The Impact of Digital Technology on Contemporary Architecture in Pampanga

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Abstract *- This study examines how digital technology has affected modern architecture, particularly emphasizing Pampanga's architectural scene. It is crucial to comprehend how digital technology affects the design, construction, sustainability, and social aspects of architecture, as well as any potential ramifications for the field's future, as it becomes more and more incorporated into architectural practice. The thematic analysis method is used in qualitative research to ascertain the respondents' sex, position, age, year of professional expertise, and perception of design innovations relative to complex geometries, building materials, construction schedules, and cost-effectiveness. The study also discovered that digital technology impacts architecture students' educational programs and is crucial for productivity and teamwork. The majority of responders from architectural businesses in Pampanga, Philippines, are male architects with over ten years of experience, aged between forty and fifty, according to the results. Regarding comments about the significant role of digital technology in design innovations, efficiency, collaborations, architecture students' educational curricula, and adaptive reuse of historical buildings, the respondent's impression is one of strong agreement or strong favorable response. The majority of CAD software, including Building Information Modeling (BIM), Rhino, Enscape, and virtual reality, is utilized in architectural programming, according to survey data. The overall findings demonstrated how digital technology significantly changed contemporary architecture in Pampanga and beyond, providing architects, academics, and industry stakeholders with important new insights.*

Indexed Terms- *Contemporary Architecture, Digital Architecture, Digital Technology*

I. INTRODUCTION

The incorporation of digital technology has emerged as a defining component shaping modern practice in the constantly changing field of architecture. This study delves into the intricate connections between digital technology and architecture to identify its significant influences on the field, both favorable and unfavorable. Although digital technology has brought about many benefits, like increased productivity, accuracy, and new design opportunities, it has also created difficulties and worries for the architectural community. Accelerated digital collaboration and more efficient architecture design are two outcomes of the present climate's push for growth-oriented approaches. [1]

This project aims to shed light on the intricate web of connections between digital technology and contemporary architecture, namely how these webs influence sustainability, design, construction, and the built environment's sociocultural fabric. It seeks to shed light on the potential consequences for the future of architectural practice by delving into these elements.

The main challenge being examined is how to thoroughly investigate the dualistic character of digital technology's impact on architecture. It aims to analyze both the advantages and disadvantages to give an in-depth understanding of its influence on architectural discourse. Several important questions, each examining a different facet of the relationship between digital technology and modern architecture, are at the heart of this investigation.

The first set of questions concerns design innovation made possible by digital technology. Through an examination of the intricacies of design geometry,

potential applications of innovative building materials, construction velocity, and economic viability, this research endeavors to determine the degree to which digital tools facilitate the expansion of architectural imagination and practicability.

Efficiency and collaboration make up yet another crucial aspect that is being examined. This study aims to determine the degree to which digital technologies act as catalysts for improving productivity and communication in architectural practice by analyzing how well they streamline architectural processes and encourage teamwork.

In addition, the research explores sustainability and how smart building technologies have transformed the environmental performance and effectiveness of contemporary architectural projects. By dissecting the complex relationship between digital innovation and environmentally friendly design principles, it hopes to shed light on the possibility of reducing the environmental impact of architecture.

Furthermore, the study looks at how digital interventions affect the architectural experience to understand how technology and human habitation are changing over time.

Additionally, the study explores the field of architectural education, examining how well-existing curricula prepare aspiring architects to traverse the digital landscape successfully. This study attempts to find potential gaps and ways to improve educational frameworks by evaluating how ready young architects are to work with digital tools.

The study also investigates how digital technology might support the adaptive reuse of historic structures in modern architectural practice. This project intends to highlight the transformative potential of technology in rejuvenating the built environment by clarifying how digital tools enable creative interventions while maintaining architectural heritage.

Finally, the study delves into the application of software, searching outside the world of traditional CAD tools to find specialist software that meets the many requirements of modern architects. By documenting high-end software solutions that are tailored to specific architectural requirements, this study seeks to give practitioners insights into optimizing digital processes and making the most of technological advancements.

This study essentially conducts a thorough investigation into the influence of digital technology on modern architecture, to expose its complex complexities and outline strategies for maximizing its transformational potential while resolving related obstacles. It aims to provide insightful information about the changing dynamics of architectural practice in the Digital age through a comprehensive investigation.

II. LITERATURE REVIEW

The integration of digital technologies into contemporary architecture has brought about a significant transformation in the way architects envision, plan, and construct-built spaces. Many advantages have come along with this change, from increased accuracy and efficiency to wider design possibilities. However, it has also brought up an abundance of complications and issues that demand careful thought. We can gain awareness of the complex effects of this technological convergence by exploring the body of literature that already exists on the subject of digital technology's influence on architecture.

Advancing the boundaries of architectural design has been made possible by digital technology, which has allowed architects to achieve complex and unusual geometries with previously unheard-of precision and efficiency. According to [2], developments in computational design techniques and parametric modeling have enabled architects to investigate intricate geometries that were thought to be impractical in the past. In addition to making it easier to realize famous architectural landmarks, this transformative capacity has made design innovation more accessible to architects of all sizes and motivated them to work with complexity and abstraction in their projects.

