

Digital Transformation Adoption in the Local Government Unit (LGU) of the Science City of Muñoz, Nueva Ecija: the Challenges and Best Practices

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Abstract. This study explores the integration of digital transformation within the Local Government Unit (LGU) of the Science City of Muñoz, Nueva Ecija, focusing on challenges and best practices. Through surveys and interviews across departments, it identifies digital initiatives, challenges, best practices, skills proficiency, and age-related factors and offers policy recommendations. The study highlights LGU efforts, including internet access, staff training, digital communication, record management, and an e-government portal, with ongoing projects such as Cashless and Online Government Transactions. The research uncovers significant obstacles impeding the LGU's digital progress, including budget limitations, skill gaps, cybersecurity issues, and user adoption challenges. The research also cited best practices within the LGU, encompassing skill development, partnerships, stakeholder engagement, change management, and infrastructure investment.

The researcher provides a set of recommendations to support the LGU's digital transformation, covering aspects like internet infrastructure enhancement, comprehensive digital skills training, budget allocation, cybersecurity reinforcement, collaboration and partnerships, user-centric design, change management strategies, cloud storage solutions, e-government portal enhancement, and age-specific training for staff. In conclusion, while acknowledging the commendable progress made by the LGU of the Science City of Muñoz in its digital journey, the study emphasizes persistent challenges hindering complete digital adoption. The outlined strategic actions in the form of policy recommendations serve as a roadmap for sustained progress, aiming to ensure that the LGU maximizes the benefits of a fully realized digital government, benefiting both its staff and the broader community. As the digital landscape evolves, adaptability and innovation become essential for the continued advancement of local governance.

Keywords: Digital Transformation; Digital Transformation Best Practices; Digital Transformation Challenges; Digital Transformation Initiatives; Science City of Muñoz

1. Introduction

In our modern world, the pervasive influence of digitalization has transformed the way we live and operate. We readily embrace this digital shift to streamline our daily tasks and boost efficiency. However, the realm of government operations has not always been synonymous with innovation and agility. Government services, too often, are perceived as slow, disjointed, and cumbersome. To address these challenges, governments must harness the power of Digital Transformation (Karpenkova, 2023), a process through which organizations infuse technology to drive fundamental changes. These changes promise to enhance efficiency, business agility, and value creation for employees, customers, and stakeholders. The adoption of Digital Transformation in government holds the potential to revolutionize decision-making, optimize operations, and elevate the functionality of government processes.

The urgency of Digital Transformation in government is a global phenomenon. The Philippines stands as a notable example, where the national government has declared Digital Transformation a top priority. The goal is to become a digital and globally competitive nation by 2040 (Abarca, 2023). President Bongbong Marcos has charged the Department of Information and Communications Technology (DICT) with the mission of harnessing information and communication technology to build a safe, secure, and competitive nation (Philippine News Agency, 2023).

In 2022, the League of the Municipalities of the Philippines (LMP) took a proactive stance by prioritizing open access to services among Local Government Units (LGUs) through digitalization. This approach aims to simplify procedures for the public when availing LGU services (Tubadeza, 2023). In the same year, Department of Finance Secretary Benjamin E. Diokno encouraged LGUs to embark on digital innovation and transformation, emphasizing the need to keep pace with digitalization.

However, despite these concerted efforts and the availability of advanced technologies, certain Local Government Units (LGUs), particularly municipalities, are still in the process of embracing digital transformation. To gauge the status of digital transformation within this context, our research zeroes in on the LGU of the Science City of Muñoz, Nueva Ecija. This unique city, one of the five cities in Nueva Ecija and the only Science City in the country serves as a distinctive case study.

The primary research objective is to delve into the challenges and best practices witnessed during the digital transformation journey of this LGU. The insights we gain

are not only invaluable to the LGU itself but also provide essential guidance for similar institutions embarking on comparable digital transformation initiatives. As we embark on this comprehensive analysis, our aim is to shine a light on the broader landscape of digital adoption within Local Governments and to celebrate the resilience and innovation of those forging the transformative path.

