MERIT RESEARCH JOURNALS
www.meritresearchjournals.org

Merit Research Journal of Education and Review (ISSN: 2350-2282) Vol. 8(4) pp. 061-067, April, 2020
Available online http://meritresearchjournals.org/er/index.htm

DOI: 10.5281/zenodo.3765868

Original Research Article

Analyzing Presentation Format for Design Development Stages in Architecture Studio

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Abstract

With the advent and popularization of Computer Aided Design (CAD) tools, students of architecture appear to be gradually losing the art of freehand sketching in developing design concepts, forms and study drawings in the design studio. This is mainly due to the liberalization of rules by most schools of architecture regarding the use of CAD in teaching design studio modules especially during the early formative years of the program. The result is that more students tend to present their design works at the development stages in CAD during crits. Studies have shown that this format of presentation affects the use of freehand sketching amongst students of architecture; however the aim of this study is to know if this format of presentation affects the overall design output of students during final juries. The study is based on a survey of 120 students of architecture from the undergraduate and graduate programmes that are undertaking studio design projects in the Rivers State University, Port-Harcourt. We argue that the format of using freehand sketches in design development stages lead to all round better design outputs when presented at final crit or jury than the use of CAD tools. The results show that while three of these key markers are indicative of the format of presentation the rest of the markers show no bearing to the presentation format. However, the study revealed other issues regarding the effects of the format of presentation that were not in the initial study foresights butare worth discussing.

Keywords: Architecture, CAD, Design output, Freehand Sketching, Presentation Format, Studio

INTRODUCTION

Freehand sketches can be done using pencil, paper, charcoal or even the computer. But Smith (2008) opines that the medium by which sketches are done is not important, rather their value is in the design intentions they convey. Nonetheless, she states that what architects propose to say and how they intend to say it affects the choice of media and technique used, since media and technique affects communication. For example, "the use of ink and wash produces an extremely different result than a no. 2 pencil does" (2008:20). However, some studies suggest that the limitations and abilities of architects to manipulate their choice or presentational media, affects the outcome of the design (Gussow 2008). As such, this study tows that line of thought to examine ifthe use of freehand sketching as a format of presentation affects design output amongst students of architecture. It lays emphasis on the medium by which the sketches are done, focusing specifically on the use of pencil, ink or any of such drawing tools, rather than the use of any CAD tool. The indicators or markers that are used to measure a good design output at design studio level include; generative concept development, creativity

(interesting or unusual design forms), functionality; details and design workability; and design programming.

Literature Review

In commencing this study, it will be apt to explain what freehand sketching is, based on a combination of definitions from past studies. It is marks made by a pointed tool using varied lines (thin, thick etc) created by hand movement with visual perception and eye coordination, involving speed and fidelity for the purpose of self-expression and communication (Johnson 2002, Smith 2008). Freehand sketching involves a fusion of the eye, hand and the mind, an indispensable combination for architects. Focillon (1992) talks of it as a complicated hand-brain relationship, with mind ruling over hand and hand ruling over mind. It is this complex relationship that enables the hand to be subject to at least 10 graphic impulses in one second of writing and the brain to take only 500 miliseconds for conscious elaboration when tracing over something impulsively. Such speed, flexibility and dexterity are what make freehand sketching a more potent tool than CAD drawing in design development stages.

CAD is a highly useful and efficient tool for graphics, draughting and modeling amongst other things. The first CAD system was developed at the Massachusetts Institute of Technology (MIT) in the 1950s, initially as an architectural graphics tool. Its first use as a drawing software was as an MIT PhD thesis by Ivan Sutherland called Sketchpad in 1960. But even then, this program required the use of a light pen to draw on a computer monitor (Aouad et al, 2012). Autodesk founded the first CAD software for PCs in 1982 and since then CAD software have become ever more sophisticated not only in terms of efficiency but also in terms of its versatility in format of visual presentation and as a tool in design programming and some might even argue design thinking to an extent.