The use of building materials has changed significantly with the introduction of digital fabrication technology, creating new opportunities for

material experimentation and exploration. Researchers like [3] emphasize how digital fabrication methods like robotic building and additive manufacturing might redefine the material palette which architects can choose from. Digital technology has led to a material innovation renaissance by making it possible to seamlessly incorporate innovative materials and fabrication techniques into architectural practice, enhancing resilience and sustainability in the built environment.

“Building Information Modelling (BIM) is a significant advancement in the twenty-first century's architecture, engineering, and construction (AEC) industry. BIM provides a digital platform for continuously monitoring a structure's functional and physical characteristics throughout its lifespan. It offers a collaborative approach to the facility's development, construction, and management” [4]. “BIM has partially achieved the AEC industry's objectives of decreasing project delivery time and cost and enhancing project efficiency and quality. Building Information Modeling (BIM) allows architects and engineers to visualize and anticipate any design, construction, administrative, or operational obstacle during actual construction processes” [4].

The construction industry has been actively exploring the use of digital assistance for collaboration as a solution to address the industry's well-known wastefulness. In actuality, the complexity of a multifaceted cognitive interaction makes design cooperation difficult. [5] Most research initiatives focus on promoting the adoption of methods in design practice, notwithstanding the uncertainty surrounding the impact of digitally enabled collaboration on crucial design activities such as reflection, critical thinking, conduct, and reason.

Healthy, technologically advanced, sustainable (i.e., maintaining performance for future generations), regulatory compliant, tenant-friendly, and sufficiently versatile and adaptable to manage change are all necessary characteristics of intelligent buildings. Effective synergy between individuals and structures necessitates the harmonious collaboration of both providers and consumers, as well as the seamless integration of residents, systems, and the physical edifice. Structures will contain a variety of systems designed by different individuals. Planning, designing, and managing to do this effectively require systems thinking as well as the ability to be creative and innovative while also remaining pragmatic. [6]

In recent years, contemporary architecture and its design methodologies have undergone rapid digitalization, primarily due to the emergence of Computer-Aided Architectural Design (CAAD) tools. Despite this technological advancement, these tools have yet to fully accommodate the intuitive and collaborative nature inherent in the ideation processes of architecture. The creative processes of architecture students and inexperienced practitioners often find themselves constrained or overlooked by conventional CAAD tools, which feature rigid interfaces. Nonetheless, there exists an opportunity for students to enhance their learning experiences in design studios through the utilization of tools that actively support and facilitate their reflective design processes. Such tools could intuitively aid in the generation of design concepts inspired by various stimuli, while concurrently documenting these thought processes and ideas within interactive design databases. Therefore, in light of the ongoing integration of digital design strategies within the architectural discipline, the adoption of tools capable of dynamically recording and tracking the evolution of design thinking and making processes stands to enhance the validation and reflection upon corresponding conceptual designs [7]

In addition, academics like [8] support investigating specialized software platforms other than CAD tools, like generative design algorithms and parametric modeling software, to give students the necessary training for creative design exploration and technological fluency.

A new paradigm in digital design and administration, historic building information modeling (HBIM) has great promise for the renovation process. In the context of cognitive automation in particular, there may be opportunities to address issues with existing documentation and asset preservation. One area where Building Information Modeling (BIM) shows promise is in the preservation of comprehensive and evolving information of the built environment. This step is

critical for determining the recoverable residual building performances with any degree of certainty.

Additionally, this approach helps ensure that all technicians with a variety of skills participate effectively and that information is shared successfully. Integrating BIM with automation technologies would not only decrease labor costs but also positively assist quality control during task execution, diagnosis, and design. [9]

As a result, the literature offers a wide range of perspectives on how digital technology has affected modern architecture. To inform future directions in architectural research, education, and practice, this research synthesizes various viewpoints to clarify the intricate relationship between technology innovation, architectural practice, and societal development.

- Theoretical / Conceptual Framework

The findings of this research provide a conceptual framework that may be used to understand the link between digital technology and contemporary architecture in the province of Pampanga in the Philippines. It has been determined that the independent variable is digital technology, and the dependent variable is modern architecture.

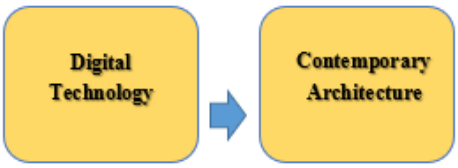

Figure 1. Diagram of the importance and impact of digital technology on contemporary architecture.

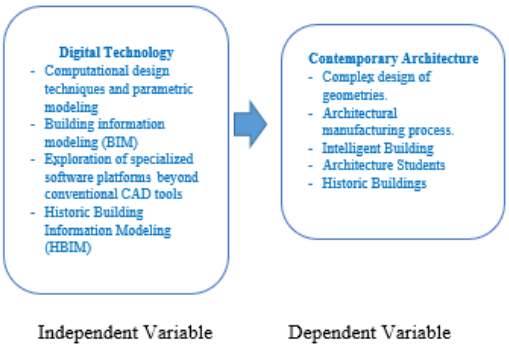

Figure 2. Diagram illustrating the relationship and effects of digital technology on contemporary building designs

In the questionnaire, participants were requested to respond to a sequence of inquiries and remarks about the research void, which were extracted verbatim from the problem statement. Using a Likert scale to create a conceptual framework could enhance the use of digital technology to speed up the architectural design process by meeting time, structural stability, and aesthetic demands.

