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Feasibility study for reengineering the existing building at NEUST San Isidro Campus: A long-term infrastructure solution

Romeo B. Campos Jr [1], Jennilyn C. Mina [1,*], Pastora S. De Guzman [2]

[1]*College of Management and Business Technology, Nueva Ecija University of Science and Technology, Cabanatuan City, Philippines*
[2]*College of Education, Nueva Ecija University of Science and Technology, Cabanatuan City, Philippines*

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ABSTRACT

This study assessed the feasibility of reengineering the existing building at the Nueva Ecija University of Science and Technology (NEUST) San Isidro Campus, located on Jose Abad Santos Avenue, San Isidro, Nueva Ecija, Philippines. The aim was to address the university's growing space requirements, enhance safety, and integrate modern educational facilities. A comprehensive approach was used, including analysis of historical enrollment data, evaluation of current space utilization, and collection of feedback through surveys and interviews with students, faculty, and administrators. Statistical techniques were applied to forecast enrollment trends and perform a cost-benefit analysis to determine financial viability. The results indicated a notable increase in deteriorating classrooms, leading to overcrowding, decreased quality of education, and safety issues. The COVID-19 pandemic further limited maintenance activities, accelerating the decline of classroom conditions. The findings highlight the urgent need for regular maintenance, repair work, and long-term infrastructure planning. Constructing a new building emerged as a crucial solution to support academic growth, provide a safe and conducive learning environment, and align with NEUST's institutional goals. The study offers strategic recommendations for optimizing space and improving campus facilities.

1. Introduction

For almost a century, the Nueva Ecija University of Science and Technology (NEUST) San Isidro Campus has been a fundamental educational institution in the province of Nueva Ecija. It has functioned as a productive educational institution for several stakeholders, providing them with the information and abilities essential to succeed in a constantly changing world (Adel, 2024). Nevertheless, the organization is now facing a crucial point in its development, as it must address difficulties that need a significant and fundamental change: The construction of a new structure (Dabić, 2024).

The existing structure, while previously sufficient, has now become totally inadequate to serve the rapidly growing number of students (Dominguez and Ueno, 2025). The exponential growth in enrollment numbers in the previous decade has resulted in significant pressure on current infrastructure, resulting in congestion and unconducive learning environments (Nyiwul, 2021). Classrooms that were formerly sufficiently large are now overcrowded, impeding the ability to teach and learn effectively (Shanta and Wells, 2022). Students have difficulties in locating accessible areas for studying and collaborating, which negatively impacts the overall academic ambiance of the campus (Kumaran et al., 2025).

Furthermore, the declining condition of the structure presents significant safety risks. The object's structural integrity has been significantly compromised due to many years of use, leading to noticeable evidence of decay (Hassani and Dackermann, 2023). Cracked walls, leaky roofs, and antiquated electrical systems are signs of significant risk to the safety of students, instructors, and staff (Garcia-Diaz and Smith, 2024). Accidents and property damage pose a significant threat to the campus community (Smith et al., 2023). Given the extensive nature of these structural issues, refurbishment would be a costly and time-

* Corresponding Author.
Email Address: zedka_jen27@yahoo.com (J. C. Mina)
https://doi.org/10.21833/ijaas.2025.09.002
Corresponding author's ORCID profile:
https://orcid.org/0000-0002-0081-8326

consuming process that may not fully address the underlying problems (Fang et al., 2022).

An exhaustive evaluation of the building's state has determined that the magnitude of the damage is so substantial that the cost and duration of repairs would be unaffordable and time-consuming (Amran et al., 2022). Allocating significant resources towards renovating a deteriorating building would eventually serve as a temporary measure since it would not effectively tackle the fundamental issues of insufficient space and safety problems (Lehmann, 2021). Constructing a new institution is the only feasible and enduring course of action (Beckert, 2022). An up-to-date, meticulously planned structure would provide enough room to handle the expanding student body, guaranteeing each student access to superior educational settings.