A number of scholars have examined the role certain media and formats of representing are thought to play to enhance architectural thinking and design. Various media and format for presenting different stages of architectural design include the use of sketching (manual or computer aided) and paper modeling. Meisenheimer (1987) is one of the early scholars whose work investigated if media and method of representation affects design thinking and ultimately the structures architects create. Smith (2005) also suggests that the architectural design process stems from a belief that sketches as indicative of process, can be viewed as a direct link to inspiration. If sketches are done directly by hand and not CAD tools, Smith (2008) suggests that it can be a personal dialogue or conversation based on imagery and the production of which is an interaction necessary to initiate a building design and nurture it to completion. Although as she says, architects employ sketches primarily for conceptual design stages, yet a sketch can be used at all stages of design process from concept development to detailing and to post-construction recording (Smith, 2005).

Sketching can be viewed not only as an instrument of thought, but of dialogue, communication, testing architectural intentions, recording ideas and evaluating architectural constructs amongst other things. Freehand sketches comprise of physical elements, graphical diagrams depicting forces, flows (such as traffic flows, wind forces and sun directional diagrams), symbols and 3Ds (Do and Gross 2001). Smith (2008) likens sketches to personal notes, references and analysis, a form of dialogue first with oneself and then with others. This supports Fraser and Henmi's (1994) suggestion that a drawing has two lives; a dialogue with the architect at the time of drawing and an afterlife when others view it. Schon (1983) had earlier viewed sketching as similar to conducting experiments or undertaking a problem solving activity. He states that "the graphic world of the sketch pad is the medium of reflection – in – action. Because the drawing reveals qualities and relations unimagined beforehand, moves can function as experiments" (1983:157)

Smiths's study focuses on the role of sketches and how they assist architects in the design process. The study raised questions such as; do the way we draw and our transition to digital methods affect the completed construction? Meisenheimer (1987) had earlier questioned whether a new and different understanding of architectural drawings alludes to a new and different understanding of architecture. In summary, Smith's work and the works of other scholars examine if architectural sketches affect architectural conception and if the design process depends in anyway on sketches. This study tows that line of enquiry by examining if the use of hand drawn sketches influences optimal design output in selected gradable aspects of the design studio than the use of CAD tools. Although this study does not make a direct comparative analysis between the influence of manual sketching and CAD sketching on design development, there are other studies that do. For instance, Ibrahim and Rahimian (2010) compared CAD and manual sketching tools for teaching architectural design. That study revealed that the use of conventional manual sketching was beneficial in providing intuitive design concepts, while CAD tools were more advantageous for detailed design outputs. But the results of the study also indicated that the use of CAD tools to some extent hindered creativity of novice designers due to intuitive ideation limitation. Johnson (2002) had also earlier compared the role of freehand sketching and CAD tools in design development in the face of increased pressure from digital manipulation in both architectural practice and education.

Similar studies were also undertaken by Acuna and Sosa (2010) where they analyzed the role of sketches

and models in developing design creativity. The scope of their study was limited to two indicators which are constituents of creativity; novelty (originality) and function (quality). Acuna and Sosa's work showed a correlation between sketching and creativity and observed that sketching was a better way to achieve originality in design. Yang (2009) also looked at the role of sketching in ideation or idea formation in the design process. The National Association of Schools of Art and Design (NASAD) handbook (2009) also states that current design practice and education paradigms assume that hand-made sketching and manual model-making are essential skills for creative design. Similarly, other scholars like Buxton (2007), Prats and Garner (2006) and Yang and Cham (2007) all suggest that the rapid flexibility and ambiguity that comes with manual sketching aids in idea generation in the design process.

METHODOLOGY

The study employed the use of protocol analysis in collecting and analyzing verbal and graphical data of the studio desk crit process. Protocol analyses have been used by a number of scholars in empirical studies of drawing activities by designers, especially in the study of verbalizations between students and tutors in crit reviews. The one-on-one desk crit is an age long tradition in design studio where student and tutor discuss the students' work in progress on a regular basis as a means of improving clarity, communication and cross-pollination of ideas before the final crit or jury.

