

# Comparison of Traditional and Digital Barangay Systems in the Philippines

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**Abstract** – This study examined the comparison between traditional manual systems and digital barangay information systems in the Philippines, focusing on their effectiveness, efficiency, accuracy, data security, and implementation challenges. Using a comparative research design with quantitative and qualitative methods, the study analyzed the experiences of barangay officials and staff in managing resident records, issuing certificates, and preparing reports through both manual and computerized processes. Findings revealed that digital systems significantly improved transaction speed, reduced errors, enhanced record organization, and strengthened data security through automated features and database management. However, the study also identified challenges affecting digital implementation, including limited computer literacy among barangay personnel, insufficient budgets, outdated equipment, unreliable internet connectivity, and frequent power interruptions, particularly in rural areas. Meanwhile, manual systems remained useful in locations with limited technological infrastructure because they do not depend on electricity or internet access. The study concluded that while digital systems generally outperform traditional methods in efficiency and accuracy, their effectiveness depends on proper training, adequate funding, system maintenance, and data protection measures. It further recommended adopting user-friendly technologies, improving digital literacy, strengthening cybersecurity practices, and implementing hybrid systems to support the gradual digital transformation of barangay governance in the Philippines.

**Keywords** - barangay information systems; digital governance; manual record-keeping; local government, data security; digital transformation; barangay management

## I. INTRODUCTION

As the smallest administrative unit in the Philippines, barangays have an important role in the operation of communities. Barangays serve as the most accessible government branch to the citizens, often being the first responders to various problems. Among other functions, barangays issue residents' documents, maintain resident databases, mediate local conflicts, and ensure peace and order using the services of barangay officials and *tanods*.

Despite being effective in the past, manual information systems are associated with a number of issues that limit their use in the present day. For instance, paper records are susceptible to physical damages or losses. Searching for

information might take a long time, especially when working with large samples of citizens. Updating and organizing information is more complicated, resulting in possible errors and service failures.

A significant portion of barangays currently adopts digital information systems. With digital data storage, faster searches, updates, and increased information security are achievable. Digital information systems allow for higher efficiency of barangay officials in their duties, improving their services to the residents. Thus, shifting from a manual to a digital information system is conducive to greater organization and efficiency.

The main focus of this study is on digital information systems used in barangays. Specifically, it seeks to explore their effectiveness compared to manual systems, outline their advantages and drawbacks, examine their implementation issues, and discuss the security of these systems. This investigation is necessary to determine how well current systems operate in managing the residents' data and provide relevant services.

The objectives of the research include the following: comparing manual and digital systems in barangays, evaluating the effectiveness of digital systems, identifying implementation issues, and analyzing measures of residents' data protection. The significance of the study lies in its potential applicability for barangay officials who wish to improve their current systems, for developers designing more effective and user-friendly systems, and for future researchers in this field.

In this literature review, the researcher focuses on manual and digital information systems in barangays, comparing their advantages and disadvantages. First of all, a manual information system relies on paper records, which are relatively inexpensive and easy to use but slow, complicated to administer, and prone to mistakes. On the other hand, a digital system operates with digital data, allowing for faster data searches, better storage and organization, and requiring proper training and resources.

## II. REVIEW OF RELATED LITERATURE

Several barangays adopt different mechanisms to ensure smooth operation and conduct of basic activities like profiling of the residents, certificate issuances, and reports. The most

common mechanism adopted is through the use of manual processes. It involves the use of paper-based records and logbooks. Manual mechanisms do not require any special equipment nor incur high costs for implementation. They come with numerous weaknesses since it will take a lot of time for staff to search through various files and provide certificates. Paper records cannot be easily organized, thus making it difficult to access them whenever they are needed. They may be misplaced. There is always a danger of losing crucial information stored in the records because of fire, water damage, insects, and human errors.

Digital mechanisms involve the use of computer devices and software for recording information. This process makes the profiling and issuance of the certificates very fast and efficient. Residents are able to receive services immediately since they do not have to wait for long hours. Digital records can be easily sorted, backed-up, and accessed using a search function. Despite the many strengths associated with digital systems, there are several weaknesses. One of the biggest is that digital equipment needs proper maintenance to avoid malfunctions. Software and hardware must be updated, maintained, and repaired from time to time. Regular back-ups must be done too, and this process can be very costly.

