

Chapter 1 – Introduction

Section 1 – Research motivation

1.1.1 A Different Era



Figure 1 First annual USC-ASU design competition (1980s) (Schluntz, 1982) (right) and Competition poster in Houston, Texas (Ellen Palmer, n.d.) (left)

The history of first modern architecture competition was started 150 years ago (Andersson Gerd Bloxham et al., 2013). Architecture competition before digital era tends to use mockup and hand-drawing as a media to communicate ideas. It seems very different back in the day and the way of design process and presentation constantly changing.

The amount of architecture competition nowadays is growing exponentially. The presence of the internet makes the information of architecture competition more accessible than ever before. The role of social media, peers, and lecturers is important to inform students about the option for external activities. Most students tend to have significant exposure to architecture competition from social media. The second is from peers, and the third from architectural websites, conventional mass communication like TV and radio is the least exposing to architecture students to competition information (Gunagama & Pratiwi, 2019).

The rise of digital architectural software and the internet creates a big opportunity to create national and international architecture student competition. It has never been this easy to participate in or create architecture competitions. Participating in architecture student competition also trains architecture students to design and evaluate their design process and thinking. The efficiency and effectiveness of digital architecture software creates an opportunity for students to trial and error or iterate a way of design thinking process with a digital architecture software in high frequency than predecessor (Ismail et al., 2012). By using computer as the main media, can make designer work faster and better even though it makes designer to work in “non-humanistic way”. The change way of making also makes a new way of thinking (Tedjosaputro, 2020).

1.1.2 Architecture Competition Have Benefits

The rise of digital architectural software and the internet creates a big opportunity to create national and international architecture student competition. It's never been this easy to participate in or create architecture competitions. Participating in architecture student competition also trains architecture students to design and evaluate their design process and thinking. The efficiency and effectiveness of digital architecture software creates an opportunity for students to trial and error or iterate a way of design thinking process with a digital architecture software in high frequency than predecessor (Ismail et al., 2012). By using computer as the main media, can make designer work faster and better even though it makes designer to work in “non-humanistic way”. The change way of making also makes a new way of thinking (Tedjosaputro, 2020).

Architecture competitions are beneficial for architecture students. It can help foster creativity and motivate students to make bolder projects. Independent work without a mentor also makes them look for individual solutions, which means increasing student independence. Architecture competition also tends to make architecture students work harder than on regular studio academic projects because of the sense of competition which means students tend to push themselves to extend their skills and knowledge (Luke, 2020). The architecture students also

said that they tend to have new insights that haven't given in lectures, increase time management capabilities, add new skill using architectural software and visualization, increase significant of their design capabilities, increase oral and written presentation, and etc. (Gunagama & Pratiwi, 2019). If academic studios are elaborated with architecture competition, it can increase the stress level and increase pressure in overall atmospheric. However, it also improves the quality of designs and it's a healthy degree of competition. It makes another student more supportive because helping each other's (Smatanová Katarína, 2021).

Prestigious architecture competition events can be a great motivation for students to overcome more difficult tasks. Academic studio and prestigious architecture competition integration lead the best students to become better and have no negative effect on less ambitious architecture student (Haupt Patrycja et al., 2019). It's uncommon to win the first architecture competition. However, victory or defeat does not seem always been the top priority. Getting new skills, additional portfolio, and polishing skill, mentality, and knowledge is still the main reason to participate in architecture competition. People who already participate in architecture competition tend to be superior to someone who never join the competition (Gunagama & Pratiwi, 2019).

1.1.3 Skill Gap Between Winner and Participant (Research Urgency)

Based on research background, it seems there is a potential of different digital design process and design thinking from architecture students who often won architectural competition than less-experienced peers. It's uncommon for architecture students to win first competition (Gunagama & Pratiwi, 2019). It seems there is a gap of efficiency and effectivity in designing digitally between upper tier architecture students that often-won architecture student and average (participant) because it is said that the best student who participates in prestigious architecture student competition tend to be getting better (Haupt Patrycja et al., 2019) which also led to make the gap wider while the average (participant) won't really benefited. As a result, the winner tends to win more and more motivate to polish their skill in architecture competition. The average tends to stay as an average (participant). After experiencing some students

architecture competition, the winner of architecture student tends to have some insight and higher digital process skill that don't have by who never participate in competition (Gunagama & Pratiwi, 2019). So, this research can help to extract the essence from the winner & average.

