A ROLE OF DIGITAL DARWING VS HAND DRAWING IN ARCHITECTURAL DESIGN PROCESS

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Abstract: there are many tools and methodologies applied in architectural design process. however, a role of digital drawing made in comparison to hand drawing in architectural design process needed further explorations to understand this comparative study examines the relationship between hand drawing and digital drawing so that both drawing methods improvements of creative performance process in design of panels. thirty interior design students enrolled in the second year of an interior design program at NSBM green university participated in this study. the library design panels made by those interior design students in academic time [2nd year 1st semester] were used for this design panels were identified under three drawing methods [only hand drawing, only digital drawing, use both hand & digital drawing] what was sought here is the best tool for learning and to what extent digital drawing tools and designs affects the final product. the result of this research will provide interior design students and design educators especially in helping to get it right final academic panels successfully process.

Keywords: Visual thinking, drawings, process of design

1. Introduction

Creative pedagogy is relying more on the design communication skills of the students. Gaining sufficient creative design communication abilities are integral in design studies. In the current context students are using digital and manual methods to communicate their design ideations to the design tutors. It made us curious about exploring how these tools (digital and manual) could contribute to the creative thinking of students in design pedagogy. The drawing methods which are applied by students are contributing heavily to the design development of a student. In the current context , digital tools are becoming more popular because they are developed with many additional supportive tools to enhance the design. In comparison to manual drawing, digital drawings are faster and easier. Not only that, but digital drawings can also be modified and enhanced with some other software which could increase the design communication ability.

Hand drawing is expected to retain its significance ,particularly in the early conceptual phases' creativity and ideation. The balance of digital drawing and hand drawing will be essential ,with architects likely blending the immediacy of hand drawing with the precision and flexibility of digital tools, ensuring a more holistic and adaptive design process for future projects.

2. Architectural Design Process

At the beginning of the design, freehand sketches are the best way to test concepts, while later in the process, computer-aided design (CAD) is necessary to fine-tune dimensional decisions and coordinate with consulting engineers. (Chris Grimley, 2013)Bridging the gap between theory and practice in higher education continues to be problematic for educators.one potential means of addressing this problem and moving practice forward is to articulate and share learning designs created from the work of exemplary practitioners. (Philip, 2018)Know the real time thinking process in which designer translate the design purpose to drawn sketches as the final ends. (Nagai, 2002)On design process as a body of knowledge that encompasses architectural design, representation and building materials. (Khaidzir, 2015)The architectural education should focus on the process of the design rather than the product, although a fair balance should be created between the education and the architectural profession. (Himdad, 2015)In the design process of interior design education is listed by program development, schematic design, preliminary design ,design development and drawings. (deger, 2015) Examines the domain -specific relationship between individuals' cognitive styles and improvement of creative performance with in the structured combinational ideation process where mixing various idea is encouraged. (Joori suh, 2018) Combining various ideas, concepts ,or design elements produced by the designers themselves. (Joori suh, 2018)The creative design may not always be true depending on the ideation method used for the project and the time during the process. (Joori suh, 2018)
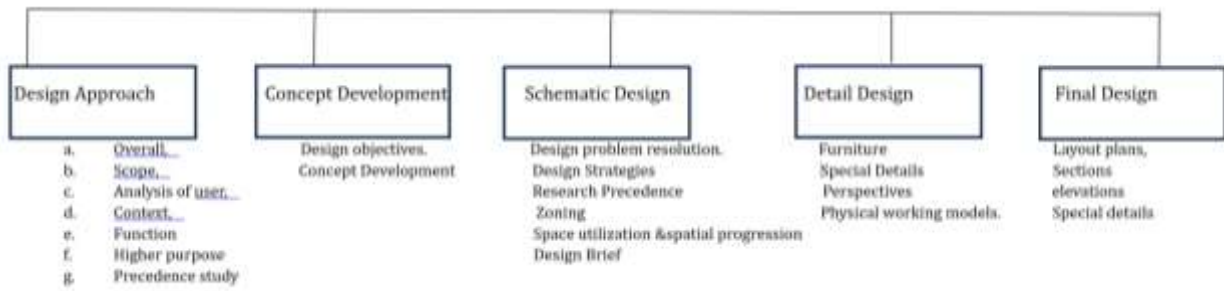
Flow chart 1-design process of design interior panels [by author]