Goldschmidt et al (2009) used two forms of protocol analysis to study diversity in teachers' performances during crits; coding of verbalizations and linkography. Their analysis focused on verbalizations in the crit process to gain clarity of the project at each stage. The issue of verbalizations and performances during crits has also been investigated extensively by other scholars such as Schon (1985, 1987), and Akin and Lin (1995). What this study focuses on is the use of protocol analysis to analyse verbalizations in the crit process where freehand sketching has been used as a means of interaction. Akin and Lin (1995) observed that most protocol studies emphasized recorded verbalizations rather than drawings. In their study they found that verbal transcripts and drawings were complimentary, leading to more novel design decisions. In earlier studies, Goldschmidt (1991) had examined the process of sketching and verbalization. She proposed that sketching results in gradual transformation of images when verbalization occurs, suggesting that combining sketching and verbalization leads to better design decisions.

We aim to test this hypothesis in design studio to see if verbalization while presenting in freehand sketching format leads to better design outputs in final design crits.

Data Collection and Analysis

The study was conducted during the design studio classes for 3rd year, 4th year and graduate level students. Apart from the weekly desk crits, the design studio projects are graded in stages; two or more interim jury stages and one final jury. During the desk crits and interim jury stages when each student is expected to present their works to their tutors, we acted as staff observers and secretly counted and recorded the number of students that presented their works in freehand sketch formats and those that used CAD formats. We documented the verbalization process and dialogue that ensued with the tutors without informing the tutors of the actual purpose of the exercise. This was to ensure that no bias was formed in the minds of the tutors that could influence the grades given in the final crit or jury. We solicited the design studio tutors to give us copies of their interim and final jury grades at the end of the project.

Indicators/Markers

- Generative concept development
- Creativity
- Interesting or unusual design forms
- Functionality
- Detailing and design workability
- Design Programming

This was suggested to be used during the summary

- Verbalization and exchange between student and studio master.

The Total number of students used for this study is 120. Listed below are the total number of students in each class and the pie chart of the percentage that used Free hand format or CAD format

MSc 1 Studio (Figure 1)

Total number of MSc students = 32
Total number of students that used freehand sketching format during desk crit= 4
Total number of students that used CAD format during desk crit = 28

Level 400 studio (Figure 2)

Total number of Level 400 students = 47
Total number of Level 400 students that used freehand sketching format during desk crit = 31
Total number of Level 400 students that used CAD format during desk crit = 16

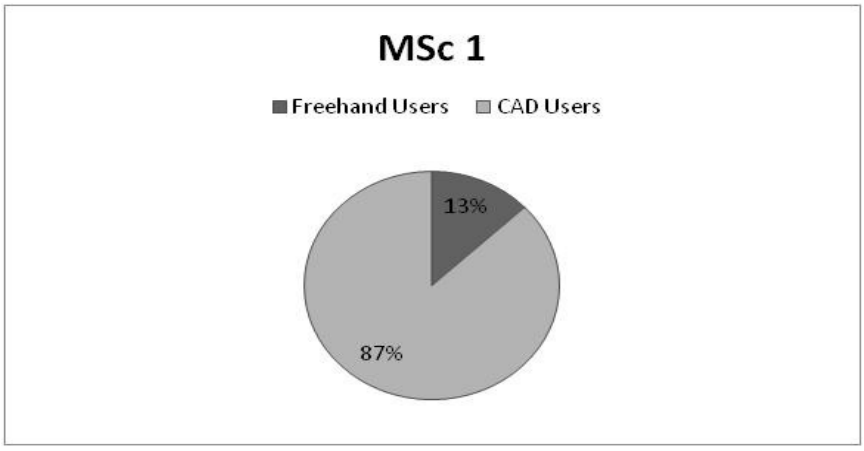

Figure 1. Pie chart showing percentage of freehand format users and CAD format users in desk crits at MSc studio level