Section 2 – Research range and limits

Even though the research seems very complex, it's manageable by setting a boundary. The research range and limits based on the topics are:

1. Design Thinking Pattern: Divergent and Convergent: Logic and Intuition, Algorithmic and Heuristic (Digital Design Thinking Management)
2. Hindrance (Digital Design Process)
3. Methods of Digital Design (Modelling, Rendering, Materialization)
4. Team Digital Management (Teamwork, Communication Clarity, and Workflow)
5. Digital Data Management (Information and Inspiration)
6. Abduction Thinking Process (Digital Realization and Challenge)
7. Self-Evaluation and Digital Skill Improvement (Software Correlation)

Section 3 – Research Benefit

1.3.1 For Student

Architecture major is well known as one of the most time-consuming majors to study in college. It's 4th highest workload by major (Neves & Hillman, 2017) and 1st in working hour for class preparation such as studio work, studying, reading, writing, etc. (Patrick Lynch, 2017). Researching the digital design process and design thinking can help to optimize the working hours for students learning architecture. Not only optimizing the time consumption but also improving the quality of work especially for the participant (average) architecture students. By working in teams and incorporating diverse perspectives, students can enhance their problem-solving abilities and produce more holistic and innovative design solutions (Livanur Erbil & Fehmi Dogan, 2007). It involves understanding the needs of the end-users, redefining problems, creating innovative solutions, and prototyping and testing ideas. In the context of the thesis

proposal mentioned, design thinking plays a crucial role in optimizing the digital architecture design process for architecture student competitions (Todoroff et al., 2021).

1.3.2 For Academic and Lecturer

Architecture competition is one of the media to examine pure architecture student thinking process without interference from anyone. The research will help to examine architecture students in digital design thinking process main problem comprehensively. It also helps to compare the differences between digital design process and design thinking between the winner and the average. The more problems or mistakes are exposed, the more efficient the lecturer suggestions or assists in architecture studio. The winner of an architecture competition is the one who can solve (technical, soft skill, and design-oriented) problems efficiently, have the best idea, and the best communication visually or verbally in digital design process. Investigating the winner also means extracting the essence of the digital thinking process essence and hopes other average can get some enlightenment.

1.3.3 For Architecture Knowledge

The future of architecture belongs to architecture students, and the digital design process is a demand in the industry. This research will contribute to updating and integrating some architectural design process books such as Problem Seeking, An Architectural Programming Primer by William M. Peña & Steven A. Parshall or How Designers Think, The Design Process Demystified by Bryan Lawson, Revealing Architectural Design Methods, Frameworks, and Tools by Philip D. Plowright. The research will be more related to architecture student problems than mature architects, so it will have a niche market reader.

Section 4 – Research Originality

Many researchers have researched the use of digital architecture software. There had been written books about architecture design thinking. There has been research about the benefit of students joining architecture competitions, competition as a design & teaching method,

architecture competition changes someone's life, role of architecture competition in learning process, etc. There are papers comparing the output of digital and conventional ways (Table 1 for further explanations). However, the effect of digital architecture software on digital architecture competition design process and thinking is still undiscovered. What makes the difference between the winner and the average (participant) in digital design workflow. How different digital software can influence different results and ideas in competition. How architecture students do a group discussion and integrate the discussion in digital software is still superficial. There is still no research that examines the digital architecture design process to a high detailed level.

In 2024 (anytime publishment), There are 329 literature that are considered relevant with "architecture student competition digital design thinking" in Scopus and 188000 literatures in Google Scholars. The table below has several accessible research papers that are relevant partially to the topic that can be used as a comparison to examine the novelty of this thesis. The 20 papers in the table are chosen based on abstract and reading the top 50 most relevant paper titles in Google Scholar. There has been no paper discussing the design thinking and digital design process architecture competition and examining the winner and the participant (average) architecture student.

