax transaction that processes the clearance of taxpayer’s tax payments.

# Chapter 3 METHODOLOGY

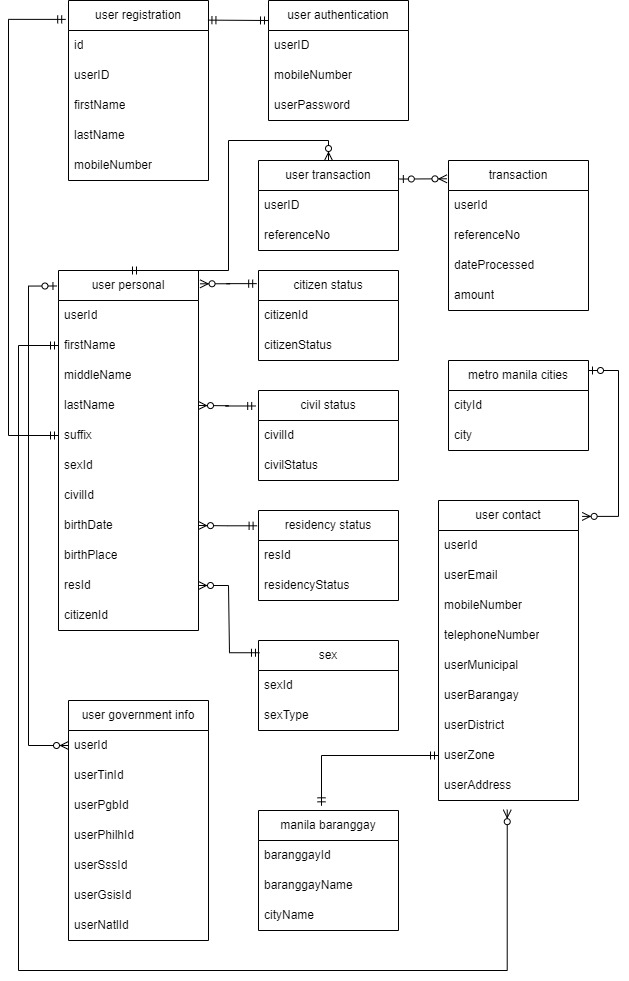
This chapter presents the project design, project development, operation and testing procedures, and evaluation procedure of the study.

# Project Design

The project design of the study is discussed below using Unified Modelling Language (UML) and System Flowchart to visualize the design and flow of the E- commerce Web Application.

## ***Entity Relationship Diagram***

The diagram illustrates the connections between entities and displays the database's stored information. Within the diagram, a one-to-one relationship signifies that each transaction in one entity is linked to a single transaction in another entity. Conversely, a one-to-many relationship indicates that a transaction in one entity can be associated with multiple transactions in another entity, while the latter is linked to only one transaction in the former. Lastly, a many-to-many relationship signifies that numerous records in one entity are connected to multiple records in another entity. The website under development encompasses the following entities: user registration, user authentication, user personal information, user transactions, transactions, civil status, Metro Manila cities, user government information, gender, user contact details, Manila barangays, and residency status.

**Figure 2.** Entity Relationship Diagram

## ***Unified Modelling Language***

Figure 3 shows the UML Use Case Diagram of the system. The system contains three actors which are the unregistered user, user, and the admin. The actors contains privileges that is different from each other in the system. To start the use of the process in the system, the unverified user must first register to verify themselves and gain their personal account in the system. After verifying and creating their own account, they will gain access to the system wherein they can now manage their profile, generate real property tax report, and pay real property tax using G-Cash. Lastly, the admin of the system has the privilege to manage the user’s profile and manage tax transactions. Both user and the admin must be logged in to gain access to their privilege in the system.

A diagram of a company

Description automatically generated

**Figure 3.** Use Case Diagram

## ***System Flowchart***

Figure 4 displays the whole process of the system. The system will verify if the user is registered. If the user is not registered, they will proceed to the registration page of the system for them to create and verify their account, and then proceeds to login. If the user is already registered, they will proceed to login. After the user has logged in, the system will identify the role of the user in the system. The user role has the privilege to process their real property tax, then pay for their real property tax after processing it or they can also get their real property tax clearance. The user can also view and manage their personal information and can also view and download their transaction history. On the other hand, the admin role has the privilege to manage the profile of users, manage tax transactions of the users, and view the tax transactions history of the users.