Additionally, it would be highly important to ensure safety and accessibility, therefore fostering an environment favorable for teaching, research, and student growth (Chan, 2023). In addition, constructing a new building provides a chance to integrate cutting-edge technology and environmentally friendly characteristics (Pan and Zhang, 2023), establishing NEUST San Isidro Campus as a frontrunner in educational advancement. The choice to create a new structure is not only a physical project but a strategic investment in the institution's future and the community it serves (Nasta and Cundari, 2024). The objective is to provide students with an exceptional learning experience that enables them to achieve their maximum potential (Jaboob et al., 2025). Constructing a new facility would enhance NEUST San Isidro Campus's status as a distinguished institution of higher education and sustain its beneficial influence on the students and the whole community (Tiyanes and Ponsades, 2024). The objective of this study was to conduct a feasibility analysis for the reengineering of the NEUST San Isidro Campus building. It aimed to identify the specific requirements and design considerations for a new structure that will meet the campus's growing needs, enhance safety, and integrate modern educational facilities.

2. Methodology

This feasibility study utilized a multifaceted method to assess the viability of constructing a new building for the NEUST San Isidro Campus. This indicates that the case study was performed at NEUST San Isidro Campus at Jose Abad Santos Avenue, San Isidro, Nueva Ecija, Philippines. The NEUST commenced in June 1908 as a vocational program at the Wright Institute in San Isidro, Nueva Ecija, where young Filipinos received training in carpentry and fundamental telegraphy. The aforementioned vocational training continued until 1927–1928, when the general secondary school relocated to Cabanatuan City. This indicates that the geography of the case study was the first campus of NEUST, and the focus of the Project Feasibility Study was the initial building on this campus. The primary objective of this study was to determine if a new structure could effectively address the campus's growing needs, enhance safety, and incorporate modern educational facilities.

This study involved data collection that analyzed historical enrollment data to predict future student population growth, assessed current space utilization and faculty workload, and gathered financial information about construction costs and potential funding sources (Jones, 2025).

The researchers also utilized stakeholder engagement by conducting surveys and interviews with students, faculty, and administrators to gather their perspectives on campus conditions and safety concerns. They desired features in a new building (Marks and Al-Ali, 2022).

Data analysis, which utilized statistical techniques to forecast enrollment trends and conduct a cost-benefit analysis to evaluate the project's financial feasibility, was also employed in this study (Senić et al., 2025).

Lastly, the viability of the new construction project was evaluated according to its capacity to fulfill anticipated spatial demands, guarantee financial viability, emphasize safety and accessibility, conform to educational objectives, and cater to the interests and desires of stakeholders (Effiong, 2025).

3. Results and discussion

This section presents the findings obtained from the primary research instrument, which was designed to identify the viability of establishing a new building in front of the NEUST San Isidro Campus. The data was collected through focus group discussions and was analyzed using descriptive statistics.

With 13 classrooms overall, the College of Education (COED) Building is notable based on Table 1. By comparison, the Laboratory High School Building features the fewest classrooms, just 8. With an average floor size per classroom of 819.00 square meters, the COED Building once more leads in spaciousness. The College of Management and Business Technology (CMBT) building closely follows, with 567.00 square meters per classroom. Conversely, with an average floor area of 315.00 square meters per classroom, the ICT Building boasts the least Effective space distribution in educational buildings, which is essential to establishing ideal learning conditions. Research indicates that the average size of each classroom and the number of classes can significantly affect the level of comfort experienced by teachers and pupils and the quality of education (Huang et al., 2022). Analyzing several buildings inside a school reveals different ways of using space, each with particular effects on academic performance (Rocha and Figueira, 2025). On the other hand, the Laboratory High School Building boasts only eight classrooms, the lowest count among all the buildings. This lower count could point to a more focused instructional

strategy, incorporating, maybe, specialized classes that require less physical space. Facilities with fewer classrooms often concentrate on specialized or advanced instruction, according to Luchenko and Kovinko's (2024) research, which can be helpful given the lower student-to-instructor ratio.

Conversely, with its 315.00 square meters average floor space per classroom, the ICT Building boasts the lowest. Though smaller than in the COED and CMBT buildings, the classroom sizes in this building are suitable for computer-based learning environments requiring individual workstations (Swart and MacLeod, 2021). The modest area could reflect the particular emphasis of ICT education, which calls for fewer students to enable ideal hands-on instruction.