2.1. DESIGN FUNDEMENTALS

In interior design students must use method of design fundamentals are correctly designing project. Also, we think about what are the design fundamentals or drafting fundamentals? In 2022,Drafting fundamentals for the entertainment classroom : a process-based introduction integrating hand drafting, Vector works, and SketchUp - Eric Appleton [associate professor of scenic and lighting design at the University of Wisconsin-Whitewater] said the practice of constructing drawings that describe items to be fabricated and that guide their fabrication is meaning of drafting and further is that standardized of graphic language. (Appleton, 2022)Four main variables fundamental for a correct drawing in product design were assessed. line, proportion, precision, and perspective. (ana maria rincon gomez, 2016)So, this graphic language is categorized by many types of drawings. These are standardized symbols, page formats, types of lines, architectural lettering …….etc. All the time in interior design students used these graphic languages in their design, it's most helpful to get good design.
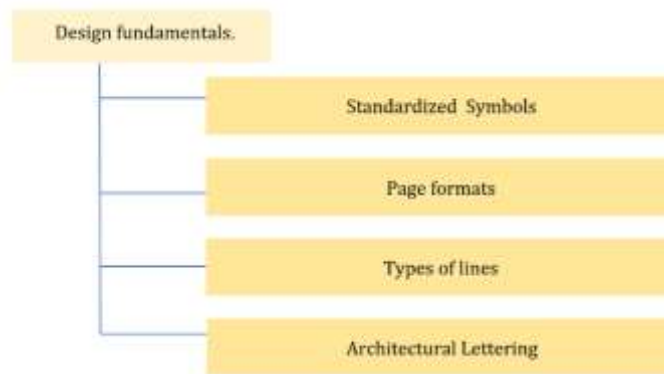

Flow chart 2- graphic language of design fundamental categorized [by author]

Drawing symbols provide a codified language by which to specify the essential elements in drawings across a set. (Chris Grimley, 2013) The obtained information from symbols of a floor plan conveys crucial information that can be employed for some higher-level semantic analysis like designing the different infrastructure layers of a building, vectorization of images, 3D reconstruction of designs. (Rezvanifar, 2021) Lines convey a project's intended plan, demonstrate the sectional quality of the space, and visually cue the reader to matters of hierarchy, type, and intent. Line weights and types can be created through various media, both manually and digitally. (Chris Grimley, 2013) lettering used to communicate ideas and to describe elements that cannot be effectively explained with just drawings. (KILMER, 2003)Design educators rate freehand lettering as more important than ASID practitioners. A statistically significant difference in use did not emerge for freehand lettering for any of the groups. Freehand lettering appears to be an important skill for interior designers to develop. (al-Murahhem, 2015)Most designers prefer vertical strokes in lettering, although slanted characters are often faster to produce. Letters should be produced with bold strokes, not drawn with a series of sketched and ragged lines. (KILMER, 2003)