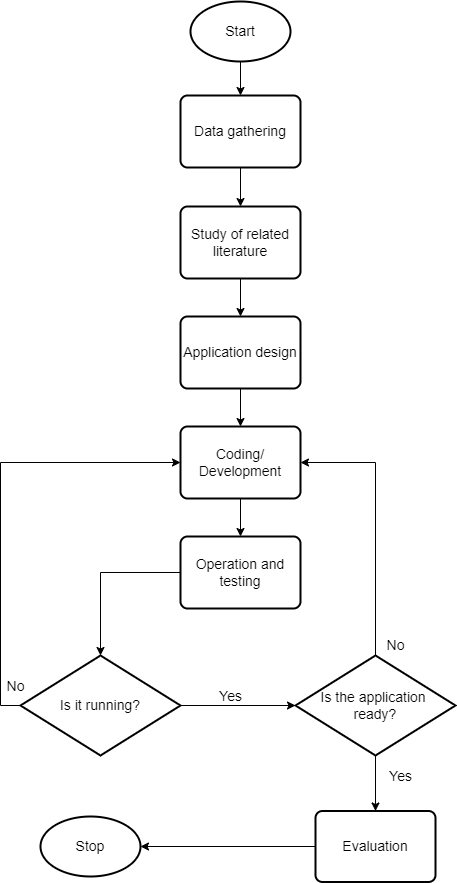
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**Figure 4.** System Flowchart

# Project Development

This part of the study highlights the comprehensive development of the project. The first part of the research will be data gathering wherein the researchers will collect and analyze the data to understand the manual processes that need to be automated and centralized at the Manila City Hall. Additionally, various tools and technology will be studied by the researchers so that appropriate solutions will be applied to streamline the operations of the said city hall.

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**Figure 4.** Project Development Flow

# Operation and Testing Procedures

The researchers conducted operation and testing procedures to be able to guarantee the correct and accurate functionality, features, and capabilities of the system. The testing procedure verifies every module of the system to work what it is supposed to work for. Moreover, executing a test case guided the researchers to identify and prevent possible errors and bugs of the system. Presented in Table 1 is a sample test case to showcase the sample testing procedure.

**Table 1**

*Test Case Sample*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Test Case ID | | MNL-008 | | | |
| Objective | | To be able to manage citizen profiles. | | | |
| Preconditions | | The user must be logged in as an administrator. | | | |
| Actions | | Expected Result | | Actual Result | |
| 1. If you are an administrator, login your credentials.  2. Click the Manage Citizen Profile button. | | The user should be logged in as an administrator and able to view the manage section when the button is clicked. | | The user is logged in as administrator and can manage the citizen profiles. | |
| Status | P A S S E D | Severity |  | Priority |  |

All testing procedures were audited in accordance with the use case associated with the test case. The case testing was then rated as either “passed” or “failed”. The rating is labeled “passed” when the testing illustrated the actual result of what is expected. On the other hand, the rating is labeled as “failed” when a different actual result was illustrated to what is expected. Moreover, the severity of the error is identified, which indicates the degree of the error as to how it will affect the development process of the system. The priority levels were also shown to indicate the significance of what problem must be addressed first. The severity and priority are illustrated in Tables 2 and 3 respectively.

**Table 3**

*Degree of Severity Classification*

|  |  |
| --- | --- |
| **Severity** | **Description** |
| Critical | The issue or problem indicates that the process has been entirely interrupted and cannot proceed until it is resolved. |
| Major | The issue or problem causes the system to crash. However, some modules remain operational. |
| Minor | The issue or problem does not cause any significant inconvenience or system failure. |

**Table 4**

*Priority Classification*

|  |  |
| --- | --- |
| **Severity** | **Description** |
| High | The issue or problem significantly affects the application; thus, it must be resolved as soon as possible. |
| Moderate | The issue or problem should be fixed to ensure the proper flow of the system development and prevent larger errors. |
| Low | The issue or problem should be resolved only when all necessary errors are addressed, as it does not cause any critical errors. |

Furthermore, the Tables 4 and 5 shown below illustrate the overall summary of the test cases, indicating the functionality test cases and the reliability test cases respectively.

