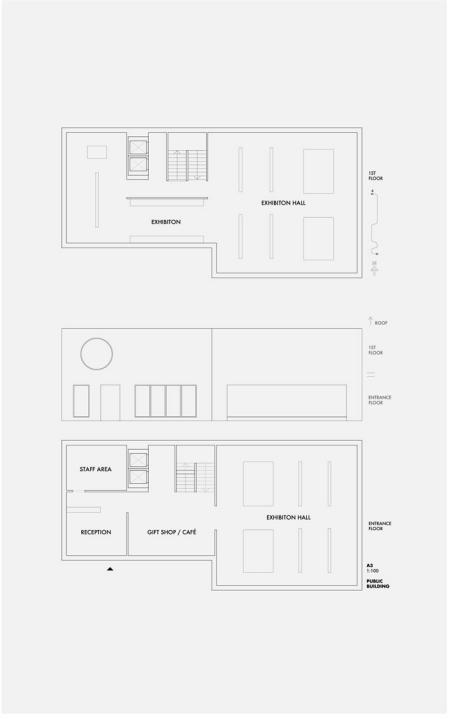
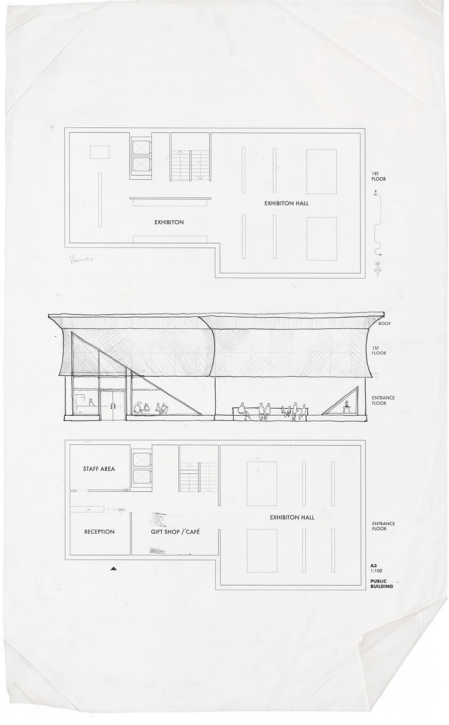
The Digital Default.







Yonna Hovrell

LTH Spring 2026
AAHM10: Degree Project in Architecture

Supervisor: Sandra Kopljar **Examiner:** Mattias Kärrholm

The Digital Default.

How the design medium affects the cognitive process and aesthetic outcomes in contemporary architecture.

Abstract

A lot of architecture today is designed through the sweeping clicks of a cursor - but what happens when we abandon the pen for the precision of the digital tools? This thesis investigates how the choice of design medium affects the cognitive process and aesthetic outcomes in contemporary architecture.

Through comparative experiments, the study looks at these differences by analysing façades produced via hand sketching and 3D modelling. The results indicate that, although the digital methods give technical precision, they can often lead to constraints due to the program. In contrast, drawing by hand was connected to a more intuitive process, allowing for more intentional artistic choices.

Based on these findings, the thesis suggests a design methodology that emphasizes the importance of tool selection during the initial sketching phase - arguing that by knowing the limitations and strengths of each tool we can make sure that the architecture we create isn't just by-products of programs, but intentional spaces where every line is a direct result of a deliberate hand.

Keywords: façade design, hand drawing, 3D modelling, digital tools, design medium

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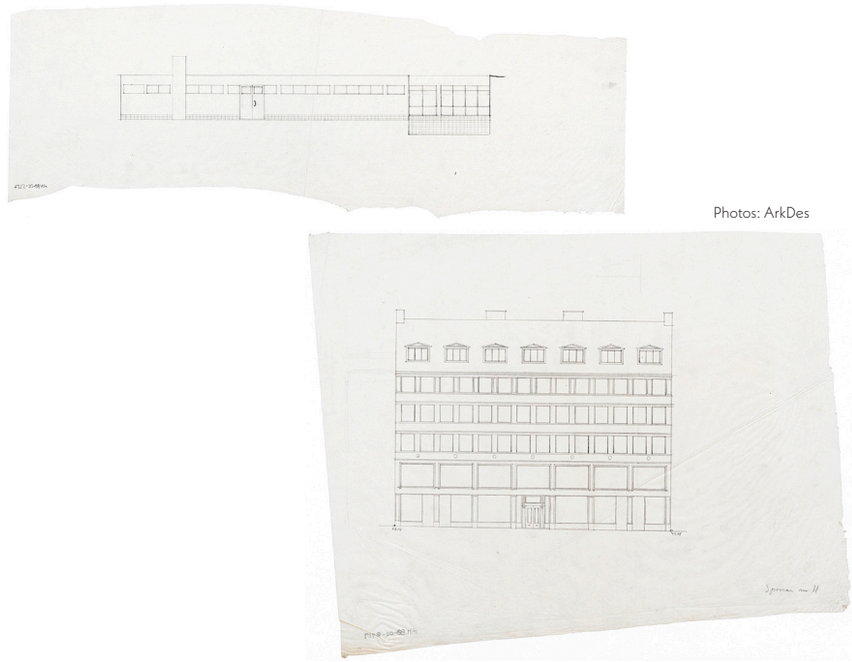
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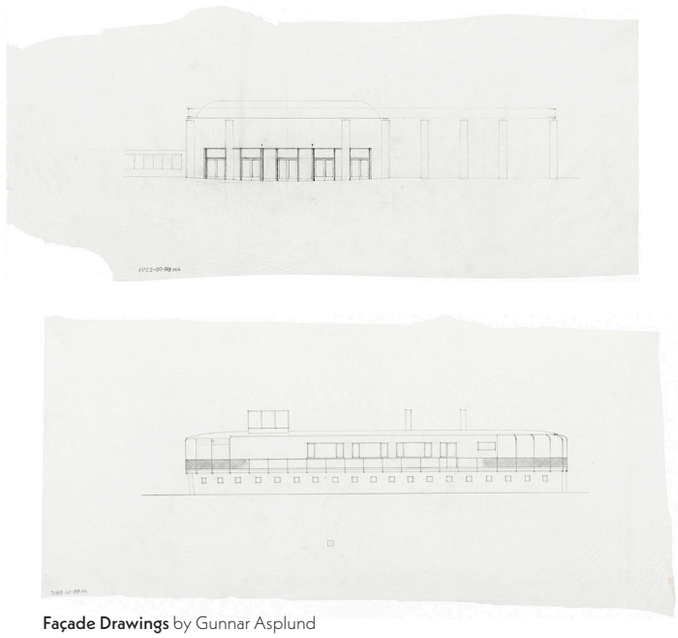
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Photos: ArkDes



Façade Drawings by Gunnar Asplund



Boudoir de Monte Carlo by Eileen Gray.