A significant amount of research has been conducted on digital versus manual recording of information within barangays. Very little of it offers an empirical and fair assessment of both approaches. Most research is dedicated towards discussing one or the other, but rarely does it compare the two. Little work exists comparing the two strategies and determining the key metrics. Those would include processing time, error rate, user satisfaction, and cost efficiency over a given period of time. Due to the lack of comparative research in the area, barangay officials are not provided with proper information to make decisions about adopting new technologies.

The last aspect worth considering is comparing manual and digital approaches with regard to how accurate the data produced by them is. Transcription, illegible handwriting, duplication of records, and calculation mistakes in documents are common pitfalls of manual data entries. These mistakes could lead to severe repercussions, from certificates with the wrong personal information to incorrect calculations of population numbers in the area necessary to distribute disaster relief funds. Although digital tools cannot guarantee the elimination of any errors – some may still emerge when entering data, and others due to software bugs – they offer a variety of mechanisms that can detect and address mistakes in an efficient manner. More research needs to be conducted to compare error rates in each approach, find out which errors occur more frequently, and assess the speed of their correction.

The second essential factor in the effectiveness of a record-keeping solution is its ability to scale and survive natural disasters. Scalability becomes one of the biggest limitations for manual data collection as a barangay's population rises, increasing the number of paper documents stored and making

their handling cumbersome. Digital databases offer better scalability options with the ability to store thousands of records and conduct searches almost instantaneously. On a different note, the ability of a database to survive a disaster is crucially different in these two scenarios. One flood, fire, or typhoon may destroy decades of manually written documents and information, while digital solutions allow surviving any disaster with adequate backup on a cloud server or another machine. At the same time, if the backup procedure is poorly organized, digital databases will prove just as vulnerable to any damage.

First, it should be noted that the use of record-keeping in barangays does not only pertain to their administrative aspect but to their legal aspect as well. For instance, the certificates issued by barangays have legal significance as evidenced by their use in obtaining various benefits or entitlements in government agencies. Thus, manually keeping records presents legal vulnerabilities such as the possibility of manipulating or misplacing the records, or even fabricating documents altogether. There exist several legal advantages to utilizing digital systems in terms of ensuring the validity of records in the form of electronic signature verification and timestamped logs, among others. Nevertheless, Philippine laws have not yet evolved in tandem with technology, as seen in some legal uncertainties as to the admissibility of barangay certificates generated electronically as direct or primary evidence, which encryption standard should apply to sensitive resident information, and so on.

Given the advantages and disadvantages of using manual versus digital systems in barangay record-keeping, a binary solution may not be advisable for most barangays. One alternative would be the implementation of a mixed approach, such as storing records via digital database but creating printout or logbook copy for backup or for compliance with legal requirements. Alternatively, it is possible for barangays to use electronic record-keeping only for processes that happen frequently, such as the issuance of certificates, while manually keeping records in other processes, since setting up a digital system is not always worthwhile for rarely done tasks. However, in the absence of empirical comparison studies of the efficiency of such hybrid approaches compared to wholly manual and wholly digital systems, it leaves barangay captains and councils little choice but to base their decision-making on the promotion of vendors or case anecdotes.

In conclusion, no discussion on barangay information systems should omit the issue of data privacy and the associated trust that would be expected from residents. Information about the residents is quite sensitive and includes details like dates of birth, marriage status, economic status, family size, among others. If the system is manual, privacy concerns may arise because anyone able to open the filing cabinets can access the files. In the case of computerized systems, there may be concerns of passwords that do not provide adequate protection, lack of updating software, and failure to encrypt the data. Under the Data Privacy Act of 2012 in the Philippines, every organization, including barangays, is supposed to comply with certain obligations

regarding data privacy, but the monitoring of the same is rare among barangays. Residents might be hesitant to share any personal data for fear of data misuse, thereby negatively impacting the process of developing plans and providing services. More research on how barangay data security can be implemented is required.