2.2. CREATIVE COMMUNICATION TECHNIQUES

Architecture students probably spend between fifteen per cent and twenty per cent of their time in the first year of architecture projects learning graphic communication skills. (al-Murahhem, Art Courses and Interior Design Students , 2015)Interior design drawings are full of designers' good intentions and emotional devotion. hand-drawn drawings cannot show designers' planning and design of space. (Yang Wang, 2019)Designers will verify the effect of space through manual model or digital model. (Xu, 2021)The silent language used by designers to express ideas and intrapersonal communication. (Yang Wang, 2019) The original context of design communication in many institutions today is the use of visual means, freehand drawings, graphic communication, orthographic views, and the use of perspective renderings to analyze and convey ideas. (Lee, 2018)
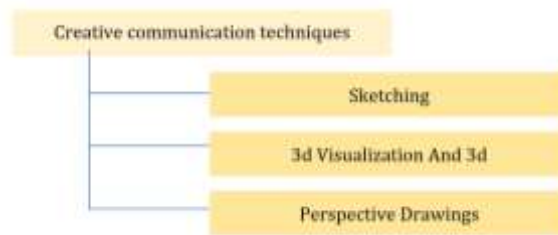
Flow chart 3- - creative communication techniques categorized [by author]

2.3. FREE HAND DRAWINGS

Traditional Manual drafting involves original copy or original design for design students it takes some effort to properly draw on paper or in a panel set during the design phase. The lines themselves tend to move from hesitant ,delicate traces towards definite and forceful affirmations of commitment and resolution during the freehand sketch process as the intellect behind those strokes and marks grows more confident and engaged.(Sorenson -2007).it is essential for designers to maintain freehand sketching throughout the schematic design stage and to convey the characteristics of the freehand drawing throughout the design process.[Suning Ding -2010]Sketch drawing is a type of drawing that designers use for detailed and schematic work, incorporating unstable lines and free-hand approaches . (deger, 2015)

2.4. DIGITAL DRAWINGS

Machine as artist server as points of departure for thinking about one of humankind's oldest arts. (Simmons, 2019)In modern design industry using famous character in digital drawing. Interior design process in interior students. Digital drawing using advantages in faster than traditional mediums-watercolour, paintbrushes, tissue, its more forgiving than traditional mediums, once one mistakes, it can easily be erased or undone one can restart [Ernesto Carlos puja on patron-2021] Traditionally, drawings were all done by hand, but now we see the computer taking over many of the repetitive and labour-intensive parts of the process. But even more exciting is that designers can use CAD to do much of their exploration, creation, and presentation. Most designers now see CAD as a tool, like the pencil or pen, but much more powerful and dynamic. (KILMER, 2003)Today, with ever-evolving software and the reduction in size and cost of computers, many designers and students use computer-aided design (CAD) systems throughout the design process. . (KILMER, 2003)The computer is an increasingly powerful tool for constructing, rendering, and animating three-dimensional models, and it can even generate formal geometries not possible to conceive in the human mind, it cannot reveal, amplify, or clarify that semi-to-subconscious state of mind where much of the uniquely individual and human creative act takes place (Sorenson, 2007)High -precision software platform for productive collaboration between computer science and biology research communities. (Matthew Austin, 2018) Digital technologies and the needs of the labour market in computer graphics professionals capable of working in the digital design and computer games industry have highlighted the need to find ways to equip the students with modern tools for creating and processing digital images of various formats and types. (p.osadcha, 2021)Different tools motivated them to create more and better artwork (Aber Salem Aboalgasm, 2014)The experience in digital field and to show a procedural process that leads to the realization of a complete product that leads to the realization of a complete product, integrating the main data, the optimization of digital works, the accuracy of the virtual environment, and finally the use of the VR and AR solutions in cultural heritage (Ylenia Ricci, 2021)Digital portfolio assessment method affects the development of children in various aspects positively apart from their learning skills. (erdogan tezci, 2006)Today's digital design tools, such as parametric simulations and agent -based simulations are not sufficiently complex to simulate the performance of the real world ,particularly its abiotic and biotic properties including social behaviour. (davidova, 2017)

   In this study consider about the manual drafting and digital drafting in digital media also Its faster than traditional mediums such as watercolor, because there is no need to prepare the paper, colors, water, paintbrushes, tissue, which all are combined under a simple software ready to use. More forgiving than traditional mediums, once one –makes a mistake, it can easily be erased or undone and one can restart. Can be duplicated with precision and work each sketch with different color palette. It provides endless possibilities as each software has different sets of tools and functions; therefore ,a digital artist may have an advantage over traditional work. But sometimes it is given to disadvantages. There is no original copy or original design that can be considered genuine, as it can be reproduced as much as anyone may want. No tangible[touch],physical copy as original.it may violate the copyright for mass production. While producing a digital painting there is no sense of touch or smell that can be felt digital art takes away these feelings during the creative process, it is what some artists may have called soulless art.