Photo: Archives Galerie Gilles Peyroulet, Paris

Introduction

The debate over which type of architecture people want to live in, and what architects actually create, has been a recurring topic in my studies, coming from both politics and social media.

One of the most prominent voices in the Nordic context has been Arkitekturupproret (The Architectural Uprising), a movement established in 2014 as a Facebook community. They campaign against what they call “the continued uglification of our cities”, maintaining a constant friction with the Swedish architectural profession.

While the movement strictly advocates for a return to classical styles - a solution I do not share - it is difficult to ignore an underlying observation. A lot of contemporary architecture has a quite homogeneous and soulless aesthetic.

There is a widespread feeling that a lot of modern buildings have lost a sense of craftsmanship leading to constructions without real good architecture. But this isn’t just a matter of public taste - even within the profession, I can notice a shared frustration.

And while this uniformity is often attributed to tight budgets, political frameworks, and short timelines, this thesis isolates and investigates perhaps another possible culprit:

The 3D modelling software.

The 3D Software

In discussions with other students who have worked in architectural offices, many describe using 3D software early in the sketching phase. As most of us know, adding ornamentation or curves in these programs can be quite time consuming and technically challenging.

When sketching by hand we allow the possibility to quickly explore different geometries and concepts, whereas modelling the same elements in 3D can require a more technical calculation. And since these digital tools are introduced so early in the creative process, initial ideas could immediately be subjected to the constraints of the program - something that might favour structural simplicity over architectural complexity.

Furthermore, the 3D software itself usually thrives on repetitions. Once a window is modelled, it requires only a click to duplicate it a hundred times across a surface. When the medium actively makes these copy-paste mechanics easy - it structurally can force a more monotonous façade.

The ability to then render with photo realistic materials, lighting, and shadows also changes the way we perceive these façades. A flat, un-ornamented building can look quite complete on a screen simply because the “sun” casts shadow across it. Rendering creates an illusion of completion - and I believe it might stop the design process too soon.

When this type of work-flow then is multiplied across an entire industry, where thousands of architects are using the same software - the result is maybe no longer just an isolated design compromise. It becomes a standardized aesthetic.

And so I ask myself:

How do our design mediums actually affect our architecture?



Aim

This thesis aims to develop knowledge on how design mediums affect architectural design, and to inspire fellow architects in how we can use these mediums to their full potential.

Method

EXPERIMENTS

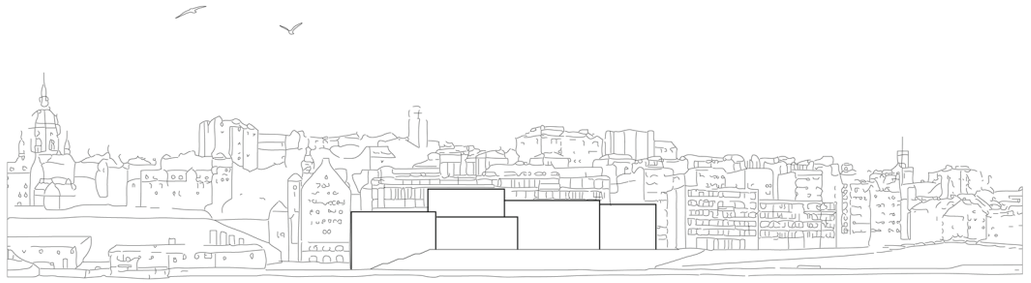
I conducted a series of experiments with architecture students to investigate the differences between designing façades by hand and through 3D software. The experiments measured both cognitive load and design variety produced in each medium.

NEW METHOD

Based on the results from the experiments I propose a methodology centered on medium awareness. This framework emphasizes critical reflection on the chosen tools during the preliminary design phase, ensuring that human intentionality remains the primary driver - avoiding the “digital defaults” sometimes created by our 3D programs.

REDESIGN

To test the methodology I decided to redesign the Nobel Center in Stockholm by using hand sketching as my primary design tool. By taking the existing volumes of the current proposal, I investigated how a more intuitive process through the hand would create a different result than the current proposal.



Current Proposal of The Nobel Center by David Chipperfield Architects

Background.

History: From Hand to 3D

The architectural practice in Sweden has undergone a significant transformation, moving from more traditional manual techniques to more contemporary digital ones in different phases:

THE ANALOGUE (PRE 1980)

Originally, the architectural practice was conducted by hand - using a universal graphic language. Architects used physical drawing boards to create scale drawings - such as plans, façades, and sections. This medium was slow and repetitive, producing drawings that often varied in quality - a factor that regularly necessitated post-completion alterations.

INTRODUCTION OF CAD (1980 - 1990)

The introduction of Computer Aided Design (CAD) occurred as a quite natural evolution for the profession. During this era, designers prepared hand-drawn sketches for specialized CAD operators to then draft digitally. Early adoption of CAD was often also driven by client demand and the promise of productivity, even though it often increased costs and slowed operations at the start.