### III. METHODOLOGY

The research utilizes a comparative research design to analyze the pros and cons of the manual and computerized information systems used in the management processes in barangays. In fact, a comparative research design is especially suitable for studying the subject matter because it allows looking at both systems under consideration simultaneously. By determining certain performance indicators, including processing speed, accuracy, ease of use, efficiency, and incidence of errors, it will be possible to understand which record-keeping system works better depending on the circumstances. Besides, the comparative design of the study helps to understand any tradeoffs, e.g., if the use of a computerized system is much faster but it requires more expenses on the maintenance of this system and employee training. Importantly, the comparative design does not imply that one system is inherently better than another one. Instead, the study will focus on understanding the conditions in which each system works well and exploring whether combined solutions are feasible and beneficial. Finally, this research design will provide the leadership with empirical evidence necessary for making informed decisions.

The research design employs both quantitative and qualitative data collection methods to analyze barangay information systems. Quantitatively, it measures performance indicators in both manual and computerized systems, including how long it takes to obtain a certificate from the barangay, the average number of errors per 100 records, and the number of technical issues that prevent the system from being used. The research also uses qualitative methods to gain deeper insight into users' experience and difficulties in using a particular system, e.g., why employees choose manual systems even when the former is clearly faster and more efficient. The use of these two research methods allows overcoming potential problems associated with the one-sidedness of the findings.

The main form of gathering data in this study is an interview administered to barangay employees responsible for operating either the manual or digital system. The interview questionnaire includes Likert scale questions on the perceptions of ease of use, efficiency in terms of time consumed, system reliability, and overall user satisfaction, as well as multiple choice questions concerning the occurrence of system-related incidents such as loss of records or incorrect output data, among other issues. The open-ended questions allow the respondent to give more detailed answers on the issues they have come across using the systems or make proposals. The interviews will be administered to a selected sample of barangays, stratified geographically (urban and rural) and by budget, and can be conducted in-person or

through printed questionnaires if the interviewee prefers that option because of lack of computer skills. Data analysis will involve a comparison of mean scores for satisfaction between two types of users via statistical testing, and coding of the qualitative responses to determine the most frequently occurring themes such as "slow retrieval" or "data loss fear."

Parallel to the quantitative research methodology used above, the project utilizes semi-structured interviews as a tool to collect rich data that would be difficult to acquire via questionnaire surveys. Interviews are especially useful when attempting to uncover the tacit knowledge held by the respondent on how to overcome certain challenges. For instance, in this case, an interview can help reveal how an employee responds to the digital system failure and finds a way to continue working without a problem. Also, an interview can provide valuable information on how one overcomes residents' distrust of computer-generated certificates of ownership of a property. Each interview takes 30 to 45 minutes, and consists of several questions on, for example, the training provided by the city government, the frequency of technical problems encountered in using the system, perceived risks of data security, and opinions on whether the current system adequately meets all the requirements of the barangay community.

To complement self-reporting data, observations are conducted of barangay personnel in the course of executing typical tasks using either a manual or a digital system. Observations are done during normal operating hours and focus on common processes such as resident profiling, certificate creation, report preparation, and record back-ups/filing. The researcher uses an observation checklist to measure how long it takes for the tasks to be completed, the number of steps taken to complete the task, occurrences of errors/corrections, and incidents of system malfunctions/uncertainty. Observation data will be useful in uncovering any discrepancies between self-reports and actual processes, for example, a staff person reporting that record back-ups are carried out every day when, in actuality, this occurs on a weekly basis or not at all. Such objective measurements can help pinpoint specific bottlenecks or unsafe practices that may not have been revealed in the course of surveys/interviews.