3.Problem Statement

The scenario described above can have an impact on students' creativity in digital tools, as most commonly use drawing tools have transitioned from hand drawing to digital drawing. Also, the amount of space arrangement, time management and difficulty may change between the two drawing styles. In academics, most pupils are interested in digital tools because they are much faster than manual drawing. As the output is in drawings in various students' panels, it may not correspond

to the spoken presentation in panel. That is the explanation for the effect of the strategies employed in designing panels. This realisation investigates the current digital and manual drawing techniques, and their successful application design panels students use both categories for academic purposes, including homework and design critiques. During design presentation, the design panel collaborates on certain design concepts for the actual output interior. However, what is the suitable design process in the outcome of the applied drawing method? Is there always a difference in the final panels of design projects? Design education in university life begins with the hand, but it is easier to utilise computers than it is to process the results of design.
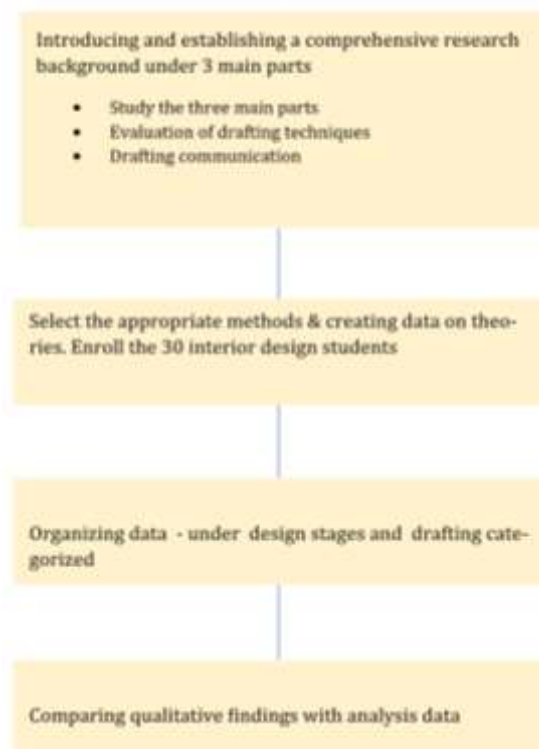
3.1. RESEARCH QUESTIONS
How do digital drawings influence the creativity of interior design students?
on this study, we discovered that interior design students use drawing tools to refine their results on a panel. As a result, this has an impact on the design in the end, as digital and hand drawing methods are more successful at different levels of design ideas.

4.Methdology

The improvement of creative performance within the organized combinational ideation process is investigated in this exploratory study, which also looks at hand drawing and digital drawing techniques. The ideation panel for the study included thirty interior design students enrolled at NSBM Green University in the second year of interior design program. The participants' creative abilities were evaluated through their interior library design project from the second semester of their second year. The library project was created using a combination of digital, manual, and mixed media to determine the information communication processing patterns of the pupils. Based on their measured manual, digital, and mix styles, the participants were split into three groups for the study's analysis process. 30 people from NSBM Green University, 10 of whom were female and 20 of whom were male, between the ages of 19 and 24 gave their informed consent to take part in the study. All the students were enrolled in the interior design program for their second year. From their interior design process, all students have prior familiarity with ideation.