DIGITAL DRAFTING

As technology-use matured, more architects moved away from the traditional drawing boards to rely fully on the computer for all project phases - with the medium fundamentally changing the efficiency of the process. Once a change was made in one digital view, it could be easily transferred to all others, facilitating a much lower cost for revisions than manual drafting. Furthermore, the ability to add various technical drawings (electrical, HVAC, etc.) onto the digital plans also allowed for less conflict and coordination before the actual physical construction began. (Zackariasson et al., 2009 p. 51-54)



CVA Drawing Office in Crowhurst Road Hollingbury 1952.
Photo: Private Collection of Jack Galway

3D SIMULATION

Today, architectural mediums have shifted from only 2D toward 3D digital models and virtual walkthroughs. The ideas and plans are transformed into matter. In this phase, architects can render realistic photographs of unbuilt projects allowing clients to see the “entire thing” as a final reality.

ARTIFICIAL INTELLIGENCE

The emergence of artificial intelligence represents the latest tool in the architectural medium lifecycle. In this new medium, the technical knowledge required to create complex renderings are becoming less important, as AI can generate realistic visualizations in seconds.

With this fast design process, architects are able to test and change countless versions of a building almost instantly - and as AI continues to evolve, it will likely force a further change within firms and the way we design.



Skandiateatern by Gunnar Asplund.

Photo: ArkDes

Swedish Housing Phases

The way we use these tools is also a consequence of Sweden's political and economic changes.

In the book Fuskbygget, Cervenka (2024) talks about the phases of the Swedish housing policies - transitioning from a state regulated social welfare model to a more market-oriented system.

THE LAISSEZ-FAIRE (PRE 1930)

Before the 1930's, the Swedish housing market operated under a laissez-faire regime (an economic philosophy that advocates for minimal government intervention). During this time, the market dictated housing conditions with little regard for social welfare.

SOCIAL HOUSING (1930 - 1970)

A big shift occurred in the 1930's and 1940's at the start of the "Folkhem" era (a political vision to even out inequalities and add social security) (Nordiska museet, n.d.). The state began setting rules for housing standards, while local municipalities were given the power to decide where new homes should be built.

To ensure access to housing for all citizens, the state established Allmännyttan (Public Housing Sweden) by introducing specialized, low-interest loans for non-profit municipal housing companies. Under these favourable financial conditions, the state absorbed the primary financial risks, resulting in the rapid creation of approximately one hundred new companies by the end of the decade (Sveriges Allmännytta n.d.).

Photo: The Nordic Museum



The Home Research Institute was founded in 1944 and its primary objective was to rationalize housework by employing experts to measure and optimize domestic tasks. (Nordiska museet, n.d.)

Photo: Karolina Kristensson / The Nordic Museum



A new modern Swedish kitchen in the 1940's.

SWEDISH STANDARDS

During the mid 20th century, standardization became a central instrument for realizing social equality. By introducing uniform technical requirements, the state ensured a high "minimum standard" for the Swedish population.

The state began requiring developers to follow these rules to be able to build, making Swedish Standards (SIS) a mandatory requirement for construction (Nylander, 2017 p. 6-7).

THE MILLION PROGRAM

In the 1960's The Million Program was initiated. A large-scale state project that saw the construction of about one million new homes to solve the housing shortage between 1965-1974.

RETREAT OF STATE FINANCED HOUSING (1990-1991)

By mid 1970's the state introduced subsidized interest rates and significant tax deductions on interest payments to incentivize home-ownership and construction. When the interest and inflation then rose at the end of the 1980's, the state's costs for these subziatations had risen to around 50 billion Swedish kronor annually.

This combined with the recession necessitated a systemic reconstruction ending in a tax reform in 1990. This reform shifted the market from the state to the private sector, specifically to households, banks and private real estate companies. Housing changed from being a social necessity to a market commodity, where construction became dependent on private demand and economic profitability (Cervenka, 2024).

This also made developers build to the absolute legal limit of the law (SIS, Swedish Standard). If the law said a kitchen only needs a certain amount of space to function, a lot of developers would now build exactly that and no more to maximize the number of apartments and profit in a building.

BUILD FOR PROFIT (2000 - PRESENT)

Since 2000, legislative changes has dictated that municipal housing companies also should operate as profit maximizing entities, aligning their operations with those of private competitors.

As highlighted in Fuskbygget, the escalating costs of construction in Sweden has also created an economic environment where the margins have narrowed. It is, therefore, a multifaceted issue where rising material and labour costs also necessitate extreme efficiency - rather than being exclusively the "fault" of the developers.

REFLECTIONS

The changes of the housing situation in Sweden is a big part of why we might see more and more uniform façades today. A lot of developers stopped asking "How well can we build homes?" and started asking "How much profit can we make per square meter?"

But when the budget is cut short - this also led to shorter time for the design process, something that affects us as architects directly. To be cost-effective, plans are made with "minimum-standard" modules that will just pass building regulations. The façades then created are the physical result of these plans. They become a "skin" for a building that has often been designed more as a financial calculation - than an actual home.

Photo: Heléne Grynfarb / Scandinav



High-Rise Buildings did not dominate the Million Program, contrary to popular belief. But from 1967 onwards, the production of high-rise buildings increased to lower costs through despite growing public criticism. (Boverket, 2025)



A modern Swedish bathroom during the 1960's. In Folkhemmet, access to personal hygiene and laundry facilities was considered a universal right. (Nordiska museet, n.d.)

Photo: The Nordic Museum

The Beautiful Façade

Façades serve as the “face” of our buildings, yet the search for what makes them truly “beautiful” remains an ongoing debate. Like most things - beauty does perhaps not exist in the building itself, but is experienced only within the eyes of the beholder.

PRACTITIONER INSIGHTS

In Prieto’s and Oldenhave’s (2021) research they investigate how professional architects define beauty in façades (interviews with 34 Dutch architectural firms). They found that the architects categorized architectural beauty into intrinsic aspects (features of the building itself, like materials and composition) and extrinsic aspects (relational features like human, contextual, and intellectual connections).

According to them beauty is not derived from a single trait but from the successful integration of multiple design resources. Material expression was the most frequently mentioned aspect, with architects favouring the sculptural quality of a façade - over flat or “smooth” surfaces. Classical principles such as proportion and the balance of solids and voids also remain central to the practitioner’s view of architectural beauty. Beauty is often found in the logic behind the design.