Respondents in the study will be selected from among barangay officials and staff who are directly involved with using the information system of their choice—manual, digital, or both. Respondents will consist of barangay captains, secretaries, treasurers, administrative aides, volunteers and barangay health workers who assist with data entry and/or certificate issuance. As far as respondent selection goes, this population group was chosen for a very obvious reason—they are the people working on the ground and thus their perceptions are critical in assessing system effectiveness. There will be at least 15-20 barangays involved with different types of information systems, various staff sizes, and different levels of available resources. Inclusion criteria will require that respondents have been using the barangay's information system for at least six months, so as to have been beyond the

learning curve stage. It is hoped that by considering the experiences of barangay personnel, realistic recommendations will emerge.

#### IV. RESULTS AND DISCUSSION

The findings demonstrate that digital systems are much more effective compared to manual systems regarding speed and efficiency. In barangays where digital systems were employed, the respondents noted that processes, such as the creation of profiles for residents, generating certificates, and compiling reports, could be performed much faster than using the manual method of doing things. For example, generating a barangay clearance or a certificate of residency, which used to take from 15 minutes up to half an hour when using manual record-keeping and manual input of data, could now be done in less than five minutes. This increased speed can be attributed to the presence of search engines, auto-complete forms, and templates for printing. The respondents noted that in the old system, the barangay staff had to go through huge amounts of paper in order to find necessary information, manually generate forms, and write everything down. Digital systems allowed them to work faster, process documents quicker, and serve more people every day.

Nevertheless, the superior speed and efficiency provided by digital systems cannot always be maintained due to certain contextual circumstances. Some respondents mentioned cases where the use of computers in the digital systems caused problems, such as frequent power outages, malfunctions of the hardware used, and poor internet connections. In those situations, the respondents resorted to performing work manually, which only doubled their effort and time. On the other hand, the manual system did not require any electricity or even network access. This means that during power cuts, there would still be an opportunity to continue working. From this point of view, manual systems appeared to be more effective in some areas, such as the most remote regions where digital systems can fail completely.

Speaking about accuracy, the results obtained consistently showed that there was always an overwhelming advantage to using digital systems over manual ones. Employees of the barangays where digital databases had been used reported significantly lower occurrences of such problems as providing wrong personal information about residents, having multiple entries with the same data, and making calculations incorrectly. Digital databases incorporate validation functions, for instance, checking whether a birthdate format is valid or whether two IDs are identical. Once the data are input correctly into the database, they can be repeated in any report or certificate, thus avoiding errors associated with manual recopying. On the other hand, manual systems suffered from numerous inaccuracies, ranging from illegible handwriting, spelling mistakes in names, wrong digits in dates of birth, and arithmetic errors when counting the number of residents in a particular barangay. As staff admitted, they did not notice such mistakes at times until a resident complained, and it resulted in embarrassment, work to be redone, and a drop in the level of trust towards the employees. The only area where manual

systems seemed to be better in comparison to digital ones is data entry performed improperly by untrained digital users, which may lead to mistakes that a simple manual system will not make. However, once people are trained well, digital systems clearly outperform manual systems in providing accurate data.

As for the question of data security, the answer here cannot be a straightforward statement about the superiority of digital technologies. It should be said that digital databases allow better access control since passwords, user roles, and audit capabilities help prevent unauthorized use of data and record changes in the log. In addition, regular data backup guarantees that all the information is secure. On the contrary, in most cases, information was kept in unlocked filing cabinets or placed on open shelves. There it was exposed to all sorts of damage, for instance from moisture or animals, and it also was likely to disappear completely in case of a fire or a typhoon. Many barangay representatives mentioned that entire logbooks were lost or damaged beyond recognition. At the same time, many barangays did not protect their digital databases either because passwords and user roles were neglected or data backup was not performed. Thus, in some situations, one forgotten password or hard drive malfunction would cause as much trouble as losing a logbook.

Of the problems discussed, the most significant problem that hinders the use of digital technology is the low computer literacy level among barangay workers. According to barangay officials, many older barangay members and workers have never experienced anything other than paperwork. In addition, many of them confessed to having a fear of computers because of their unfamiliarity with them. While the younger workers may be knowledgeable about computer operations, they lack expertise in using the specific software required for managing information within the barangay. This problem affects the efficiency of their work since data entry takes a longer time, and they make mistakes frequently. Moreover, they are less able to maximize the use of the available software program and must always depend on one person who knows how to use the computer. This situation becomes a hindrance if the competent person is not around. Another limitation of the digitalization process among barangay workers includes the limited budget. Barangays have small incomes based on revenues collected locally and from government sources for use within their jurisdictions. Therefore, purchasing computers, printers, and other necessary materials like software requires a lot of money. In fact, some barangays have been donated outdated computers that cannot run the database program, or they do not have enough money to buy ink and paper.