2. Methodology

This research study seeks to delve into the intricacies of digital transformation adoption within the Local Government Unit (LGU) of the Science City of Muñoz, Nueva Ecija. Employing a mixed-methods approach, the research combines both qualitative and quantitative analyses, using surveys and interviews to comprehensively examine the factors influencing digital transformation within the LGU.

The research aims to identify the LGU's digital transformation initiatives, uncover the challenges encountered during their adoption, and document the best practices and strategies employed to surmount these challenges. Additionally, it seeks to establish the statistical significance of staff age in relation to their digital skills and willingness to undergo training, thereby influencing the LGU's digital transformation efforts.

For data collection, the qualitative component utilizes interviews with purposefully selected participants familiar with LGU operations, while the quantitative aspect employs surveys with random sampling to ensure representation across different organizational levels. Data analysis methods encompass statistical tools for survey data, such as spreadsheets and the Chi-Square of Independence, and thematic analysis for interview data. Ultimately, the outcomes of this research endeavor will yield valuable insights and policy recommendations to enhance the LGU's digital transformation process, contributing to its effectiveness and success in serving the community.

2.1. *Sampling Procedure*

In this research, two distinct sampling procedures were employed to gather data for both qualitative and quantitative analysis. For the qualitative component, a purposeful sampling approach was adopted, a method commonly utilized in qualitative research to deliberately select a specific group of individuals or units based on their relevance to the research objectives (Heath, 2023). This approach ensured that the participants chosen for interviews possessed a deep familiarity with LGU operations and the digital transformation process.

Conversely, for the quantitative analysis, a random sampling technique was utilized. Random sampling, as recognized in statistical research (Thomas, 2023), allows

for the unbiased selection of survey respondents, ensuring that each staff member within the LGU has an equal and impartial chance of being included in the survey. This approach facilitated making statistically valid inferences about the broader LGU population.

Survey was administered to all 70 identified staff members, constituting a substantial portion of the LGU staff actively engaged in digital transformation initiatives. Simultaneously, interviews were conducted with representatives from the main offices of the LGU responsible for overseeing certain aspects of the LGU's digital transformation practices.

2.2. Respondents

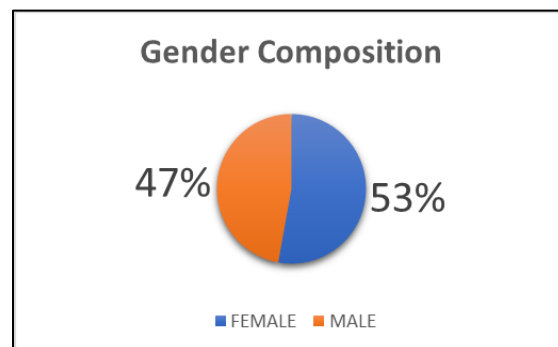
This research collected data from a diverse group of individuals within the LGU of the Science City of Muñoz, Nueva Ecija. The survey respondents included staff members, department heads, and IT officers from various departments such as the Assessor’s Office, Treasurer’s Office, Information Office, Library, City Social Welfare Development Office (CSWDO), City Health Office (CHO), City Planning Development Office (CPDO), City Population Office (CPO), City Environment and Natural Resources Office (CENRO), Human Resource Management Office (HMRO), and other offices to ensure a broad representation across offices of the Local Government Office of the Science City of Muñoz. In the case of interviews, participants were selected from the pool of LGU staff who are actively involved in the digital transformation initiatives.

In essence, the respondents for this research were carefully chosen from within the LGU, as they are integral to the digital transformation process and possess a comprehensive understanding of the LGU's operations.