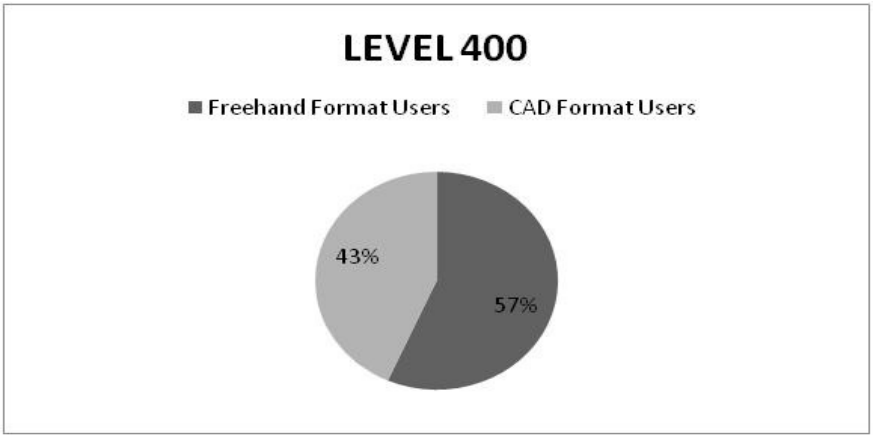

Figure 2. Pie chart showing percentage of freehand format users and CAD format users in desk crits at 400 level studio

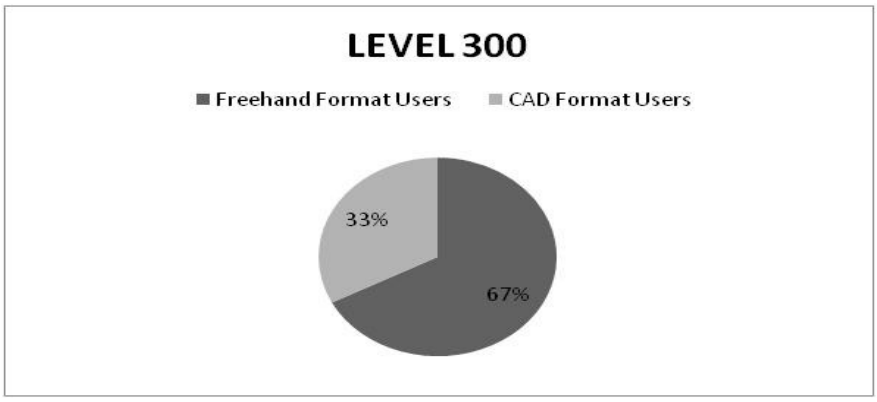

Figure 3. Pie Chart showing percentage of freehand format users and CAD format users during desk crits at 300 level design studio

Level 300 studio (Figure 3)

Total number of Level 300 students = 46
Total number of Level 300 students that used freehand sketching format during desk crit= 31
Total number of Level 300 students that used CAD format during desk crit = 15

Applying the Indicators to the outcome of the students, we have decided to use students that scored above 50% on both formats.

Table 1. MSc1 students

	Generative Concept Dev.	Design Forms/ Creativity	Functionality	Detailing and Design Workability	Design Programming	Overall Design Output	Avg. time spent on students
Total number that scored over 50%	3	8	8	8	6	9	
Students using Freehand Format	-	3	3	3	2	3	22 mins
Student Using CAD Format	3	5	5	5	4	6	9mins

Table 2. 400 Level students

	Generative Concept Dev.	Design Forms/ Creativity	Functionality	Detailing and Design Workability	Design Programming	Overall Design Output	Avg. time spent on students
Total number that scored over 50%	10	9	13	13	14	20	
Students using Freehand Format	5	4	6	6	6	10	19mins
Student Using CAD Format	5	5	7	7	8	10	11mins

Table 3. 300 Level students

	Generative Concept Dev.	Design Forms/ Creativity	Functionality	Detailing and Design Workability	Design Programming	Overall Design Output	Avg. time spent on students
Total number that scored over 50%	27	16	20	20	19	15	
Students using Freehand Format	17	9	13	12	11	7	17mins
Student Using CAD Format	10	7	7	8	8	8	9 mins

The table 1 above shows that for the postgraduate students at MSc 1 level only nine scored above 50% in overall design output during the crit for the given project. Of this number three used the freehand format, while six used CAD format. However, it should be noted that only four from a total of 32 students used the freehand format during presentation as opposed to 28 students that used the CAD format. Based on percentage, if 3 out of 4 students scored over 50%, it suggests that 75% of students that used the freehand format performed well in the overall design output and just 21.4% of students that used the CAD format performed creditably in the overall design output. Three other indicators (design form/ creativity, functionality and Detailing) showed a similar percentage of students who used the freehand format scoring over 50%, while no student that used the freehand format scored over 50% in generative concept development. The results suggest that for students at the postgraduate level, the use of the freehand format did not influence generative concept development as an indicator but could affect the overall design output if ratio is applied.