Acknowledging the human factor is also a crucial extrinsic aspect. Architects suggest that human touch (imperfections caused by the human hand in design) make a building relatable. In contrast, the “perfect” and anonymous façades of contemporary generic styles are often perceived as less human and therefore also less engaging for the public.

VISION OF HAPPINESS

In The Architecture of Happiness (2006), Alain de Botton writes that our attraction to certain buildings comes from an acknowledgment of our own psychological vulnerabilities.

He argues that what resonates with us in design inherently suggests our desirable way of living, allowing façades to function as invitations to a specific psychological state and offering a “vision of happiness.”

This response is partly shaped by our associations. We may decide to dislike a style, such as Neoclassicism, simply because it had the bad luck of being favoured by the Nazis, or love Brutalism due to personal nostalgia. Consequently, buildings are often evaluated in what they represent to us as individuals, rather than their objective physical qualities.

Arguments about what is beautiful thus becomes as unresolvable as defining what the ideal life is, as we judge architecture based on how it speaks to us personally. As de Botton quotes Stendhal, “there are as many styles of beauty as there are visions of happiness” (p. 100).

In that sense, great design might be the result of architects who use their own perceptions of joy and translate them into physical spaces for people to experience - allowing them to share their own specific definition of beauty.

A BEAUTIFUL LONGEVITY

When we talk about sustainable architecture today, we often focus on technical things like carbon footprints and energy efficiency - but there is another kind of sustainability that is just as important: the aesthetic longevity.

The argument is quite simple: if a building is widely perceived as beautiful, it will be cared for - and it will be much less likely to be demolished.

Thus, “beauty” might actually be the ultimate tool for keeping our

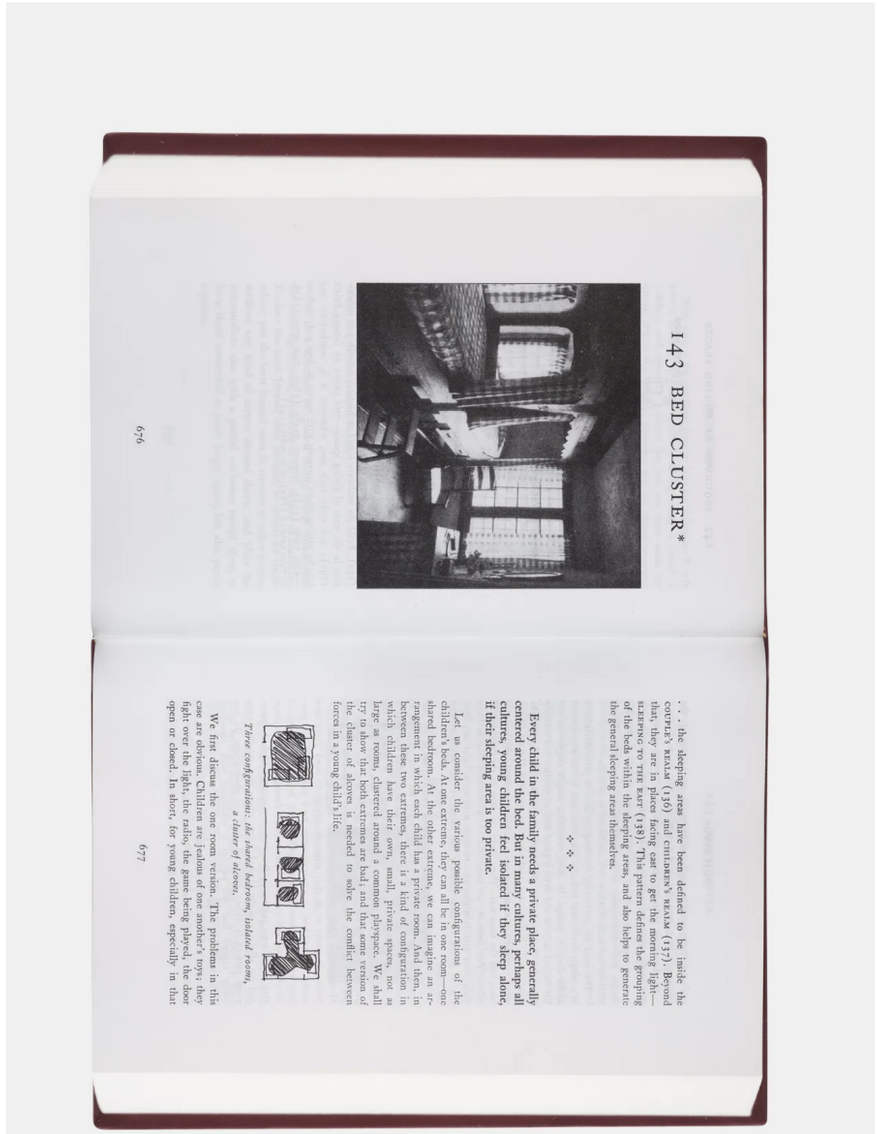
EDUCATION

Despite its importance - beauty is often a marginalized topic within architectural education. Architect Elin Holm talks about this in her thesis about Façades (2022). She has noticed that students at her school are frequently taught to motivate design choices only through what the building actually does, more than what it looks like.

And while a building's function certainly contributes to its beauty, future pedagogy could perhaps benefit from a more holistic approach - where beauty is also taught through the study of historical and modern aesthetics, alongside a diversity of architectural qualities.

Implementing teaching about theories that provide architectural qualities such as Ola Nylander's "unmeasurable values" or Chistopher Alexander's "patterns", along with the aesthetics of the past, can maybe give future architects a mix of tools to work with.

Beauty is perhaps simply about care - in any shape or form. The feeling that someone has thoughtfully considered the experience of the person experiencing their work. In the end, teaching these theories and styles is about giving future architects the power to choose. It is about providing the knowledge for them to decide which tools in their kit are best suited for the project before them - ensuring they have the right mastery to create their own vision of happiness.



A Pattern Langauge by Christoffer Alexander

Something Old, Something Borrowed and Something New

The way we design is also influenced by the references and history we carry with us. Architecture is rarely a singular act of invention - it is a continuous dialogue between our inherited traditions and the demands of the present.