- Statement of the Problem

Finding out the impact of digital technology on contemporary Pampanga architecture is the aim of this study. While digital technology has offered many benefits to architecture, including increased efficiency, precision, and new design possibilities, it has also presented challenges and concerns for architects and the broader industry. Therefore, the problem to be addressed is the exploration of the positive and negative impacts of digital technology on contemporary architecture, including its influence on design, construction, sustainability, and social aspects of architecture, and the potential implications for the future of architecture. Its primary purpose was to respond to the subsequent inquiry:

1. How would you characterize the respondents' demographics in relation to:
   1.1 Sex
   1.2 Position
   1.3. Age
   1.4 Years of Work Experience

2. What are the design innovations that will be contributed through the use of digital technology in terms of:
   2.1 Complicated geometries of the design
   2.2 New opportunities for building materials
   2.3 Building speed
   2.4 Cost Effectiveness

3. How effective is digital technology in terms of efficiency and collaboration?
4. How does digital technology impact the educational curricula of architecture students? Are future architects adequately prepared to work with these technologies?
5. How does digital technology contribute to the adaptive reuse of historical buildings in contemporary Architecture?

6. What are the various particular high-end software that will assist Architects and are currently being used in fulfilling their design aside from the typical CAD software (i.e. AutoCAD, Sketch Up, and others)

- Scope and Limitations of the Study

The study's respondents were architectural draftsmen and building project architects, and it was restricted to Pampanga-based architectural firms. Some of this study's limitations are:

- Because this study focuses on a particular industry, its findings might vary if they were applied to another. (At this time, the research is restricted to Pampanga, Philippines' architectural industry.)
- The primary research work limitation is the effect of digital technology on modern architecture of architectural businesses. This implies that the other factors influencing work performance cannot be addressed by these findings.
- This study was conducted between 2022 and 2024; however, given the multitude of variables influencing architectural design performance, results may vary for different years.

- Significance of the Study

In the years to come, the findings of this study will be beneficial not only to the province of Pampanga in the Philippines, but also to all architectural enterprises, staff researchers, and aspiring architects in particular. An important understanding of design innovation, efficiency, collaboration, sustainability, cultural impact, educational change, and digital technology-enabled historical preservation will be provided by this project.

- Innovation in Design

  Unique building elements and structures are available for experimentation, architects can use never-before-seen creative thinking and construction methods.

- Efficiency and Collaboration

  Building Information Modelling (BIM) and other related tools increase construction experts' accuracy and cooperation, which results in a more productive building process.

- Sustainability

  Architects may optimize building energy efficiency by employing digital simulations, enabling them to promote more ecologically conscious design methodologies.

- Educational Transformation

  It can draw attention to the necessity of bringing digital technologies into architectural education to better prepare upcoming architects for the changing architectural landscape.

- Historical Preservation

  By providing novel approaches to conservation, digital technology can play a major role in preserving and restoring historic structures.

The findings may shed light on how digital technology is impacting the practice and results of architectural projects in the field of modern architecture. This study may function as a roadmap for upcoming advancements and inventions in the architectural industry.

Definition of Terms:

- Architecture - is the art and craft of creating and erecting structures. It includes the planning, designing, and building of spaces that take into account aesthetic, social, and utilitarian factors.
- Contemporary Architecture - known as 21st-century architecture, and it is distinguished by a variety of styles and a focus on innovation. It is characterized by a variety of styles rather than just one, such as high-tech architecture, postmodernism, and fresh takes on classic designs.
- Digital Architecture - is an engineering discipline that leverages digital media throughout the architectural design process. It facilitates the conceptualization, design development, and detailed design of architectural forms.
- Digital technology - Electronics include equipment, devices, and systems that manipulate, transfer, and retain data in binary form. Digital technology distinguishes itself from traditional technology by transmitting data using binary code, which expresses information as discrete states of either true or false, or on or off, rather than utilizing continuous wave impulses.

III. METHODS AND PROCEDURES

- Research Design

The researcher utilized a quantitative methodology on the subject to gather information on the optimization of maintenance for a distribution utility in Pampanga, Philippines. The data collection aimed to evaluate the effect of digital technology on Pampanga's modern architecture.

As a result, the researcher employed deductive reasoning, defining the goal of the study, gathering information to address the issue, and then analyzing the information. After that, the researchers reached conclusions to wrap up the investigation. The Descriptive-Comparative Method's quantitative design will be used by the researcher.

- Locale of the Study

Pampanga is situated in the central part of Region III. The province is situated to the north of Tarlac and Nueva Ecija, to the east of Bulacan, to the southwest of Bataan, and to the west of Zambales. The area's geography is predominantly flat, except for a solitary peak known as Mount Arayat. The land area measures 2,180.68 square units.

The expected respondents in this study scenario work for architectural firms. The investigator believes that the study's site is suitable.

- Respondents of the Study

The Pampanga, Philippines-based architecture professionals, architectural firms, and individual architects in private practice were all taken into consideration by the researchers. Since the 120 respondents were the intended target demographic for the selected issue, they were selected using a non-probability sampler technique called purposive sampling. Additionally, the employees' affiliation with various construction enterprises highlights organizational parallels and commonalities.

- Samples and Sampling Procedure

The Architectural Firm, its personnel, and individual architects who worked privately in Pampanga, Philippines, would be selected as a sample response from the general population using a non-probability selection approach known as purposive sampling. Each of these individuals would be selected from the general population. The researcher chose to apply the sampling procedure in order to target specific respondents and achieve their purpose.