2.2.1 Research Site

Gender and Survey Respondents by Age Bracket

Table 1 Gender Composition of Survey Respondents



The chart indicates that, among the 70 surveyed staff members of the LGU, 47% are male, and 53% are female. This demonstrates a nearly balanced gender composition among the survey respondents.

Table 2 Distribution of Survey Respondents by Age Bracket

AGE BRACKET	FREQ.	PERCENTAGE	RANK
18-30	33	47.14%	1
31-40	18	25.71%	2
41-50	11	15.71%	3
51-60	7	10.00%	4
60&Above	1	1.43%	5

The table illustrates that a majority of the respondents, constituting 47.14% of the total, fall within the 18-30 age bracket. Additionally, 25.71% belong to the 31-40 age group, 15.71% are in the 41-50 age range, 10% fall within the 51-60 age bracket, and 1.43% are aged 60 and above.

3. Results and Discussion

3.1. Digital Transformation Initiatives of the LGU

Table 3 Digital Transformation Initiatives of the LGU

DIGITAL INITIATIVES	FREQ.
Internet Access	65
Relevant Training for the Staff	49
Digital Communication	46
E-Government Portal	43
Online Government Transaction	19
Digital Transaction	26

According to the table 3, the majority of respondents highlighted six major initiatives: Internet Access in the LGU, Staff Training, Digital Communication (via FB Messenger & Email), Digital Records, and the Official LGU Website (E-Government Portal). Additionally, there were initiatives mentioned in interviews and surveys, such as Cashless Transactions and Paperless Transactions, as well as Online Government Transactions, which are not fully implemented yet. However, staff involved in the process confirmed that the LGU is currently in the process of adopting these initiatives with support from DILG, DICT, and ARTA.

3.2. Digital Transformation Challenges and Obstacles Encountered

Table 4 Challenges and Obstacles in the Digital Transformation Journey of the LGU

CHALLENGES AND OBSTACLES	FREQ.
Budget Constraint	49
Lack of Digital Skills	32
Cybersecurity Concerns	29
Data Privacy Issues	16
Technological Barriers	15
Inadequate Training	28
User Adoption Challenges	22

According to the table 4, the LGU faces seven prominent challenges and obstacles in its digital transformation journey: Budget Constraints that impede the LGU's adoption, Lack of Digital Skills among staff, Cybersecurity Concerns, Data Privacy Issues, Technological Barriers, Inadequate Training, and User Adoption Challenges in utilizing tools and applications. Additionally, respondents have identified additional challenges, including limitations in data infrastructure (11 instances), resistance to change (3 instances), and issues related to digital inclusion (10 instances).

3.3. Digital Transformation Best Practices of the LGU

Table 5 LGU'S Digital Transformation Current Best Practices

BEST PRACTICES	FREQ.
Engage Stakeholders	36
Effective Change Management	36
Infrastructure Investment	23
Digital Skills Development	42
Collaboration and Partnership	40
Community Engagement	18
Budget Management	29
Data Security and Privacy	18

According to the table 5, the LGU implements specific exemplary approaches in embracing digital transformation. These include involving stakeholders to solicit input and ideas for the digital adoption process, implementing effective change management strategies to address resistance from both staff and citizens, creating plans for developing digital skills among their staff, fostering collaboration, partnerships with other government agencies such as DOST, DICT, ARTA, and DILG. Other highlighted practices include budget management, infrastructure investment, community engagement, and data security & privacy. Also, as mentioned in the interview from the selected staff, the LGU plans to conduct cybersecurity and privacy webinars in response to recent attacks on government websites. Additionally, User-Centric Design and community engagement initiatives are in place to educate citizens about adopting new

digital processes, aligning with the LGU's commitment to equipping the community with knowledge about the evolving digital landscape.