Introducing and establishing a comprehensive research background under 3 main parts

- Study the three main parts
- Evaluation of drafting techniques
- Drafting communication

Select the appropriate methods & creating data on theories. Enroll the 30 interior design students

Organizing data - under design stages and drafting categorized

Comparing qualitative findings with analysis data

Flow chart 4-methodology diagram [by author]

4.1. DATA ANALYSIS
To investigate originality in final panels of design students, thirty interior design students completed questionnaires and three case studies of each category that were identified and examined. NSBM Green University second-year interior design students were used in this comparative study to examine the contributions of manual and digital drawing to the creative process of final design. With authorization from the Department of Design Studies, data from design panels was collected. Their second-year work drawing panels for the library design. To give a thorough examination of the various approaches employed by students, this research focused on three separate sketching methods (digital, hand, and both), considering several criteria to assure the study's applicability. Only three panels were chosen from a total of thirty panels since they demonstrated the three methods in an excellent manner.
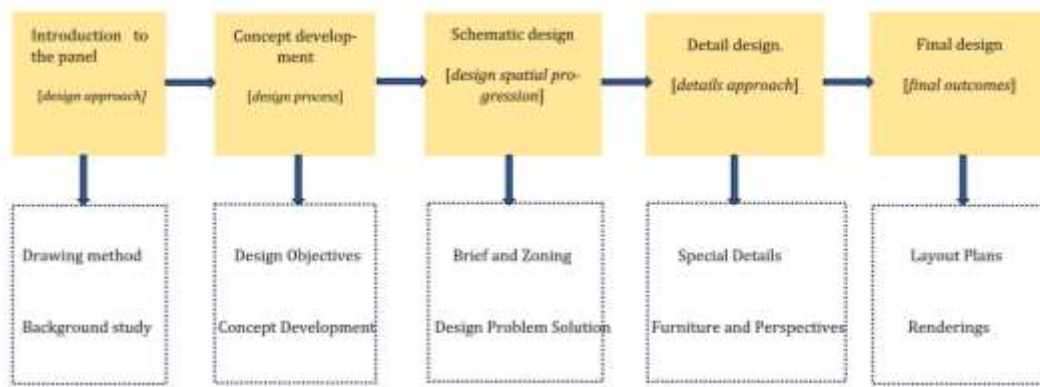
Flow chart 5-case study methodology diagram [by author]
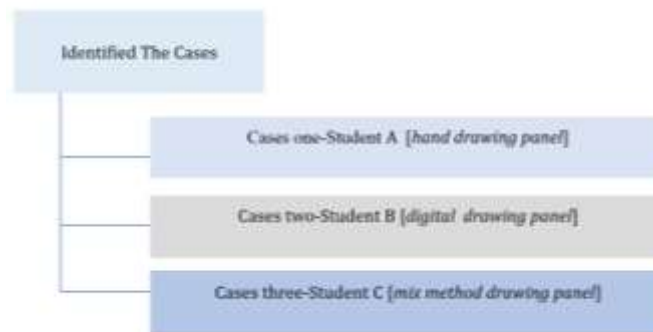
4.1.1 Design Approach
In this project that student A has too mainly focused on users. The target audience is average under 35 aged & most of students this whole project going to be on the whole project. Work with younger generation because of that this student think about their minds.to build a vibrant, functional & youth centric environment beyond the typical library. This design student wants to communicate it using endless. Charm with the freshness of sea waves. Student B is using A youth centric approach -This student focuses on this fully digital method in all stages but this. Time to discuss about that student how to improvements design stages one by one varies in relatively sample one.in the dynamic landscape of education and learning the design of spaces plays a crucial role in shaping the experiences of students. Libraries once traditional repositories of books have evolved into vibrant. hubs of knowledge ,collaboration and creativity. The focus of this project is too reimaging library interiors with a youth -centric approach ,specifically tailored to meet the needs and preferences of interior students. Especially that students identified the problems in the initial for design background. But I do not focus on context analysis in the site area. Student c is using A flexible knowledge – this student starts the focus about design objectives so that the main affect to the design theory. Identified the other problems and solutions in interior of existing space. This student used to hand & software tools for design.