- Research Instrument

Data collection involved the use of a questionnaire. It is a survey questionnaire with Likert scale questions. The respondents can access the Google Forms questionnaires with their email addresses. The questions were distributed electronically. The survey consists of two sections. The respondents' personal information is the focus of the first section. In the second section, respondents were surveyed using a Likert scale to ascertain their level of familiarity with digital technology. The questions focused on how an architectural design team may expedite the design process while maintaining the structural integrity and aesthetic appeal of the projects.

- Data Gathering Procedure

The following are the actions that the researchers conducted to collect the data needed for this study:

1. A request letter will be sent by the researchers to the Pampanga Chapters of United Architects of the Philippines.
2. Following the letter of request's clearance, the researcher will distribute survey Google forms to the principal architects and architectural staff responders, giving them a window of time to complete the form.
3. The researchers will collect the survey questionnaires from the respondents as soon as they have completed answering them.
4. The answers that survey participants offer will be interpreted, categorized, and assessed by the researcher.

Statistical Treatment of Data
The researchers will utilize the following formulas to conduct a statistical analysis on the acquired data.

Frequency Counting and Percentage
It refers to the procedure of determining a percentage or fraction that is associated with a whole. The researcher will utilize this formula to ascertain the respondents' Sex, position/nature of employment, and year of work experience when constructing their demographic profiles.

$f / n \cdot 100 = \%$ Percentage = %
Frequency = f Sample population = n

Weighted Average

This type of average incorporates data points that have varying degrees of influence on the final mean, rather than each data point contributing equally. The researchers employed this algorithm to ascertain the sentiments of the respondents regarding the progressions in design inside the realm of digital technology.

$\bar{x} = \Sigma fx / n$ $\bar{x}$ = Mean Summation of = $\sum$
Frequency = f Weights = x Sample Population = n

IV. RESULT & DISCUSSION

Part of the result includes the collected, reviewed, and evaluated material. The combined weight of the figures and tables is calculated and shown. This encompasses the calculation, examination, and explanation of the statistical findings by the researchers. Part of the result is only obtained from the responses of participants to a survey that was distributed by the researchers.

Presentation of Respondents' Profile
Table 1.1: Respondents' Distribution by Sex

Position	Frequency(f)	Percentage (%)
Male	49	66.22
Female	25	33.78
Total	74	100

Out of 74 respondents, the distribution of respondents by Sex is displayed in the table above. The data is displayed in descending order of frequency. As can be seen from the data above, males have the highest frequency—49, or 66.22%—while females have the lowest frequency—25, or 33.78%. The findings imply that male respondents make up the bulk of the sample.

Table 1.2 Respondents' Distribution by Sex by Position

Position	Frequency(f)	Percentage (%)
Architects	42	56.76
Apprentice & Others	24	32.43
Architectural Staff	8	10.81
Total	74	100

Out of 74 respondents, the distribution of respondents by Position is displayed in the table above, with data arranged from highest to lowest frequency. As was previously said, architects have the highest frequency (42, or 56.76%) while apprentices and others have (24, or 32.43%) followed by architectural staff has the lowest frequency (8, or 10.81%). The statistics suggest that most people who took the survey are Architects.

Table 1.3 Respondents' Distribution by Age

Sex	Frequency(f)	Percentage (%)
Below 30 years old	30	40.54
31 to 40 years old	19	25.68
41 to 50 years old	25	33.78
Total	74	100

Out of 74 respondents, the distribution of respondents by age is displayed in the table above. The data is displayed in descending order of frequency. According to the data above, the age group under 30 has the highest frequency (30, or 40.54%), followed by the age group 41 to 50, which has a frequency of 25 (33.78%). The lowest frequency of 19 or 25.68% is found in those between the ages of 31 and 40. The bulk of respondents, according to the data, are under 30 years old.

Table 1.4 Respondents' Distribution by Year of Work Experience

Year of Work Experience	Frequency(f)	Percentage (%)
Less than 5 years	32	43.24
5-10 years	16	21.62
More than 10 years	26	35.14
Total	74	100

The respondent's years of work experience are based on a sample size of 74 respondents. The data is displayed in descending order of frequency. As can be seen from the data above, respondents with fewer than five years had the highest frequency (32, or 43.24%) while those respondents with more than ten years has a frequency (26, or 35.14%). Respondents with five to ten years has the lowest frequency (16, or 21.62%). The findings suggest that members with less than five years of experience make up the bulk of responders.

Table 2. Statements about the design innovations that the application of digital technology will bring forth.

Statement	Weighted Mean		GWM	Interpretation
	Architect	Architectural Staff and Apprentice & others		
Statement relating to Complicated Geometries of the design				
The use of digital technology enhances the creation of intricate design geometries.	4.57	4.28	4.43	S.A.
Statement relating to New opportunities for building materials				
Digital Technology expands the range of available building materials for design implementation	4.38	4.28	4.33	S.A.
Statement relating to Building Speed				
I believe digital technology offers notable improvements in building speed,	4.40	4.18	4.29	S.A.
Statement relating to Cost Effectiveness				
The use of digital technology results in better cost management throughout the project cycle	4.38	4.25	4.32	S.A.
GWM	4.39	4.27	4.33	S.A

Legend:

4.23 - 5.00 Strongly Agree
3.43 - 4.22 Agree
2.63 - 3.42 Neutral
1.83 - 2.62 Disagree
1.00 - 1.82 Strongly Disagree

The table above presents four inquiries on the potential design advancements that can be achieved through the utilization of digital technology. The statements are compared to the comments of the architects, personnel, apprentices, and other participants. Architects had a weighted mean of 4.57 and the group of architectural staff, apprentices, and others had a weighted mean of 4.28, both indicating a strong agreement, in contrast to the respondent's response. This was for the statement "the use of digital technology enhances the creation of intricate design geometries," which has a general weighted mean of 4.43, also indicating a strong agreement. Architects had a weighted mean of 4.38, while the group of architectural staff, apprentices, and others had a

weighted mean of 4.28. Both groups strongly agreed with the statement "Digital Technology expands the range of available building materials for design implementation," which has a general weighted mean of 4.33, also interpreted as Strongly Agree. The comparison between the group of architectural staff, apprentices, and others is 4.27, which is understood as a strong agreement. For architects, the comparison is 4.39, also interpreted as a strong agreement. The overall weighted average for Statements Relating to the design advances that will be contributed through the application of digital technology is 4.33, which indicates a strong agreement. In summary, this indicates that the respondents have a strong agreement with the comments provided about the design advancements that will be facilitated by the use of digital technology.

Table 3. Statements on digital technology in terms of efficiency and collaboration.

Statement	Weighted Mean		GWM	Interpretation
	Architect	Architectural Staff and Apprentice & others		
Digital technology streamlines processes and tasks, leading to increased efficiency.	4.03	4.29	4.16	S.A.
I believe digital technology improves workflow efficiency within the organization.	4.31	4.42	4.37	S.A.
Adopting digital tools enhances productivity and reduces time spent on manual tasks.	4.34	4.50	4.42	S.A.
I perceive digital technology as ineffective in improving overall efficiency.	3.63	3.43	3.53	Agree
GWM	4.08	4.16	4.51	Agree

Legend:

4.23 - 5.00 Strongly Agree
3.43 - 4.22 Agree
2.63 - 3.42 Neutral
1.83 - 2.62 Disagree
1.00 - 1.82 Strongly Disagree

Unlike the response given by the respondent, architects had an average score of 4.03, while the group consisting of architectural staff, apprentices, and others had an average score of 4.29. Both scores indicate a strong agreement. The statement "Digital technology streamlines processes and tasks, leading to increased efficiency" has a weighted mean of 4.16, interpreted as Strongly Agree, as indicated in the table above. Unlike the respondent's answer, architects had an average score of 4.31, while the group consisting of architectural staff, apprentices, and others had an average score of 4.42. Both scores were viewed as indicating a strong agreement. The statement "I believe digital technology improves workflow efficiency within the organization" has a weighted mean of 4.37, indicating a strong agreement.

The overall average score for the statement "Adopting digital tools enhances productivity and reduces time spent on manual tasks" is 4.42, indicating a strong agreement among the group of architects and architectural staff, apprentices, and others. For architects specifically, the average score is 4.34, also indicating a strong agreement together with architectural staff, apprentices, and others 4.50 which indicates a strong agreement. Unlike the respondent's answer, architects had an average score of 3.63, while the group consisting of architectural staff, apprentices, and others had an average score of 3.43. Both scores were read as indicating agreement. The statement "I perceive digital technology as ineffective in improving

overall efficiency" has a weighted mean of 3.53, which is taken as a Strongly Agree response. Overall, this indicates that the respondents strongly agree with the claims regarding the usefulness and collaboration of digital technology.

Table 4. Statements on digital technology impact the educational curricula of architecture students.

Statement	Weighted Mean		GWM	Interpretation
	Architect	Architectural Staff and Apprentice & others		
The integration of digital technology enriches the educational experience of architecture students.	4.48	4.03	4.25	S.A.
I believe digital technology enhances the understanding of architectural concepts and principles among students.	4.55	4.31	4.43	S.A.
Digital technology plays a crucial role in preparing architecture students for the demands of the industry.	4.55	4.34	4.45	S.A.
I perceive digital technology as having little influence on the educational curricula of architecture students.	3.19	3.63	3.41	Agree
GWM	4.51	4.17	4.34	S.A.

Legend:

4.23 - 5.00	*Strongly Agree*
3.43 - 4.22	*Agree*
2.63 - 3.42	*Neutral*
1.83 - 2.62	*Disagree*
1.00 - 1.82	*Strongly Disagree*

When evaluating respondent's answer to the statement, "The incorporation of digital technology enhances the educational experience of architecture students," the weighted average is 4.25, indicating a Strongly Agree response. This can be observed in the table provided above. The weighted mean of 4.48 for architects is considered to indicate a strong agreement, whereas the weighted mean of 4.03 for architectural staff, apprentices, and others is seen as indicating agreement. Contrary to the respondent's answer, the statement "I believe digital technology improves students' comprehension of architectural concepts and principles" has an overall weighted average of 4.43, indicating a Strongly Agree response. The weighted average for architects is 4.55, while the weighted average for architectural staff, apprentices, and others is 4.31, showing a good agreement. The average rating for the group of architectural staff, apprentices, and others is 4.34, which is read as a strong agreement. For architects, the average rating is 4.55, also interpreted as a strong agreement. The overall weighted average for Statements Relating to "Digital technology plays a crucial role in preparing architecture students for the demands of the industry." is 4.45, indicating a Strongly Agree response. The statement "I perceive digital technology as having little influence on the educational curricula of architecture students" received a general weighted mean of 3.41 from the responder, indicating a Strongly Agree response. The weighted average for architects is 3.19, while the weighted average for the group that

includes architectural staff, apprentices, and others is 3.63. Both of these averages are considered to indicate agreement.