3.4. Digital Skills Proficiency Self-Assessment

Table 7 Staff's Self-Assessment in their Digital Skills Proficiency

DIGITAL SKILLS	x	Md	Mo	Std
Computer Literacy	3.71	4	4	0.7828
Email and Communication	3.77	4	4	0.8017
Internet Browsing	3.83	4	4	0.8160
File Management	3.71	4	4	0.8190
Microsoft Office Suite	3.80	4	4	0.6505
Digital Security	3.56	4	4	0.7150
Social Media Awareness	4.13	4	5	0.8151
Data Entry and Management	3.73	4	3	0.7599
Online Meeting Collaboration	3.47	3	3	0.8115
Digital Literacy	3.64	4	4	0.7230
Data Privacy Awareness	3.80	4	4	0.8614
Basic Cybersecurity	3.46	3	3	0.8286
Basic E-Government Services	3.60	4	3	0.7876

According to table 7, survey data reveals that respondents generally exhibit a moderate to high level of proficiency across various digital skills, with mean scores falling between 3.46 and 4.13. This suggests an overall competence in the evaluated skills. Notably, the consistent median and mode values hovering around 4 indicate a central tendency in self-assessments, indicating a prevailing confidence or consensus among respondents regarding their digital proficiency. The standard deviations, ranging from 0.65 to 0.86 across all skills, highlight the variability in individual responses. For instance, "Data Privacy Awareness" exhibits a higher standard deviation of 0.8614, suggesting greater diversity in proficiency ratings among respondents. Conversely, skills like "Microsoft Office Suite" and "Email and Communication" show lower standard deviations, indicating more uniformity in proficiency levels among respondents. Skills with lower average proficiency scores, such as "Basic Cybersecurity" and "Online Meeting Collaboration," may signal areas where individuals could benefit from skill enhancement efforts. By analyzing these self-assessment results, the LGU can identify specific areas of improvement and develop training programs tailored to address the varying proficiency levels and needs of its staff, facilitating their adaptation to digital transformation initiatives within the organization.

3.5. Statistical Significance of Staff Age in their Willingness for Training

Table 8 Chi-Square Computation to Test Statistical Significance of Respondent's Age in the Willingness for Training

Age Group	Cat	O	E	O-E	(O-E) ²	(O-E) ² /E
18-30	1	22	25.46	3.46	11.95	0.47
	2	11	7.54	-3.46	11.95	1.58
31-40	1	17	13.89	-3.11	9.70	0.70
	2	1	4.11	3.11	9.70	2.36
41-50	1	8	8.49	0.49	0.24	0.03
	2	3	2.51	-0.49	0.24	0.09
51-60	1	7	5.40	-1.60	2.56	0.47
	2	0	1.60	1.60	2.56	1.60
60 & Above	1	0	0.77	0.77	0.60	0.77
	2	1	0.23	-0.77	0.60	2.60

To assess significance, the researcher utilized a significance level (α) of 0.05 and computed the degree of freedom (df) as 4. Referring to the chi-square table (Turney, 2023), the critical chi-square value is identified as 9.488. Given that the calculated Chi-Square (X^2) value is 10.68, surpassing the Critical Value of Chi-Square at $\alpha=0.05$ and $df=4$ (9.488), the hypothesis suggesting independence of age in relation to willingness to participate in digital literacy and cybersecurity training is rejected. From this, the researcher provided insight into the result:

a. Influence of Age: Respondents perceive varying degrees of influence of age on their willingness to participate in digital literacy and basic cybersecurity training.

b. Statistical Significance: The chi-square test reveals a statistically significant association between age and the willingness to participate.

3.6. Policy Recommendation

The researcher derived policy recommendations from the gathered data. The key policies proposed to support the LGU in their digital transformation include:

- Strategic Foresight: Engage in strategic foresight to anticipate challenges and opportunities in the digital landscape.
- Enhance Access and Connectivity: Upgrade internet infrastructure for faster and more efficient online operations.
- Collaborate with Other Agencies: Foster collaboration with national agencies to leverage resources and expertise.
- Upgrade Digital Skills: Implement initiatives to enhance digital literacy among staff and residents.
- Enhance Cybersecurity: Establish a robust framework to address cybersecurity and data privacy concerns.
- Encourage E-Government Services: Promote the adoption of e-government services for streamlined online transactions.
- Digital Governance Framework: Develop a comprehensive digital governance framework aligned with the LGU's digital plans.