The results were more even in table 2 above, with 10 students each scoring over 50% in the overall design

output although more students presented using the freehand format than the CAD format as shown in the pie chart figure 2. However, the other indicators showed that at the 400 level, students who presented using the CAD format scored more on the average on 4 out of the 5 indicators used than students who used the freehand format. More students that presented using the CAD format scored over 50% on indicators such as creativity, detailing, functionality and design programming but on generative concept development they were even with students that presented using the freehand format.

Table 3 above also shows a slightly even distribution between students that presented using freehand format and those that presented using CAD format that scored over 50% in the overall design output. At this level, students using the freehand format in presentation, scored higher on all indicators than their counterparts who used the CAD format. However, in this table, some students who scored over 50% in the indicators did not end up scoring over 50% in the overall design output. Rather students using the freehand format scored less by one than students using the CAD format in the overall design output.

DISCUSSIONS

The data reveals that at the 300 and 400 levels of the undergraduate program, more students preferred to present their projects in freehand format than in CAD format at the design development stages but at the postgraduate level, the reverse was the case.

The results did not show any consistent patterns amongst the indicators at each level of study. Rather, the results at each level of study revealed opposing patterns. For example, where more students that presented using the freehand format at the 300 level performed better on each indicator than their counterparts using CAD format, at the 400 level it was the other way around, with more students using CAD format performing better than their counterparts using freehand format during crits.

The study also revealed other interesting results. It showed that when students present in freehand format, a lot more verbalizations take place between tutor and student. It was observed that tutors tend to spend longer time viewing works of students who presented in freehand format. Tables 1-3 showed that the average time spent viewing students' works that used the freehand format during crit ranged from between 17 – 22 minutes while the average time spent viewing students' works that used CAD format ranged from9 – 11 minutes.

In addition, some tutors were also observed to buttress points or emphasize other design options by sketching on the student's works using layering with tracing paper or directly on the work using coloured pens to distinguish between students' lines and tutors' lines. Such verbalization accompanied by sketching is considered "Design thinking" where one is complimentary to the other leading to more novel design decisions (Goldschmidt 1991, Akin and Lin 1995) and often requires longer time in deliberation than just verbalization. For example at the 3rd year class, the average time spent critiquing a student's work who presented using CAD format was 9 mins, while the average time spent in critiquing a student who presented using freehand sketching format was 22 mins. This supports previous studies which show that the use of freehand sketches stimulates more reflection in the early stages of design and as such engenders more discussion between parties (Schon 1985, Fish and Scrivener 1990, Goldschmidt 1991). It may not however translate into an overall better design output at the final crit stage.

The results of this study did not support the conjecture that freehand sketching and verbalization leads to overall better design output, yet it does not negate the hypothesis that a combination of these lead to better design decisions and creativity as observed by Goldschmidt (1991)and as shown bythe indicators in table 3. It however suggests that overall design output does not necessarily rely on the use of freehand or CAD format but on how good an individual can manage the use of a medium of expression.We commenced this study by stating that freehand sketches can be done using pencil, paper, charcoal or even the computer. What may have been less apparent is that the ability for students of architecture to use the computer as a tool for freehand sketching has increased rather than the use of traditional drawing tools. It further supports what Smith (2008) states that the medium by which sketches are done is not important, rather their value is in the design intentions they convey.

We however, recommend the use of sketching as a tool in early design stage development based on a few findings from our study. The study revealed that there were some other issues regarding the effects of the format of presentation that were not in the initial study foresights, but that ensued during crits where sketching is accompanied by verbalization. The first is the opportunity for detailed questions between parties and clarification of design brief. In the course of the study, it was observed during the crit stage that some students did not quite grasp the full import of the written brief, hence requiring further clarification. Secondly, we observed that most of the sketches made during the crit are the same ones developed and presented during the final jury to show working or the process by which the desired design outcome is achieved. This shows that the process of sketching and verbalizing is not only useful in idea generation but also in final presentation stage.

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