Overall, this indicates that the respondents had a solid agreement with the assertions regarding the impact of digital technology on the educational curricula of architecture students.

Table 5. Statement on digital technology contributes to the adaptive reuse of historical buildings in contemporary Architecture.

Statement	Weighted Mean		GWM	Interpretation
	Architect	Architectural Staff and Apprentice & others		
Digital technology enables accurate documentation and preservation of historical buildings for adaptive reuse projects.	4.03	4.29	4.16	S.A.
I believe digital technology enhances the feasibility assessment of adaptive reuse projects for historical buildings.	4.31	4.42	4.37	S.A.
The integration of digital tools facilitates the exploration of innovative design solutions while preserving the historical integrity of buildings.	4.34	4.50	4.42	S.A.
Digital technology enables architects to simulate and visualize proposed adaptive reuse designs, aiding in stakeholder decision-making processes.	3.63	3.43	3.53	Agree
GWM	4.08	4.16	4.51	Agree

Legend:

4.23 - 5.00	*Strongly Agree*
3.43 - 4.22	*Agree*
2.63 - 3.42	*Neutral*
1.83 - 2.62	*Disagree*
1.00 - 1.82	*Strongly Disagree*

The table above shows that the statement "Digital technology enables accurate documentation and preservation of historical buildings for adaptive reuse projects" has a weighted mean of 4.16, indicating agreement with the respondent's response. The weighted average for architects is 4.03, indicating agreement, while the weighted average for the group consisting of apprentices, architectural staff, and others is 4.29, indicating strong agreement. Contrary to the respondent's answer, the statement "I believe digital technology improves the evaluation of the practicality of repurposing historical buildings" had an average rating of 4.37, indicating a strong agreement. The architects had a weighted mean of 4.31, indicating a strong agreement. In contrast, the group consisting of architectural staff, apprentices, and others had a slightly higher weighted mean of 4.42. The rating for the group of architectural staff, apprentices, and others is 4.50, which is understood as Strongly Agree. For Architects, the rating is 4.34, also regarded as Strongly Agree. The overall weighted average for Statements Relating to "The integration of

digital tools facilitates the exploration of innovative design solutions while preserving the historical integrity of buildings" is 4.42, which indicates a strong agreement. The respondent's response to the statement, "Digital technology enables architects to simulate and visualize proposed adaptive reuse designs, aiding in stakeholder decision-making," was analyzed using a general weighted mean of 3.53, which indicates agreement. The weighted average for architects is 3.63, while the weighted average for the group that includes architectural staff, apprentices, and others is 3.43. Both of these values are considered to represent agreement. Overall, this indicates that the participants strongly agree with the statement that digital technology is involved in repurposing old structures in contemporary design.

Table 6. Statements about the different, specialized high-end software that, in addition to standard CAD software, will help architects and are currently being employed in fulfilling their design.

Statement	Weighted Mean		GWM	Interpretation
	Architect	Architectural Staff and Apprentice & others		
BIM (Building Information Modeling) software such as Revit, ArchiCAD, or Vector Works greatly enhances the efficiency and accuracy of architectural design.	4.64	4.47	4.56	S.A.
Computational design tools like Rhino with Grasshopper or Dynamo enable architects to explore complex geometries and parametric designs efficiently.	4.45	4.25	4.45	S.A.
Rendering software like V-Ray or Lumion enhances visualization capabilities, allowing architects to create realistic presentations of their designs.	4.71	4.38	4.54	S.A.
Virtual reality (VR) and augmented reality (AR) tools such as Enscape or Unreal Engine provide immersive experiences for design review and client presentations.	4.69	4.31	4.50	S.A.
GWM	4.67	4.34	4.51	S.A

Legend:

4.23 - 5.00 Strongly Agree

3.43 - 4.22	*Agree*
2.63 - 3.42	*Neutral*
1.83 - 2.62	*Disagree*
1.00 - 1.82	*Strongly Disagree*

According to the above table, the respondent's response is not in line with the statement that "BIM (Building Information Modeling) software such as Revit, ArchiCAD, or Vector Works greatly enhances the efficiency and accuracy of architectural design," which has a general weighted mean of 4.56, interpreted as Strongly Agree. With a weighted mean of 4.64 for architects and 4.47 for architectural staff, apprentices, and others, both groups are interpreted as Strongly Agreed. The general weighted mean for the statement, "Architects can explore complex geometries and parametric designs efficiently with computational design tools like Rhino with Grasshopper or Dynamo," is 4.45, which is interpreted as Strongly Agree. In contrast, the respondent's response, "Architects," has a weighted mean of 4.45, while the group of architectural staff, apprentices, and others has a weighted mean of 4.25, which is also interpreted as Strongly Agree. Comparing the respondent's response to the statement, "Rendering software like V-Ray or Lumion enhances visualization capabilities, allowing architects to create realistic presentations of their designs," the general weighted mean is 4.54, which is read as Strongly Agree. With a weighted mean of 4.71 for architects and 4.38 for architectural staff, apprentices, and others, both groups are characterized as Strongly Agreed. Statements about "Virtual reality (VR) and augmented reality (AR) tools such as Enscape or Unreal Engine provide immersive experiences for design review and client presentations" have a general weighted average of 4.50, which is taken as Strongly Agree. In contrast, the group of architectural staff, apprentices, and others had a weighted mean of 4.31, interpreted as Strongly Agree, and the group of architects had a weighted mean of 4.69. Overall, this suggests that respondents, aside from the standard CAD software, have a strongly Agreed response to statements about different high-end specific software that will help architects and are now being used in fulfilling their design.