4.1.2 Concept Development
Concept development of student A to mainly focused on the users to build a vibrant ,functional & youth centric environment to typical library .that student wants to communicate it. using endless charm with the freshness of sea waves.
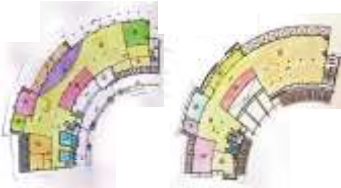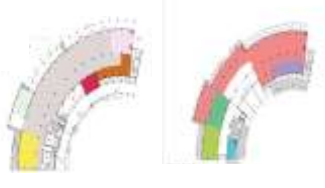
Table 1-Concept Development of Students

Student A	Student B	Student C

4.1.3 Schematic Design

Table 2-Schematic Design of Students

Student A	Student B	Student C

4.1.4 Detail Design

A library's exhibition space was developed, and student B's detail design involved the development of section drawings [a peaceful haven with simulated trees, acoustic panels, individual study carries for focused study - dynamic seating arrangements near a simulated river feature, fostering, collaborative and engaging activities] and perspectives in the detail design stage, where student A completed a parodical section and used some architectural lines.
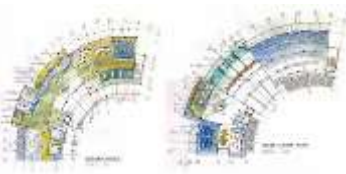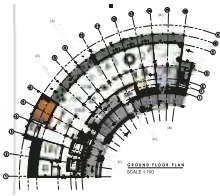
Table 3-Detail Design of Students

Student A	Student B	Student C

4.1.5 Final Design

Final design of student A -development of layout plans final design stage on floor design so its creative path of inspire level in design , that student did not use to any digital software method for design. final design of student C -development of layouts plans used software tools & hand but consider about color theory are different both layout plans this student focus to ground floor design writes up specification about design space.

Table 4-Final Design of Students

Student A	Student B	Student C

4.2. RESUILTS OUTCOMES

Technical drawings, renderings, lettering, sketches, and mood boards are the five categories used to analyze the interesting parts in this research. The paragraph showed that the majority is made up of technical drawings (37%), which are closely followed by renders (33%). Lettering, sketches, and mood boards make up minor portions (13%, 10%, and 7%), respectively. In proportionate complement, this table shows these measurements visually and makes it evident that technical drawings and renders predominate in the composition.

The detail design phase, which makes up 53% of the process, is clearly visible in Table 2. Third with 33% is the concept development stage. The first layout and arrangement of the design comprise the schematic stage, which makes up 7% of the workflow. The two components, the precedence research and the design approach, each made up 3.3%. Table 5.1 indicates

that the most used technique was three sketches, which were employed by 67% of design students. AutoCAD is used by 47% of design students after sketching. Rendering software is utilized by 33%, and SketchUp is used by 43%. Finally, 20% of users use Adobe Creative Cloud, which helps with many parts of the design process.

Table 5- interesting elements

Technical Drawings	Renders	Lettering	Sketches	Mood Boards
37%	33%	13%	10%	7%

Table 6- interesting stage of design process

Detail design.	Concept development	Schematic design	Design approach	Precedence studies
53%	33%	6%	3%	3%

Table 7- most used design methods

sketches.	AutoCAD	Sketch up	Rendering software's	Adobe creative cloud
66%	46%	43%	33%	20%

The schematic design phase, which makes up 50% of the process, is notably prominent in Table 4. 30% goes into the concept development phase after that. Thirteen percent of the procedure is made up of the design method, which includes beginning the manual sketch. The final design and detail design make up 3% and 4% of the total.

Table 8- starts of manual sketch.

Design approach	Concept development	Schematic design	Detail design	Final design
13%	30%	50%	4%	3%

Table 9- use of precedence studies

Design approach	Concept development	Schematic design	Detail design	Final design
10%	56%	23%	3%	11%

Thus, 56% of interior design students prefer to use precedent studies in their design projects throughout the concept formulation stage. Students who enjoy the schematic design stage are 23% of the total. In other stages of the final, design approach, and detail design stages, 21% of students dislike using precedence images.