From the final analysis, it is clear that poor internet connectivity has a major effect on the efficiency of digital systems, specifically affecting the efficiency of cloud or internet-based platforms. There were many barangays that did not have adequate internet connectivity; most barangays located in the mountains, islands, or other rural areas faced the problem of slow, poor, or lack of internet connection altogether. The poor connectivity affected not only the

processes of real-time data syncing and remote backup but also basic activities like software updates, online learning modules, and the filing of tech support tickets. Some of the examples of fieldwork included the fact that there was an issue of using the software to generate certificates where the system needed internet connectivity in order to verify the information of residents stored in a central database, but poor internet connection prevented the process of carrying out transactions. In some cases, barangays tried to use offline digital systems, which also had their disadvantages including no automatic updates, the challenge of uploading data to the offices of other higher government agencies, and increased risks of losing data because of computer breakdown. It appears that the combination of poor computer literacy, budget constraints, and connectivity issues implies that the move towards full digitization is impractical in the country

## V. SUMMARY OF FINDINGS

In summary, the present study, which involves a careful analysis of digital versus manual systems in terms of their effectiveness, accuracy, data security, and implementation issues, indicates that digital information systems are superior to manual counterparts in many aspects. As demonstrated above, they are more effective in that they process requests, produce documents, and generate reports faster since transaction time drops from 20 to less than five minutes on average. Moreover, digital systems are characterized by higher accuracy since features such as validation, database searching, and use of pre-filled data fields reduce the risk of spelling mistakes, duplication of records, and calculation errors typical of paper records.

At the same time, it should be stressed that digital systems cannot be viewed as automatically superior to paper records because their performance depends greatly on factors such as adequate training of staff members, the presence of appropriate equipment and power supply, maintenance, and protection against threats. If at least one of these requirements is lacking (for instance, barangay staff are not adequately trained; computers are old and prone to malfunctioning; power outages are frequent), digital systems can perform as poorly or even worse than manual counterparts due to the increased risk of system failures and data loss.

First, based on the results of the study, the first recommendation that must be followed in order to ensure effective use of the systems is providing proper training to all personnel working within the barangay who will be using the system. The training will have to focus not only on general computer literacy but also on specific skills like entering data into the database, producing certificates, generating reports, and handling technical problems when they arise. Ideally, this training has to take place on site using the actual machines and software used in the barangay, and it needs to happen regularly in order to accommodate turnovers and new upgrades to the systems. Another key improvement needed is improving the level of security within the system. There are many barangays which use digital systems and do not secure their data through user accounts with unique usernames and

passwords, do not produce backup files for their records, and do not create logs for tracking user access to the system. As such, there is a clear need for a simple, yet efficient, security policy.

Third, there must be an annual allocation for system maintenance and support from the barangay governments working together with the city or municipality's local government unit. Digital projects often fail not because of software problems but because of the lack of resources to replace the ink cartridges, computer parts, the on-call services of the IT person, and the software subscriptions. An attainable budget for the maintenance of the software, even if it is only 5%-10% of the barangay's administration budget, can sustain the system's effectiveness without having to worry about outdated computer equipment. Moreover, the developers and the government institutions should create systems that will be easy to understand for the barangay staff. This means using big buttons, labeling the system in the vernacular language, minimizing the use of the keyboard (using the drop-down menu and check-box options instead), and making the system functional even without the internet connection. The user's guide should be graphical in nature, providing clear steps in using the system. Testing these systems in selected barangays before a full deployment can address any possible challenges that might arise from using the system. Through proper training, effective security measures, sufficient budget, and simple systems, the barangays can enjoy the advantages of digitization through increased efficiency, accuracy, and security.

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