Table 1: The current profile of the San Isidro campus in terms of the number of classrooms

Building	Number of classrooms	Average floor area
Laboratory high school building	8	504.00 m^2
CMBT building (front building)	9	567.00 m^2
ICT building	5	315.00 m^2
COED building	13	819.00 m^2
Total	35	2,205.00 m^2

According to the Philippine Building Code, the standard classroom size is approximately 63 square meters. This is typically measured as 7.00 meters × 9.00 meters, with dimensions taken from the center of the walls

Students enrolled over several academic years and semesters are listed in Table 2. Student enrollment has exhibited swings overall; some years indicate rises, and others show falls. Usually, for most academic years, the First Semester has more enrollment than the Second Semester. This is especially clear in the years 2013–2014, 2014–2015, 2018–2019, and 2021–2022. There are, nevertheless, certain exceptions where the enrollment numbers for the first and second semesters are somewhat similar: 2016–2017, 2017–2018, and 2020–2021. Unlike 2013–2014 and 2018–2019, which saw a rather higher number of students registered during the summer semester, summer enrollment has been continuously low. Although student enrollment has changed over time, generally, the pattern shows a slight rise in student population. More research is required to pinpoint the fundamental causes of these variations and create plans for preserving and raising enrollment.

Table 2: Student's historical profile

Academic year	1st semester	2nd semester	Summer
2013 – 2014	2,559	2,205	122
2014 – 2015	2,921	2,573	6
2015 – 2016	3,215	2,302	
2016 – 2017	2,400	2,302	
2017 – 2018	1,831	1,810	
2018 – 2019	2,203	1,916	247
2019 – 2020	2,302	2,079	
2020 – 2021	2,391	2,235	
2021 – 2022	2,448	2,123	
2022 – 2023	2,371	2,054	
2023 – 2024	2,371	2,280	

Various elements can affect student enrollment patterns in educational institutions: Economic situation, institutional repute, program offers, and demographic developments (Cox, 2021). Although the general tendency in many academic environments shows a minor rise in student population, variances are typical due to these external and internal factors (Balalle, 2024). Economic downturns, for example, can cause lower enrollment if families prioritize financial stability above education (Al Khalili, 2025). Furthermore, the reputation of a university and the perceived quality of its programs influence student decisions; colleges with high ratings frequently see either more consistent or rising enrollment levels (Plata, 2025).

Table 3 shows a notable difference between the Nueva Ecija University of Science and Technology San Isidro Campus to the global average of the actual student-to-classroom space ratio and the advised range of 2.5–3.0 square meters per student for institutions (Ready et al., 2004).

Table 3: Classroom ratio analysis according to m^2

Academic year	Average number of enrollees	Ratio per m^2
2013 – 2014	2,559	0.86
2014 – 2015	2,921	0.75
2015 – 2016	3,215	0.69
2016 – 2017	2,400	0.92
2017 – 2018	1,831	1.20
2018 – 2019	2,203	1.00
2019 – 2020	2,302	0.96
2020 – 2021	2,391	0.92
2021 – 2022	2,448	0.90
2022 – 2023	2,371	0.93
2023 – 2024	2,371	0.93

The ratio continually exceeds the ideal across all academic years, implying a lack of classroom capacity to handle the rising student enrollment. With just 0.69 square meters of classroom space available per student, the academic year 2015–2016 boasts the lowest ratio recorded—0.69. It is below the advised level, causing congestion, discomfort, and hampered learning (Kanwal andbashir, 2022). Furthermore, exposing a changing pattern in the ratio over the years is the data. Some years show development, while others show a fall. This mismatch points to insufficient, consistent planning and resource allocation to handle the rising student population and guarantee enough classroom space (Yangambi, 2023). The study finds the university's classroom space to be seriously lacking. The learning environment, student comfort, and general educational quality (Guan and Scott, 2024) suffer from this insufficient room per student. The institution should expand classroom facilities or use techniques to prioritize current space to solve this problem (Dearborn and Braun, 2025). Long-term planning and resource allocation are also crucial to ensure the institution can sustain a suitable learning environment for its students and handle upcoming expansion (Lo, 2024).