Table 1 Research Originality Comparison

Title	Writer	Focus of the research	Methods	Result
Investigating possibilities of developing self-directed learning in architecture students using design thinking	(Avsec & Jagiełło-Kowalczyk, 2021)	Want to test a hypothesis if self-directed learning is actually highly correlated with design thinking	Questionnaire to 117 undergraduate students	Discuss more about design thinking traits, relationship between design thinking, self-directed learning, and metacognitive ability.
Concerning digital design in architectural pedagogy	(Tedjosaputro, 2020)	Finding the correlation between hardware, method of learning, and	Study case of six education	Discuss about digital design cognition, digital design eco-system, and what pedagogical approach is needed

		what needs to be criticized in education aspect	practices in 5 universities	
Effects of student architecture competitions on learning outcomes in design studio courses	(Smatano vá Katarína, 2021)	Focused on benefit of the architecture competition in a studio class. It tells more about the student's opinion about how they feel about the competition and the impact for their self-development.	Questionnaire survey, open ended questions, evaluation scale,	The positive impact of the architecture competition on student motivation, skills, and enjoyment is real.
The Role of Architectural Competition in the Learning Process of Architecture Students	(Gunaga ma & Pratiwi, 2019)	Discussing the trend of the architecture student competition, the reason architecture student participates in competition, and the positive impact that can be gain.	Questionnaire using Likert scale	There are a lot of benefits in architecture competition such as new insights, time management, socialization, enhance digital design skill, etc.
Architectural competitions and BIM	(Sørensen et al., 2015)	It was more professional architecture competition oriented and discussed BIM advantages and disadvantage in actor network theory.	Literature review	BIM is a new architect's toolbox and every of the new member in the competition team must know the consequence and what to expect
Comparing Design Thinking Traits between National Samples of Civil Engineering and Architecture Students	(Todoroff et al., 2021)	Find the difference in perceived design thinking in civil engineering students and architecture students. The design thinking trait was used as the benchmark.	(ANOVA) analysis of variance by using 356 civil engineering and 335 architecture student samples.	Architecture students' scores are higher than civil engineering students because the different of approaches.
Analyzing Presentation Format for Design Development Stages in Architecture Studio	(Brisibe, 2020)	Comparing the different impact of presentation format in digital and analog (freehand).	Survey of 120 architecture students (graduate and undergraduate)	Jury tends to take more time in freehand sketch and free hand format tend to be verbalized by the creator. While digital ones are easier to be understood and more efficient.
Teaching Architectural Design Through Competition,	(Haupt Patrycja)	Try to find the correlation of final studio course results, a design	Case study (45 students)	Architecture students who attend international architecture competition score higher and push their personal

Motivation And Challenge	et al., 2019)	challenge in group competition (master's degree case)		standard. However, it just affects the best students.
Between design and digital bridging the gaps in architectural education	(Doyle & Senske, 2016)	Explaining what needs to do increases the efficiency in design process using digital media as an architect or architecture student	Literature review	Technical proficiency is important, but the ability to work creatively and effectively is more important. Learning habits among students also need to be updated.
DIGITAL FABRICATION-FROM TOOL TO A WAY OF THINKING Toward redefining architectural design methodology	(Silva, 2019)	To find if digital fabrication is actually can be a new medium for a cyclic design thinking and design process	Literature review	Digital fabrication not only act as a tool, but also can be a new integrated strategy in collaborative digital design process.
Design Thinking Models For Architectural Education	(Tepavčić, 2017)	Try to analyze the relationship between making processes in design-led research and other aspects that challenge architectural education.	Literature Review	Advanced design and manufacturing technologies and digital modes of representation bring new design thinking models and reconciled the dual nature of design process.
Application Of Immersive Technologies In The Early Design Stage In Architecture Education - A Systematic Review	(Al-Suwaidi et al., 2023)	Reviewing existing research on the use of virtual reality in architectural design process.	Literature Review	Virtual reality can be integrated to design studio process and a new teaching framework by using virtual reality can be tested in the next research.
Computer Aided Design (Cad) Technology Versus Students' Learning In Architectural Design Pedagogy – A Controversial Topic Review	(Onosahwo Iyendo & Zafer Alibaba, 2015)	Examining the studies related to architecture studio and CAD utilization as well as the effects on students learning.	Literature Review	Hand sketches is required in the initial stage of the design process while CAD is better for communication in multifaceted problem-solving conditions.
Whom Do Architects Have In Mind During Design When Users Are Absent?	(Verhulst et al., 2016)	Seeking what is inside of the architect's mind when the user is actually hypothetical and reveals how architect actually imagine them	Case study of a real-world design process	Architect can change the user in the middle of the process. The users tend to be adjusted by architects in terms of having more meaning for themselves.