In The Architecture of Happiness, de Botton (2006) explores the evolution of architectural styles and categorizes this evolution into three phases:

SHARED CONSENSUS

Before the industrial age, architectural style was sort of a collective agreement. A singular aesthetic, such as Classicism or Gothic, reflected the shared values of a society - providing a sense of both visual and psychological order.

SMÖRGÅSBORD

In the nineteenth century, increased historical knowledge and technical capabilities allowed architects to replicate any style from any period. This led to a sort of smorgasbord of unrestricted choices - and a lot of buildings became costumes of another time.

MODERNIST RESOLUTION

Modernism emerged as an attempt to resolve this chaos by rejecting historical ornament entirely. The movement argued that style should not be a choice between historical styles, but an honest style as a result of function, logic, and engineering - appropriate for the industrial era.



The Aalto House in Finland. Photo: The Modern House

CONTEMPORARY STYLE

Today much of contemporary architecture - particularly commercial and residential developments has become quite generic. While innovative and distinctive projects certainly still persist, the transition to digital tools has fundamentally prioritized efficiency and cost-effectiveness over aesthetic expression - and so the “style” of many modern buildings today is dictated by the limitations (and opportunities) of the software together with the global supply chain of standardized materials (glass, steel panels, pre-cast concrete).

Furthermore, as Cervenka (2024) notes in Fuskbygget, the transition to a market-oriented system has also transformed residential buildings into financial assets - resulting in a neutral design intended to “fit everyone” in order to maximize profit.

THE REACTION

If the modernist movement was a reaction to the stylistic chaos of the 19th century - we are now entering a new phase of reaction. A reaction against the uniformity and generic “boxes” produced by modern digital efficiency.

This reaction has recently even been seen in political movements, such as Partiet Arkitekturupproret, which advocates for writing aesthetic requirements into the Planning and Building Act (PBL). They specifically propose legislation to mandate certain elements like roof eaves (takfötter) and distinct bottom floors to end the era of “flat-roofed boxes” (Arkitekten, 2026). And while this stems from a desire to reclaim “traditional beauty” - imposing rigid rules through law risks destroying the very things that allows architecture to evolve.

In architecture, the word pastiche usually refers to a design that imitates the visual language or “style” of a previous period. While the public often can appreciate these familiar forms, the word is frequently used as a derogatory term by professionals to describe a building they see as an unoriginal or a “fake” copy.

“(Nowadays) you have no ornament” says one of the Dutch founding partners when speaking of façades. (Prieto and Oldenhave, 2020 p. 29). In the past, “no ornament” was a functionalist principle - but has this professional stigma perhaps also made us hesitant to engage with our historical smorgasbord at all? I would argue that we are no longer in the modernist era and in our effort to avoid the charge of being unoriginal, we may have become afraid to even take inspiration from the past - even if it is just to use a single element or picking the “cheese topping”.

De Botton argues that we shouldn’t fear the past, because old styles can express values that we might still need. Today we as architects want our buildings to be “of our time”, but sometimes that comes with the idea that ornaments or borrowing from historical elements are “dishonest” - a fear that might narrow our design vocabulary, leaving us with a very few words to work with.

THE SHIFT

If we are to move past the current state of generic design - we might first have to reclaim our right to be intuitive. Ultimately, the transition from hand to digital was a technical shift - but the transition back to an architecture of character might require a political one.

However, instead of implementing aesthetic laws, the industry should perhaps embrace an approach where architects are allowed to experiment more freely without being forced to replicate history or stay inside “modern” rules. By leaving behind the restrictive “no ornament” rule of the past, we as architects can maybe start to explore what architecture of our time truly looks like.

Architecture is unique among the arts because it is a sort of “public theatre.” While a poem or a painting can be a private experience, architecture is the material reality that everyone inhabits. Every building is a part of our society and how do we want that to look like? The future of architecture maybe lies in the reclamation of our autonomy - where we as designers are liberated from restrictive rules. Freeing us from the constraints of what beauty “should” be and allowing beauty to emerge as the natural by-product of a truly thoughtful, unhurried practice.

Perhaps a state support for architecture would enable architects to take more risks, experiment with materials, and explore artistic qualities that the commercial market currently deems too expensive or “irrational.” The benefit would not just be for the architects, but for the public as well. It could possibly foster a built environment of higher quality, ensuring that the places where we live and work are not just “boxes,” but vibrant, soul-filled spaces that reflect our society.

We need a system that values the “unnecessary” beauty of a building as much as a good energy rating. Only when the economic framework allows for more than the minimum standard can we as architects truly open our toolboxes and build environments that are not just “for our time,” but for the lives lived within them.

How expensive will it be to go away from minimum-standard? And what becomes the actual cost if we don’t.

Photo: From Gunnar Asplund: Arkitekt i brytningstid 1909–1931.



Asplund mixed Scandinavian, Greek, Roman and Egyptian style features when designing Stockholm Public Library.

Experiments.

The Experiments

To investigate the possible differences between designing façades by hand, and designing them in 3D software, a series of experiments have been conducted for the purpose of this thesis.

These experiments will not give a full answer to the ongoing debate regarding modern architectural aesthetics. Instead, they aim to provide an empirical indication of how tool selection might dictate aesthetic outcomes during the conceptual phase.

OBJECTIVE

To investigate the differences in design outcome, cognitive load, and time management between manual drawing methods (Hand) and 3D modelling software (Digital/Rhino) during early-stage façade design.

PARTICIPANTS

The study involves eight fifth-year students from the international master's programme in architecture at Lund University. This group was selected to ensure technical proficiency in both the analogue and digital medium.

Participants were informed of the project's general idea beforehand, and instructed to design façades according to their own architectural preferences.

They were randomized (lottery) into Group A (4) and Group B (4). Group A started drawing by hand, and Group B started with 3D modelling. For the second day they switched, doing the medium they hadn't done.

SETUP

The experiment was conducted to investigate differences in design outcome, cognitive load, and time management between analogue (hand drawing) and digital (Rhino 3D) mediums. The experiments took place during two days.