Table 4 shows a persistent difference between the suggested 1:40 ratio and the actual student-to-classroom ratio at Nueva Ecija University of Science and Technology, San Isidro Campus.

Table 4: Classroom ratio analysis according to the number of students

Academic year	Average number of enrollees	Ratio per classroom (Average number of students per classroom)
2013 – 2014	2,559	73
2014 – 2015	2,921	83
2015 – 2016	3,215	92
2016 – 2017	2,400	69
2017 – 2018	1,831	52
2018 – 2019	2,203	63
2019 – 2020	2,302	66
2020 – 2021	2,391	68
2021 – 2022	2,448	70
2022 – 2023	2,371	68
2023 – 2024	2,371	68

The average number of student-learners in a classroom throughout all academic years much exceeds the ideal, suggesting a shortage of classroom capacity to handle the rising student count. Far above the advised limit, 92 students per classroom in the school year 2015–2016 is the highest ratio noted. Although the ratio has changed over time, generally, the tendency points to a continuous difficulty in keeping enough classrooms to satisfy the growing student demand. Lessening of classroom space for higher education influences quality, student comfort, and learning (Ikram and Kenayathulla, 2023). Over the years, classroom-to-student ratio fluctuations have highlighted the challenges of maintaining adequate classrooms to meet student demand (Preña and Labayo, 2024). This study addresses the consequences of insufficient classroom space and provides strategies for universities to maximize space plans and distribute resources to fit future expansion.

Because students may have few chances for involvement and engagement, overcrowded classrooms often lower the quality of instruction and learning (Makena, 2025). Studies show that crowding can lead to higher noise levels and distractions, impairing instructors' ability to run their courses and students' ability to concentrate (Adsız and Dinçer, 2025). Moreover, limited classroom space can make students uncomfortable, leading to discontent and reduced academic performance (Egan et al., 2024).

Enhancing physical infrastructure is a principal method to resolve classroom space challenges (Li and Wise, 2025). Constructing or enlarging classrooms will help to reduce crowding and offer more favorable learning conditions. Therefore, Long-term planning is necessary to control classroom demand properly and guarantee that colleges can support future expansion (Hoque, 2025).

Table 5 shows a constant difference between the recommended standards and the student-to-classroom ratio. Although the total number of classrooms has stayed relatively steady, the average student count in each classroom consistently exceeds the ideal of forty students. This suggests a shortfall of classroom space to handle the rising student count. Furthermore, the ratio per square meter regularly shows below the advised range of 2.5–3.0, implying insufficient classroom capacity for the enrolled student count. These results emphasize the importance of the institution prioritizing building new classroom facilities or using techniques to maximize current space to guarantee a suitable learning environment for its students.

A good learning environment in higher education depends on maintaining suitable student-to-classroom ratios. Studies repeatedly find that ideal class sizes improve student involvement, contentment, and learning results.

The educational experience can be significantly changed by exceeding the advised student-to-classroom ratio (Kehan et al., 2024). Personalized learning and effective teaching depend on limited student-teacher interactions, which overcrowded classrooms may produce (Bano et al., 2025). Teachers may find it difficult in such settings to run the classroom properly, give each student individualized attention, and include students in

meaningful conversations (Alam and Mohanty, 2023). Furthermore, large student-to-classroom ratios could cause distractions and higher noise levels, impairing concentration and learning (Gervas, 2024). Larger class sizes have also significantly impacted student performance and satisfaction (Carro and Gallardo, 2024). Students in packed classrooms reported lower degrees of happiness and engagement, which are vital elements of academic achievement, Johnson (2025) discovered. These results imply that preserving high-quality education and favorable student outcomes depends on keeping a suitable student-to-classroom ratio (Brown et al., 2023).