Observations From A Design Competition				
Design As Redesign In The Case Of Architectural Competitions: The Role Of Design Visualisations And Juries	(Jacobsen et al., 2021)	Try to expose how building scales and design concepts were translated and inscribed in different forms of design visualization as well as who actually interconnected with the visualization.	Ethnographic study (Actor Network Theory)	Architectural visualization not only stay in the office of jury, it also spreading to other parties and different organizational site. Verbal input can expose multiple issues and perspective.
Inclusive Architecture: Digital Technologies, Co-Design And Qualification Of The Project Process	(Luísa Batista de Oliveira Silva & Andréa Quadrado Mussi, 2020)	Trying to present a scenario in real life to use BIM as a main idea to make architects and engineer collaborate to solve inclusive design in architecture. Plug-ins and Dynamo become the main media.	Case study (simulated) in Brazil	BIM tools (Revit) can be very effective to solve human-environment relationships because it can optimize time for repetitive manual activities.
Competition as an activating tool in architectonic education	(Ilkovičová & Ilkovič, 2018)	Tries to find what architecture student feel when in architecture competition in certain phase (problem solving and presentation)	Questionnaire survey to 46 students	Students felt more motivated and enriched if the task is competitive and felt stressed than enriching when in presentation and open discussion.
Digital Vs. Traditional Design Process	(Svetel, 2018)	Showing that it is possible to create a digital design process that is in line with what architect really do.	Literature review	Architects need to find the true role for digital models in the design and exploration processes
Who or What "Wins" an Architectural Competition?	(Menon & Vanderburgh, 2014)	Focusing on the expand as many variables what affecting the architectural competition and try to make personal model and use it as an experiment.	Case study	Openness of the program (TOR) correlates with the number of participant, architects and users. Architecture teams competing each other and try to impress an insensitive jury.
Architectural Competition Support Student Creativity	(Luke, 2020)	Try to find a factual case that architecture competition is fostering student creativity and motivating students to create bolder project	Case study (creates a competition, 38 entries)	The answer is yes; architecture students tend to give their best in competition project than regular course.
Measuring design thinking mindset	(Dosi et al., 2018)	Try to validate of a questionnaire that designed to measure design thinking mindset self-awareness by	Literature review + exploratory	Design thinking mindset is composed by 71 items that use a 5 points Likert scale in 22 constructs.

		using comprehensive review to 19 relevant literature and construct it.	factor analysis	
--	--	--	-----------------	--

The book of *Arsitektur Digital* (Satwiko, 2012) has a great explanation for case study, exploration of architecture software and website, and tips in doing digital architecture practice but don't examine the correlation of digital architecture design process and thinking comprehensively.

Section 5 – Research Gap

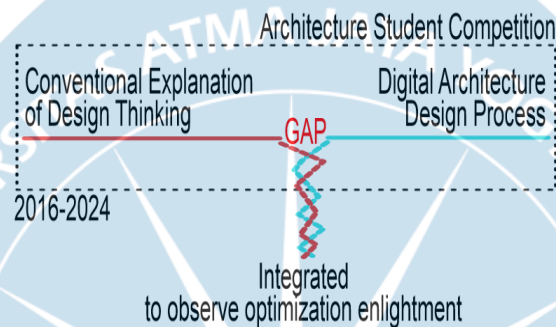


Figure 2 Diagram of the gap, Source: Researcher

There is study in student software preference and their reason is already exposed. Even though, it didn't specify the micro behavior by how they are using the software, and it doesn't integrate with design thinking. There are books that describe the design thinking and process of an architect. In conventional ways, there is an instrument as the design thinking fundamental theory. Design thinking and process have a relation in decision making. In this research, it will be the joint and an integration of design thinking and digital software process and behavior in architecture student competition from upstream to downstream (figure 2). It's important to examine the whole digital design process from start to end, so the design thinking mechanism can be observed holistically.