These policy recommendations aim to guide the LGU in further advancing its digital initiatives for the benefit of both staff and the community.

4. Conclusions

This research study concludes that while the LGU of the Science City of Muñoz has made commendable progress in its digital journey, it has not yet achieved the status of a fully digital government that fully harnesses the advantages and benefits of digitalization. The study underscores the strategic imperative for the LGU to address challenges and seize opportunities in its ongoing digital transformation. The recommended actions outlined in this study serve as a guiding framework for the LGU to navigate its path toward digital transformation successfully, ensuring that the advantages of a digital government are fully realized for both its staff and the wider community. As the digital landscape continues to evolve, the LGU's dedication to adaptability and innovation becomes crucial in shaping a local governance model that is not only digitally resilient but also progressive

Acknowledgements

Acknowledgment extends to Honorable Armi Alvarez and to the Local Government of Science City of Muñoz, Nueva Ecija for granting permission to conduct research within their premises. Gratitude is also extended to Dean Jocelyn Cruz of the Graduate School and Dr. Noel Florencondia for their invaluable assistance and guidance throughout the research process.

References

- Abarca, C.M. (2023, February 1). Digital Transformation Named As PH's National Priority. Manila Bulletin. <https://mb.com.ph/2023/01/31/digital-transformation-named-as-phs-national-priority/>
- ARTA To LGUs: Automate Business and Building Permits Now Using DICT's IBPLS. (2020, September 15). Anti-Red Tape Authority. <https://arta.gov.ph/press-releases/arta-to-lgus-automate-business-and-building-permits-now-using-dicts-ibpls/>
- Baumann, B. (2022, November 23). 5 Government Digital Transformation Challenges and How to Win in Spite of Them. Panorama Consulting Group. <https://www.panorama-consulting.com/government-digital-transformation-challenges/>
- Bhandari, P. (2023, June 21). How to Find the Mean | Definition, Examples & Calculator. Scribbr. <https://www.scribbr.com/statistics/mean/>
- Chapter 7. Policies for digital transformation: Recommendations for a whole-of-government approach. (n.d). OECD Library. <https://www.oecd->

- ilibrary.org/sites/cf006e1b-en/index.html?itemId=/content/component/cf006e1b-en
- Crawford, B. (2021, February 17). The Internet: Overcoming Current Challenges To Increase Digital Transformation. Forbes. <https://www.forbes.com/sites/forbesbusinesscouncil/2021/02/17/the-internet-overcoming-current-challenges-to-increase-digital-transformation/>
- Dela Peña, K. (2022, October 3). Understanding Digitalization: Why PH Needs To Do More. Inquirer.Net. <https://newsinfo.inquirer.net/1674396/understanding-digitalization-why-ph-needs-to-do-more>
- Dharmaraj, S. (2020, July 8). Philippine Local Government Units Go Digital. Open Gov Asia. <https://opengovasia.com/philippine-local-government-units-go-digital/>
- Digital Transformation. (n.d.). Accenture. <https://www.accenture.com/us-en/insights/digital-transformation-index>
- Digital Transformation in the Public Sector: Opportunities and Challenges. (2023, August 5). London Premier Centre. <https://www.lpcentre.com/articles/digital-transformation-in-the-public-sector-opportunities-and-challenges>
- Digital Transformation to Contribute US\$8 Billion to The Philippines GDP by 2021. (2018, February 14). Microsoft Philippines Communications Team. <https://news.microsoft.com/en-ph/2018/02/14/digital-transformation-contribute-us8-billion-philippines-gdp-2021/>
- Dillera, A. (2020, September 3). Philippine Government Services Going Fully Digital By 2022. Open Gov Asia. <https://opengovasia.com/philippine-government-services-going-fully-digital-by-2022/>
- DOF Challenges LGUs To Keep Up With Digitalization Goal. (2022, October 27). Department of Finance. <https://www.dof.gov.ph/dof-challenges-lgus-to-keep-up-with-digitalization-goal/>
- Espiritu, P. G. G., & Jocson, J. C. (2023). Navigating Cybersecurity Challenges in The Era of Digital Transformation: Threats and Mitigation Strategies in The Philippines. *International Journal of Progressive Research in Science and Engineering*, 4(11), 10-23. <https://journal.ijprse.com/index.php/ijprse/article/view/994>
- Espiritu, P. G. G., Cañonero, C. M. D., Toba, T. R., Fernando, O. J. T., & Jocson, J. C. (2023). Navigating The Regulatory Landscape: Guiding the Development and Use of Emerging Technologies in The Philippines. *International Journal of Progressive Research in Science and Engineering*, 4(11), 33-49. <https://journal.ijprse.com/index.php/ijprse/article/view/996>
- Flores, H. (2023, January 3). Marcos To Ramp Up Digitalization Of Government. Philstar Global. <https://www.philstar.com/headlines/2023/01/03/2234896/marcos-ramp-digitalization-government>