No focus on building materials to keep the experiment even between mediums.

Hand drawing setup: Participants were provided with standard A3 prints of floor plans at 1:100 scale, a scale ruler (1:100), black pens, pencils, and erasers. The instructions strictly prohibited the use of colour to maintain focus on geometry and line weight.

3D modelling setup: Participants used laptops with Rhino 3D installed. Base files were prepared with plans already positioned in the 3D space to eliminate time spent on file setup. Participants were instructed to model the facade in 3D (including depth, windows, and roof). They could sketch in 2D, but final result had to be modelled.

PROCEDURE

The experiment was divided into two days, each day including two sessions with two different building typologies: one public building (exhibition hall) and one residential. Each session was exactly 50 minutes, separated with a break of 10 minutes.

SURVEYS

Three different surveys were conducted during the experiments.

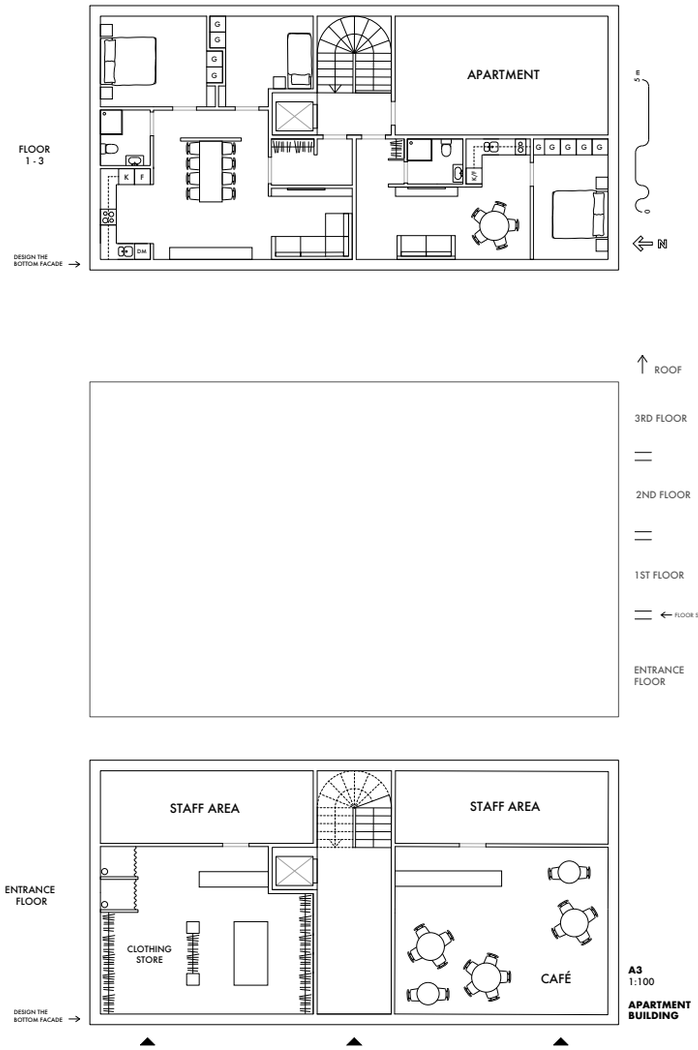
Before starting: Participants get to fill in their proficiency in hand drawing and Rhino.

After each day (Medium): Participants get to fill in their subjective experience including feelings of being rushed, frustration of the tool, and mental effort.

After both experiments: Participants get to fill in a comparative questionnaire between design mediums (speed, creativity, preferred medium).