Section 6 – Bibliometric Analysis

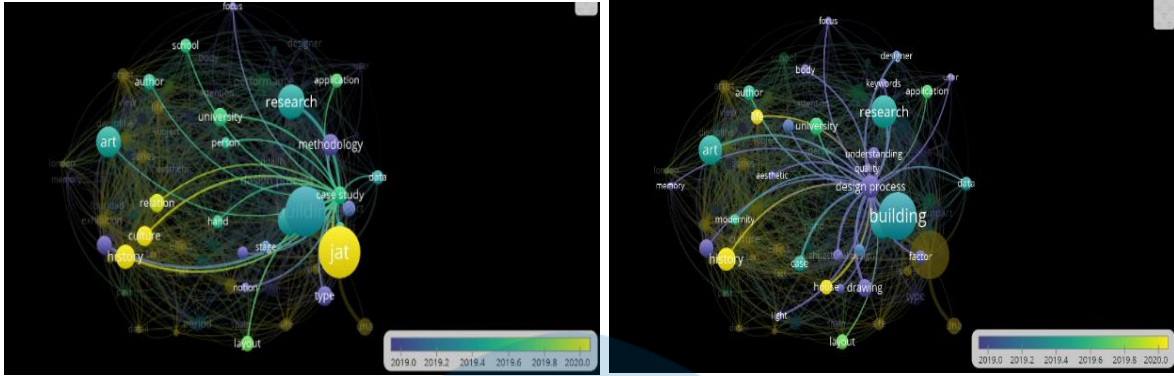


Figure 3 Bibliometric Analysis, Source: Researcher

To prove that the research had never been done before, here is the bibliometric analysis of the research (figure 3). It's using lens.org to filter all relevant research by using keywords, field of study, subject matter, and all of the research start in 2016. It seems most of the research uses case study as the most common method. However, architecture students do not appear in the nodes and the design process is still not connected to case study. Journal of architecture thought (JAT) seems as the main resource/hub of this kind of topic. Application has correlation to design process.

Section 7 – Research Questions

1. What's the difference of the digital design process and design thinking of the winner architecture student and the participant (average) architecture students in the 2016-2024 generation in architecture student competition?
2. Is there any lesson that can be learned from the winner so the average can catch up?

Section 8 – Research Replicability

Every university has its own curriculum and every software usage in the country can vary. The diversity of digital implementation can create diverse design processes and different implementation output of distinctive design thinking. The research can be replicated to other universities or larger scale, if there is someone who ever won a student architectural competition in that university. Even though there is different software usage, the interview question is still

applicable to conclude the impact of design thinking. The digital design process also tends to be limited by the amount of variation digital software. \

Section 9 – Research Timeline

Table 2 Research Timeline, Source: Researcher

Activity	Schedule																																																							
	May				June				July				August				Septem ber				October				Novem ber				Decem ber				January				Februar y				March				April				May				Jun			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
Thesis proposal seminar preparation (including finalization of collecting data mechanism and preparation) (phase 1,2)																																																								
Trial and Error for methods (preliminary)																																																								
Learn how to use Nvivo																																																								
Finding the potential informant candidate (Average)																																																								
Thesis Proposal Seminar	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x							
Collecting data from average architecture student, UAJY (phase 3)																																																								
Collecting data from average architecture student, NIU (phase 3)																																																								
Transcribe and process all the data from average architecture student (phase 4)																																																								
Collecting data from winner architecture student (Possible from all over the world) (phase 5,6)																																																								
Transcribe and process all the data from winner architecture student (phase 12,13,14,15)																																																								
Full conclusion and write all the thesis and paper																																																								
Precaution time might be needed for any hindrance																																																								
Thesis Defense																																																								

The preparation for the thesis was done in mid-July. The collecting data from the participant (average) architecture student in UAJY can be started since the researcher still in Indonesia and some other average in NIU. In mid-November, the data collection for the winner gathered and had been done in early February. The script of the thesis finished 2 months and an extra 3 weeks if there is any hindrance. The thesis defense would have been held around May-June.