Table 5: Campus profile analysis according to the ratio of the students and m^2

Academic year	Number of classrooms	Ratio according to class size	Ratio according to m^2
2013 – 2014	35	73	0.86
2014 – 2015	35	83	0.75
2015 – 2016	35	92	0.69
2016 – 2017	35	69	0.92
2017 – 2018	35	52	1.20
2018 – 2019	35	63	1.00
2019 – 2020	35	66	0.96
2020 – 2021	35	68	0.92
2021 – 2022	35	70	0.90
2022 – 2023	35	68	0.93
2023 – 2024	35	68	0.93

Expanding classroom facilities to fit rising student counts is part of long-term fixes (Kolié et al., 2023). This could involve constructing new buildings, adding more classes to existing structures, or using underused areas (Grazuleviciute-Vileniske and Zmejauskaite, 2025). Strategic planning and resource allocation should also be activities of universities to guarantee they can sustainably support their academic programs and future expansion (Kayyali, 2025).

Table 6 shows a worrying pattern of reducing operable classrooms at Nueva Ecija University of Science and Technology for the past ten years. Although the overall count of classrooms has stayed the same, the number of run-down classrooms has continuously climbed, lowering the accurate count of usable classrooms. The university may suffer from overcrowding, worse educational quality, higher maintenance costs, and safety issues resulting from the lack of suitable classrooms. The COVID-19 epidemic has probably accelerated the drop since maintenance and repairs under lockdowns and limitations are difficult.

The institution should give constant maintenance and repairs of current classrooms top priority, as well as long-term planning and resource allocation to guarantee a suitable learning environment for its students.

Table 6: Comparative analysis of the current number of classrooms versus the actual number of classrooms

Academic year	Number of classrooms	Dilapidated number of classrooms	The actual number of serviceable classrooms
2013 – 2014	35	0	35
2014 – 2015	35	1	34
2015 – 2016	35	2	33
2016 – 2017	35	3	32
2017 – 2018	35	4	31
2018 – 2019	35	4	31
2019 – 2020	35	5	30
2020 – 2021	35	5	30
2021 – 2022	35	9	26
2022 – 2023	35	9	26
2023 – 2024	35	9	26

The drop in classroom quality might affect the morale and drive of professors and students (Manueke and Tung, 2024). While declining circumstances could cause emotions of indifference and apathy, studies have demonstrated that well-kept and aesthetically beautiful learning spaces favorably influence student attitudes and actions (Buttazzoni et al., 2023). When faculty members are educated in inadequate conditions, they may become more stressed and frustrated, influencing their job satisfaction and teaching efficacy (Bange et al., 2025).

Maintaining classroom infrastructure has been more difficult due to the COVID-19 epidemic (Musikavanhu and Scheepers, 2024). Lockdowns, social distancing rules, and financial restrictions have upset routine maintenance plans and postponed repairs (Huderek-Glapska and Antczak, 2025). The epidemic caused budget cuts for many organizations, limiting the money available for maintenance and infrastructure upgrades (Arapis and Chatterjee, 2025). Consequently, the number of deteriorated and unserviceable classrooms has grown, aggravating problems with safety and congestion.

4. Conclusion and recommendations

The analysis of classroom space utilization at Nueva Ecija University of Science and Technology reveals a significant shortfall in capacity regarding the number of classrooms and their size. The

persistent decline in serviceable classrooms due to dilapidation further exacerbates this issue. The current situation has negative implications for the quality of education, student comfort, and overall campus efficiency. To address these challenges, the university should prioritize constructing a new building. This investment will provide additional classroom space and alleviate the burden of maintaining and retrofitting existing dilapidated buildings. A new building can be designed with modern infrastructure, adequate ventilation, lighting, and other essential amenities, creating a more conducive learning environment for students.

Moreover, a new building can reduce operational costs associated with maintaining aging infrastructure. The university can streamline operations and improve efficiency by consolidating resources and facilities into a modern, well-designed building. This can free up funds for other critical areas, such as academic programs, faculty development, and student support services. In conclusion, constructing a new building is a strategic investment that can significantly improve the quality of education at Nueva Ecija University of Science and Technology. By addressing the current shortage of classroom space and providing a modern, well-equipped learning environment, the university can enhance student satisfaction, improve academic outcomes, and strengthen its reputation as a leading institution of higher education.

Compliance with ethical standards

Ethical considerations

The study adhered to ethical research standards. Participation in surveys, interviews, and focus group discussions was voluntary, and informed consent was obtained from all participants. Responses were treated with confidentiality and anonymity.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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