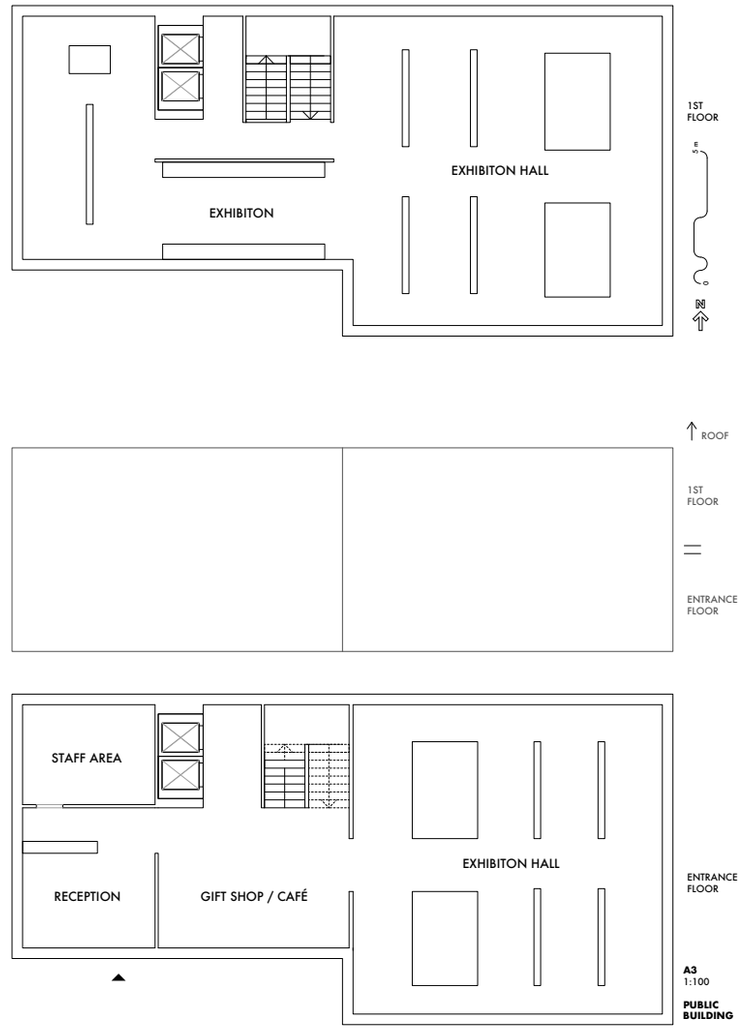
First Experiment Day 1

10th of February 2026

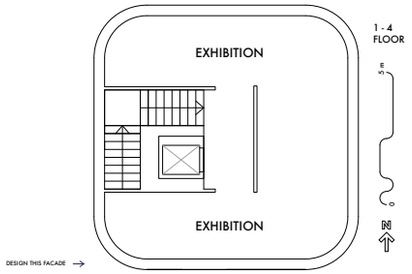


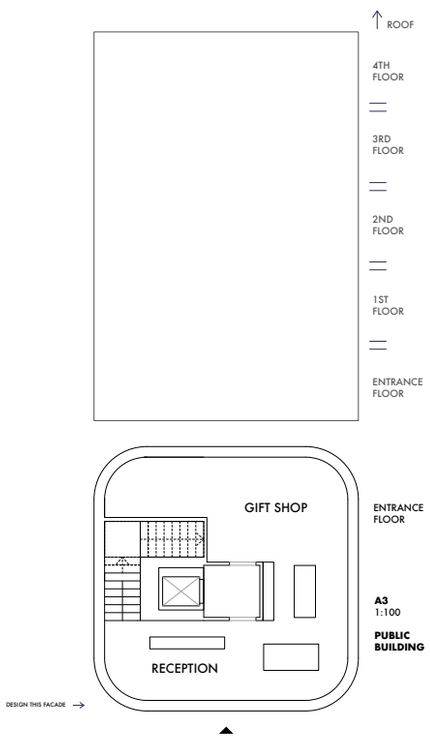
Second Experiment Day 1

10th of February 2026



First Experiment Day 2
11th of February 2026



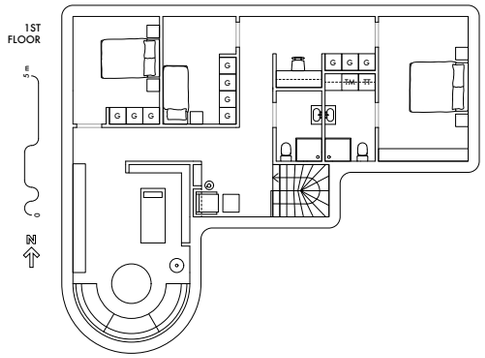


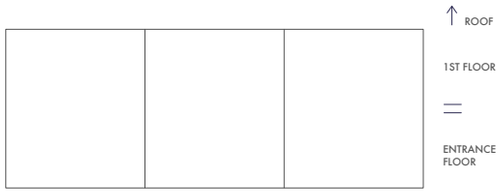
ENTRANCE
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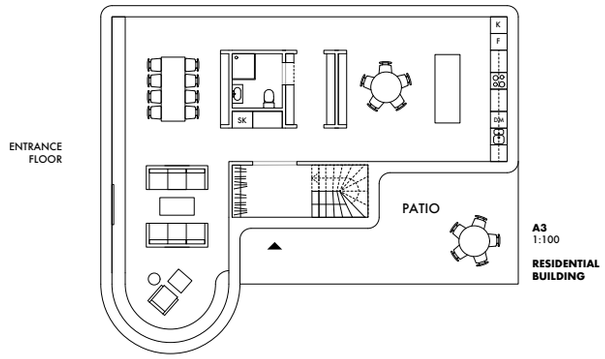
A3
1:100

PUBLIC
BUILDING

Second Experiment Day 2
11th of February 2026







A3
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RESIDENTIAL
BUILDING

Results from Experiments

The evaluation of the experiment results is to investigate the relationship between the architect and the used design medium - and to understand how these mediums shape the architectural outcomes.

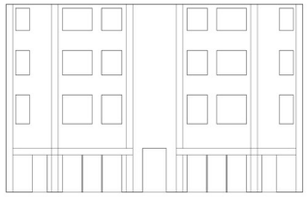
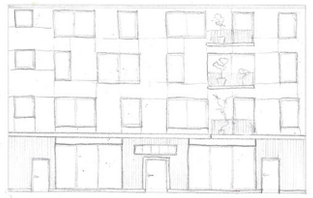
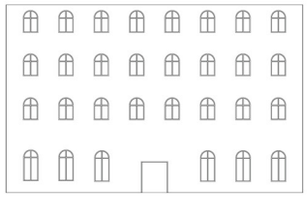
The comparison does not aim to judge the façades based on taste or to declare one aesthetic better than another. Instead, the analysis tries to focus on design diversity and how the chosen medium has helped or restricted the creative outcomes.

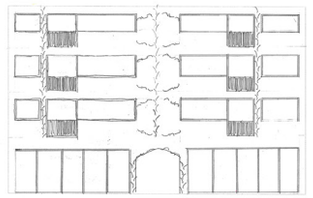
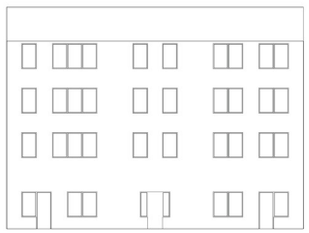
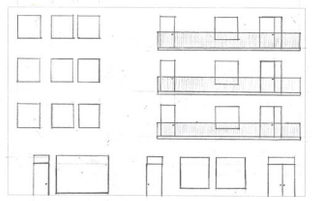
The façades were not compared through predetermined aspects, but were evaluated based on the differences found within each typology.



Drawing façades. Photo taken during experiments.

First Experiment Day 1
Apartment Building

3D TOOLS

BY HAND




Façade & Plan shape.
Four floors.

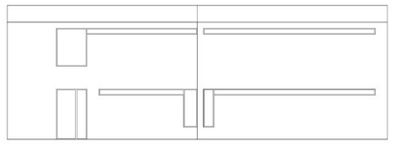
SYMMETRY & VARIATION
The digital façades are a bit more symmetrical while the hand drawn display more variation.

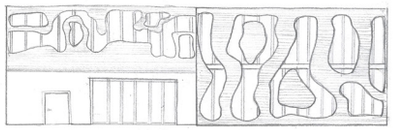
FLAT ROOFS
Neither work flow resulted in the design of roofs.