V. FINDINGS, CONCLUSION & RECOMMENDATION

The conclusions drawn after the data are presented in this chapter, along with suggestions made in light of the data and results. The researcher will list the problems sought together with a summary of the study's findings to arrive at a theme synthesis.

CONCLUSION

Following the presentation of this project's data, the study will now draw logical conclusions:

1. Regarding the Sex profile of the participants, the results indicate that most of the responses are male. A consequence of the dominance of the masculine Sex. The majority of responders are architects, according to the data about the participant profile in terms of position. An effect of having more people reporting to you. Regarding the participant's age profile, the results show that the majority of responders are under 30 years old. It can be inferred that the participants are either adults or middle-aged. The majority of respondents have fewer than five years of work experience, according to the participant profile as shown by the data. It can be inferred that the responders do not yet have sufficient work experience.
2. Regarding the respondents' perceptions of the design innovations that will be made possible by the use of digital technology, such as intricate design geometries, novel opportunities for building materials, building speed, and cost-effectiveness, the findings show that the respondents strongly agree with or react favorably to the statements made about the innovations.
3. Regarding respondents' perceptions of digital technology in terms of efficiency and collaboration, the results show that respondents strongly agreed with or gave positive answers to statements about these aspects of digital technology-enabled efficiency and collaboration.
4. The results reveal that the participants strongly agree or have a favorable response to statements that show how using digital technology improves the educational experiences of architecture students in the curriculum.
5. The results indicate that respondents have strong opinions, either strongly agreeing or strongly disagreeing, regarding the use of digital technology in

modern architecture to adaptively reuse historical buildings. Specifically, their opinions relate to the accuracy of documentation and the preservation of historical buildings for such projects.
6. Concerning the respondents' perception of high-end software that will help architects and is currently being used in carrying out their designs, aside from the standard CAD software, the findings show and conclude that the respondents strongly agree or positively respond to statements about various software, including BIM (Building Information Modeling), Rhino, Grasshopper, Lumion, and other applications that expedite the design process.

RECOMMENDATIONS

The researcher suggests the following to evaluate the impact of digital technology on Contemporary Architecture in Pampanga, Philippines, based on the aforementioned findings and conclusions.

1. Architects and construction professionals should embrace digital tools like BIM and parametric design software to enhance design processes and project management. This adoption leads to improved efficiency, timelines, and cost-effectiveness.
2. Organizations should prioritize integrating digital technology into their workflows to enhance overall efficiency, despite initial reservations. Digital tools have the potential to streamline processes, reduce manual workload, and increase productivity.
3. Educational institutions should embrace digital technology to enhance the educational experience of architecture students. Incorporating tools like BIM and virtual reality simulations enriches students' comprehension of architectural principles, preparing them for industry demands.
4. Architects and preservationists should leverage digital technology for sustainable preservation and adaptive reuse of historic buildings. Tools such as laser scanning and VR simulations enable accurate documentation, creative design solutions, and effective communication with stakeholders, ensuring the continued relevance of historic structures.

SUGGESTION

The researcher suggests the following approaches to utilize the digital technology on Contemporary Architecture in Pampanga, Philippines, based on the aforementioned findings and conclusions:

To improve design procedures and project management, architects and construction industry professionals are urged to think about utilizing digital tools like BIM and parametric design software. It is anticipated that this integration will lead to increased cost-effectiveness, timeliness, and efficiency.

Despite initial doubts, it is recommended that organizations prioritize the integration of digital technology into their workflows to improve overall efficiency. Digital tools are said to have the ability to improve productivity, decrease manual labor, and expedite procedures.

It is recommended that educational establishments think about using digital technologies to improve architecture students' learning outcomes. The utilization of tools like as BIM and virtual reality simulations has been suggested as a means to enhance students' comprehension of architectural principles and better prepare them for the demands of the industry.

It is advised that architects and preservationists make use of digital technologies to enable historic building adaptive reuse and sustainable preservation. It is proposed that technologies like virtual reality (VR) simulations and laser scanning facilitate precise documentation, innovative design solutions, and efficient stakeholder communication, guaranteeing the historical significance of buildings.

REFERENCES

[1] Azmi, N.F., Chai, C.S., Chin, L.W., 2018. Building Information Modeling (BIM) in Architecture, Engineering and Construction (AEC) Industry: A Case Study in Malaysia. In: Proceedings of the 21st International Symposium on Advancement of Construction Management and Real Estate, Springer, Singapore; pp. 401–412.

[2] Burry, M., & Kolarevic, B. (2003). Between intuition and process: parametric design and rapid prototyping. Architecture in the digital age: design and manufacturing, 148-162.