- Gita-Carlos, R.A. (2023, May 24). PBBM to DICT: e-Gov System Update Vital For LGUs' Convenience. Philippine News Agency. <https://www.pna.gov.ph/articles/1202099>
- Gupta, A. (2022, March 7). 5 Key Digital Transformation Challenges Government CIOs Must Tackle. Gartner. <https://www.gartner.com/en/articles/5-key-digital-transformation-challenges-government-cios-must-tackle>
- Karpenkova, A. (2023, February 28). Digital Transformation in Government: Challenges, Examples (2023). Whatfix. <https://whatfix.com/blog/digital-transformation-in-government/>
- Marasigan, L. (2023, July 26). DICT Ramps Up Government Digital Transformation Initiatives. Business Mirror. <https://businessmirror.com.ph/2023/07/26/dict-ramps-up-government-digital-transformation-initiatives/>
- PBBM Orders Immediate Digitalization Of Vital Government Services To Boost Ease Of Doing Business, Combat Corruption. (2023, July 24). Presidential Communication Office Website. https://pco.gov.ph/news_releases/pbbm-orders-immediate-digitalization-of-vital-government-services-to-boost-ease-of-doing-business-combat-corruption/
- PH Digital Transformation Urgently Needed For Better Policy-Making, Service Delivery - NEDA. (2021, July 27). National Economic and Development Authority. <https://neda.gov.ph/ph-digital-transformation-urgently-needed-for-better-policy-making-service-delivery-neda/>
- Philippine Digital Transformation. (2023, June 16). Philippine Information Agency. <https://pia.gov.ph/infographics/2023/06/16/philippine-digital-transformation>
- Shtpula, N. (2023, September 26). Digital Transformation in Government: Challenges, Examples. Soloway. <https://soloway.tech/blog/digital-transformation-in-government/>
- The Benefits of Digital Transformation in Government. (2023, May 17). Tiscki. <https://tiscki.com/updates/benefits-of-digital-transformation-in-government/>
- Tubadeza, C. (2023, January 1). LMP Bats for LGUs Going Digital. <https://www.baguiomidlandcourier.com.ph/lmp-bats-for-lgus-going-digital/>
- Turney, S. (2023, June 21). Chi-Square (X^2) Table | Examples & Downloadable Table. Scribbr. <https://www.scribbr.com/statistics/chi-square-distribution-table/>
- What Is Digital Government Transformation? (n.d). Granicus. <https://granicus.com/dictionary/digital-government-transformation/>
- What Is Digital Transformation? (n.d). Salesforce. <https://www.salesforce.com/ap/products/platform/what-is-digital-transformation/>