Table 10 -collecting data tools satisfied.

Digital Tools	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Layout and composition	-	-	13.3%	70%	16.7%
Using design software	-	-	30%	50%	20%
Comfortable of using variety of tools	-	-	6.7%	63.3%	20%
Enjoy the process of design	-	16.7%	-	56.7%	40%

Design software helps	-	-	10%	46.7%	43.3%
Over traditional methods	-	10%	30%	43.3%	16.7%
Software skills satisfied	3.3%	3.3%	30%	46.7%	16.7%
Architectural lettering	-	10%	43.3%	36.7%	10%
Hand drawing tools	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Nature inspiration	-	-	36.7%	46.7%	16.7%
Drafting skills satisfied	-	-	13.3%	60%	26.7%

The present study additionally focusses on students' satisfaction with the use of both digital and manual drawing tools in design assignments. Therefore, it's evident how employing digital tools in a range of processes produces different outcomes. Student consent is obtained for the use of digital tools in activities. Table 6 shows the layout and composition of the panel using digital tools. Students who consent to use digital tools make up 70%. Students strongly agree that, 16.7% of them are otherwise. In terms of using manual versus digital tools, 13.3% of students have no opinion. Because they are happy with the design panel, 13.3% of pupils have no trouble using any kind of tool.

Fifty percent of respondents say they would use design software when using digital tools. Twenty percent of students strongly concur that digital tools should be used.as a result of 20% of pupils expressing interest in digital panels. 56.7% of students said they find the digital design process enjoyable. However, 16.7% of students don't think they appreciate using digital tools. The average percentage of students that are interested in manual drawings is 16.7%. 46.7% of students believed that design software was useful to their panel of designers and that digital resources are provided to foster innovation in interior design. Table 5.1–6 reveals that 43.3% of students preferred using digital tools over traditional ones.

It is intended to comprehend students' desire in using digital design tools for their projects. Sixty percent of students prefer to employ their droughting talents by hand, meaning that twenty-seven percent of students strongly disagree and want to embrace digital design. 46.7% of students use hand drawing tools to create designs that are inspired by nature. In 16.7%, 36.75 students were neutral. Pupils wholeheartedly concur that nature serves as motivation. This indicates that 16.7% of panels are operated by hand skills. In this study, thirty students who are enrolled in the program used both hand and computer technologies for interior design when creating their panels.so people like students. The outcome in this instance was obtained using the tools they were using for the design approach, concept development, schematic design, detail design, and final design stage. This relates to the outcome of the discoveries.

Table 11- tools difference using in design stages

Method	Design approach	Concept development	Schematic design	Detail design	Final design
Digital	20%	6.6%	4%	72%	24%
Manual	76.6%	83.3%	62%	22%	12%
Both [mix]	3.3%	10%	34%	6%	64%

Results for each design step attained by students at varying levels are shown in Table 6. At the design approach stage, many students (76.6%) choose to collect data manually. Approximately 20% of students use digital tools, and 3.3% use both digital and manual tools. Ten percent of students prefer to utilize both tools, while six percent use digital tools during the concept development stage, with 83.3% of students preferring to use manual tools. In other words, interior design students should be comfortable using manual software for their projects. Their panel design benefits greatly from it. Although 34% of students use both, 62% of students use manual hand sketches for schematic design. Digital tools are the only ones that use 4%. 22% of students refer to manual hand drawings during the detail design stage, whereas 72% of students use digital tools. Six percent of pupils are accustomed to using both resources. While 24% of students exclusively utilize digital, 64% of students use both drawing approaches in the final design stage. Only 12% are used for manual hand drawing. According to this research, 75% of respondents have the greatest difficulties when designing a time management panel.as a mean of pupils encountering digital tools that are instantly designed interiors. However, this student is the only one who uses the detailed design step. When it comes to the detail design stage, 72% of students express interest in digital tools at an early stage. most of the academic knowledge about the interior design sector.