[3] Beorkrem, C., McGregor, M., Polyakov, I., & Desimini, N. (2013). Sphere Mapping: A Method for Responsive Surface Rationalization. International Journal of Architectural Computing, 11(3), 319–329. https://doi.org/10.1260/1478-0771.11.3.319

[4] Kushwaha, V. (2016). Contribution of building information modeling (BIM) to solve problems in architecture, engineering and construction (AEC) industry and addressing barriers to implementation of BIM. Int. Res. J. Eng. Technol, 3(1), 100-105

[5] Bråthen, K. (2015). Collaboration with BIM - Learning from the Front Runners in the Norwegian Industry. *Procedia Economics and Finance*, *21*, 439–445. https://doi.org/10.1016/s2212-5671(15)00197-5

[6] Derek Clements-Croome d.j.clements-croome@reading.ac.uk (2011) Sustainable intelligent buildings for people: A review, Intelligent Buildings International, 3:2, 67-86, DOI: 10.1080/17508975.2011.582313

[7] Nizar, F. (2020, July 29). *Retracing Spatial Design Processes: Developing a Pedagogical Tool* pectrum.library.concordia.ca. https://spectrum.library.concordia.ca/id/eprint/987128*for Architecture*. S/

[8] Leach, N. (2009). Digital Cities. *Architectural Design*. https://www.academia.edu/10400558/Digital_Cities

[9] Bruno, S., De Fino, M., & Fatiguso, F. (2018). Historic Building Information Modelling: performance assessment for diagnosis-aided information modelling and management. *Automation in Construction*, *86*, 256–276. https://doi.org/10.1016/j.autcon.2017.11.009

[10] Luyten, L. (2015, September). CAAD and conceptual design collaboration between architects and structural engineers. In *Real time-proceedings of the 33rd eCAADe conference* (Vol. 2, pp. 215-224). Education and Research Computer Aided Architectural Design Europe; Brussels.

[11] What is Digital Architecture and How to Design One. (n.d.). Www.itarch.info. https://www.itarch.info/2020/05/what-is-digital-architecture-and-how-to.html

[12] Ambika. (2015, July 7). What is Digital Architecture? Https://Www.careerindia.com; Careerindia. https://www.careerindia.com/courses/unique-courses/what-is-digital-architecture-015089.html

[13] Berman, M. (2021, October 28). What is Digital Technology? Programming Insider. https://programminginsider.com/what-is-digital-technology/

[14] Manzoor, B., Othman, I., & Pomares, J. C. (2021). Digital Technologies in the Architecture, Engineering, and Construction (AEC) Industry—A Bibliometric—Qualitative Literature Review of Research Activities. International Journal of Environmental Research and Public Health, 18(11), 6135. https://doi.org/10.3390/ijerph18116135

[15] Vilmas. (2023, February 5). Exploring the Impact of Technology on Modern Architecture. Vilmas Studio. https://vilmasstudio.com/exploring-the-impact-of-technology-on-modern-architecture/

[16] The Impact of Digital Technologies on Contemporary Facade Design: From Parametricism to Smart Facade. (n.d.). Meridians Haus— Award Winning Farmhouse Villa Architecture Firm in New Delhi. Retrieved March 27, 2024, from https://meridianshaus.com/press/the-impact-of-digital-technologies-on-contemporary-facade-design-from-parametricism-to-smart-facade

[17] How digital technology is transforming architectural practice. (2019). Architecture.com. https://www.architecture.com/knowledge-and-resources/knowledge-landing-page/how-digital-technology-is-transforming-architectural-practice

[18] The Impact of Technology on Architecture. (n.d.). My Modern Home. https://www.mymodernhome.com/blog/impact-technology-architecture/

[19] Kumar, A. A. (2022, December 17). The Digital in Architecture: past, present and the future. RTF | Rethinking the Future. https://www.re-thinkingthefuture.com/architectural-community/a8820-the-digital-in-architecture-past-present-and-the-future/

[20] Kumar, A. A. (2022, December 8). How Technology Rules the Future Spaces of Architecture. RTF | Rethinking the Future. https://www.re-thinkingthefuture.com/technology-architecture/a8736-how-technology-rules-the-future-spaces-of-architecture/

[21] Kulkarni, B. (2022, November 7). The digitalization of Architecture: Past, Present and Future. RTF | Rethinking the Future. https://www.re-thinkingthefuture.com/architectural-community/a8467-the-digitalization-of-architecture-past-present-and-future/

[22] Reffat, R. M. (2008). DIGITAL ARCHITECTURE AND REFORMING THE BUILT ENVIRONMENT. Journal of Architectural and Planning Research, 25(2), 118–129. https://www.jstor.org/stable/43030827

[23] Manzoor, B., Othman, I., & Pomares, J. C. (2021). Digital Technologies in the Architecture, Engineering and Construction (AEC) Industry—A Bibliometric—Qualitative Literature Review of Research Activities. International Journal of Environmental Research and Public Health, 18(11), 6135. https://doi.org/10.3390/ijerph18116135

[24] Zion, A. S. (1998). New Modern: Architecture in the Age of Digital Technology on JSTOR. *Assemblage*, 62. https://doi.org/3171239

[25] Wang, K., Guo, F., Zhang, C., Hao, J., & Schaefer, D. (2022). Digital Technology in Architecture, Engineering, and Construction (AEC) Industry: Research Trends and Practical Status toward Construction 4.0. *Construction Research Congress 2022*. https://doi.org/10.1061/9780784483978.100