**Table 4**

*Summary on Functionality Test Cases*

|  |  |
| --- | --- |
| **Use Case** | **Number of Test Cases** |
| Unregistered User |  |
| Registered User |  |
| Admin |  |
| **Total** |  |
|  |  |

**Table 5**

*Summary on Reliability Test Cases*

|  |  |
| --- | --- |
| **Test Case ID** | **Objectives** |
|  |  |

In Table 6, the procedures taken to properly execute each module in the system subject for functionality and reliability testing are shown, as well as the expected output.

**Table 6**

*Testing Procedure for Functionality and Reliability*

|  |  |  |
| --- | --- | --- |
| Modules | Procedures | Expected Output |
| Register | * In the landing page, click the Resister Here button. * Fill in the necessary user details. * Click Register * The user will be redirected to the home page. | * The user is on the landing page. * The user should be redirected to the registration page. * The system requires the user to fill in the necessary fields. * The system must handle any error that may occur. |
| Login | * In the landing page, fill your login credentials. * Click the login button. | * The user is on the landing page. * The user will not be able to login when the login credentials are wrong. * The user should be redirected to the Home page if logged in successfully as a user, and Dashboard page if as an admin. |
| Manage User Personal Profile | * Login to your account. * Select the Personal Information button from the dropdown menu. * Check / Edit your personal information. | * The user must be able to view his or her profile and personal information. * The user must be able to edit and save the changes of his or her profile. |
| Real Property Tax Transaction | * Click the Real Property Tax button. * The user should choose between tax payment or tax clearance from the dropdown menu. * Fill up the necessary fields. * Proceed to payment. * Check payment status. | * The user must be able to fill up the necessary fields. * The user should be able to proceed to payment and display payment status. * Any error in the system should be handled. |
| Transaction History | * Click the Transaction History button. * Check and view the history. * Download the transaction history. | * The user should be able to view the history of his or her transactions. * The user should be able to download the transaction history. |
| Manage Citizen Profiles | * View the list of the citizens. * Manage the citizen’s profile. | * The admin should be able to manage citizen profiles. * The data should be stored and secured in the database. |
| Manage Tax Transactions | * View the list of tax transactions. * Manage the tax transactions. | * The admin should be able to manage tax transactions. * The data should be stored and secured in the database. |

As shown in Table 7 below, the test data were collected and reported at the end of each test cycle. The system would be deemed acceptable if all the tests' expected results were met and all the specified test cases were completed.

**Table 7**

*Degree of Severity Classification*

|  |  |
| --- | --- |
| **Executions** | **Result Expectation** |
| Total Number of Test Cases Executed | 100% |
| Test Case Result  Passed  Failed | 100%  0% |
| Total Number of Test Cases Unexecuted | 0% |

# Evaluation Procedure

The researchers regulated the overall quality of the system using the standards of ISO 25010 as an instrument. The researchers assessed the functionality and reliability of the system as criteria in the rating system's 4-point Likert scale shown in Table #. There were 30 people gathered by the researchers, which consisted of 10 local government units, 5 IT professionals, and 15 taxpayers. In addition to achieving the objective of the research, a demonstration on how to properly use the system was executed. The participants reviewed and assessed the relevance and value of the project with the help of the criteria that had been set as benchmarks. Accordingly, with the results of the evaluation, the overall weighted mean ratings for each criterion were calculated and converted into a qualitative interpretation with the use of the range of mean ratings shown in Table 8.

**Table 8**

*Four-point Likert Scale*

|  |  |
| --- | --- |
| **Scale** | **Descriptive Rating** |
| 4 | Outstanding |
| 3 | Acceptable |
| 2 | Fair |
| 1 | Not Acceptable |

**Table 9**

*Range of Mean Ratings and the Equivalent Descriptive Rating*

|  |  |
| --- | --- |
| **Scale** | **Descriptive Rating** |
| 3.26 – 4.0 | Outstanding |
| 2.51 – 3.25 | Acceptable |
| 1.76 – 2.50 | Fair |
| 1.00 – 1.75 | Not Acceptable |

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