5. Discussion

First, as I mentioned in the research discussion, second-year interior design students are mostly interested in panel technical drawings.37% of the pupils in that. In contrast, 53% of students prefer detailed design when they are engaged. This needs to be located. Students made comments regarding how design projects typically use sketches as elemental methods. It is likewise 66% of the total. In any case, when it comes to schematic design, pupils prefer to begin by hand drawing. To understand the differences in the results, pupils like to begin their projects with hand sketches. Three types of project panels were found in this study's sample of academic interior designers. A crucial component of panels is discussing design composition and arrangement. Students accept the use of digital tools for design, and they cite software and tool control as the basis for their time management instruction.as pupils prefer to make use of that. Students use manual methods and pay close attention to how they begin the project by creating the panel. Design software was used with students in this study because, on average, 50% of students enjoy utilizing digital tools. Nonetheless, I did obtain some useful results from the pieces I used in the sketch. This demonstrates that kids desire important details in their sketches. However, 53% of students like the technical details section. With reference to the usage of architectural letters in design base students, 43% express no opinion regarding the use of digital technologies. The usage of architectural letters in digital technologies is strongly agreed upon by 10% of pupils. When it comes to following the sketches for their design base theme, 46.7% of students choose to draw inspiration from nature. According to the study's findings, 60% of pupils are content with their ability to employ hand drawing skills. The students in this instance wish to adopt a hand-drawn approach, but their final design uses computer tools.

This table shows how students' use has affected the results. Because of this, students studying interior design also start their designs with manual tools before moving on to the concept development stages, where they need to be able to use manual tools to refine their sketches. When students begin working on both tools at that level, the schematic phase which is significant of proportion in lower in the menu comes next. An additional reason is that students attempt to use digital tools because they believe that effective time management is necessary for their work to be completed. For this reason, they use digital tools. Students studying interior design base pay close attention to the schematic design stage and adhere to the design basis. 83.3% of students employed hand tools to create their design panels throughout the concept development stage. Ten percent of students said they prefer mixed methods when it comes to design expertise.10% of pupils possess a range of tool-use skills. In the schematic design stage, 62% of students adhere to the manual drawing once more, but less so in the concept development phase. 72% of students support the use of digital tools in design project panels at the detail design level. During this stage of interest, students employ this tool to expand their work area. Sixty-four percent of students use both tools for their panels in the final design stage. It finds fresh interior design concepts.

6.Conclution

Using a range of instruments, this study determined how different creative performances were in the final interior design panels. There are several levels under the three categories. 60% of students in this study reported being happy with their ability to apply hand drawing skills.90% of students in this class prefer to draw by hand, however their final designs are created using digital tools. In that scenario, the most significant discoveries from the students' design process are that they wish to use both approaches. The stage in which design students are most interested is in detail design, and they enjoy using software because it has a greater impact on design. The concept design must be used in the initial sketches and hand drawings that are successfully submitted for the final design panel. begin the creation of the panels throughout the last week. Notably, pupils begin with only hand drawing tools. Additionally, these are all the steps of the design process that interior design students go through. Manual architectural writing is a very efficient way to create design panels. because kids' usage of digital tools is neutral.as a result of the digital font style look. In conclusion, the utilization of both manual and digital tools proves to be highly efficacious in the final panels of this research. This study looks at the interior design industry from several angles going forward. Today's modern interiors typically employ digital tools; however, this is very helpful for upcoming academic students who will use both digital and manual sketching tools for their projects. A crucial stage in using hand-drawn techniques, digital tools are advantageous to various design stages for university students studying interior design. Students studying interior design and interior design educators might benefit from these findings for their professional development. I was pleased to see that students are interested in both digital and manual droughting for the final panel's advancement.

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