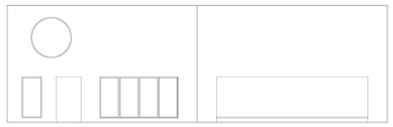
DIVERSITY
The hand drawn façades feature a greater variety of window typologies and projecting balconies.

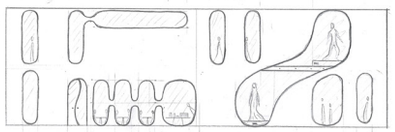
ENTRANCE FLOOR
The hand drawn façades create more different entrance floors (Rows 1 & 2). In the 3D examples the ground-floor doors and windows are locked into the exact same vertical grid as the apartments above. In the hand-drawn versions, the ground floor is treated as its own programmatic zone that intentionally breaks the vertical grid of the upper floors.

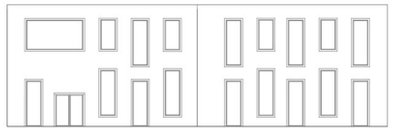
Second Experiment Day 1
Exhibition Hall

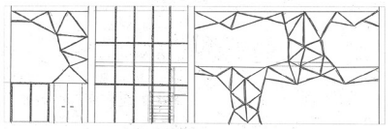


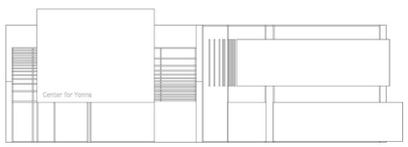


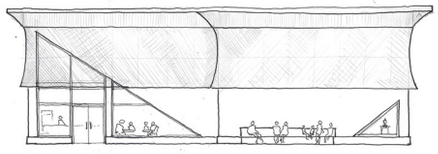












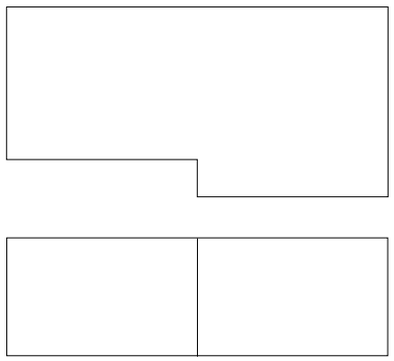
3D TOOLS

BY HAND

GEOMETRY
The digital façades rely more on straight lines, while the hand drawn break the grid more to include more organic, fluid shapes.

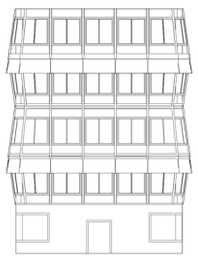
REPETITION
The digital facade in the third row demonstrates the copy-paste function, resulting in a strict repetition not seen in the hand drawn examples.

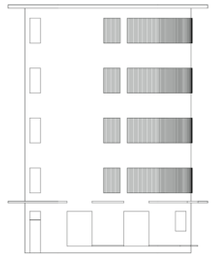
HUMAN SCALE
Two of the hand drawn façades (Row 2 & 4) include the human scale by putting in people and interior.

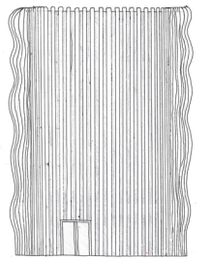


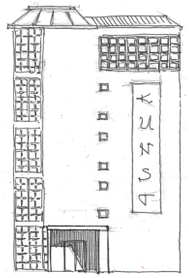
Plan & Façade shape.
Two floors.

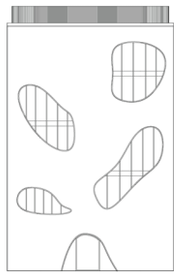
First Experiment Day 2
Exhibition Hall

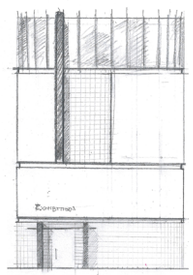


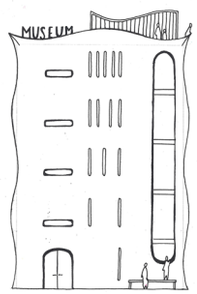






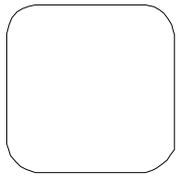


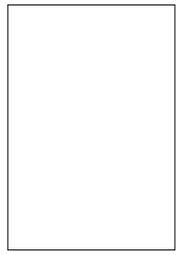




3D TOOLS

BY HAND





Plan & Façade shape.
Five floors.

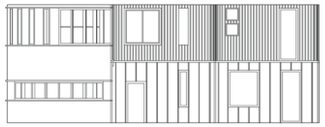
SILHOUETTE
The digital façades are staying more in their bounding box. The hand drawn more frequently change the entire silhouette of the building.

Both groups show variety.

SIGNS
The hand drawn group have used signs more frequently.

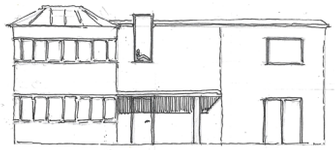
SYMMETRY & COMPOSITION
All hand drawn façades have put the entrance off to the left, while all digital has put it in the center.

Second Experiment Day 2
Residential Villa

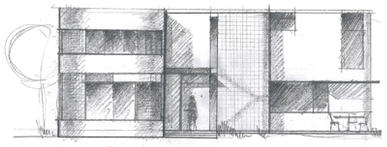


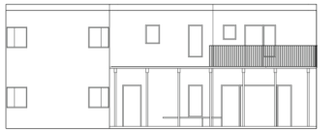










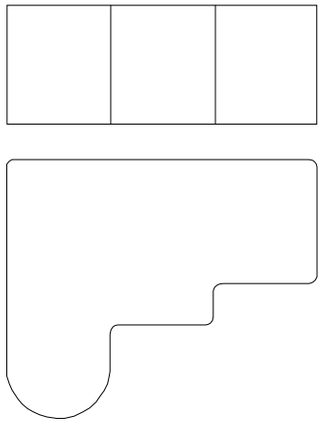




3D TOOLS

BY HAND

ROOF TYPOLOGIES
The digital roofs are mainly flat, while the hand drawn ones move outside the bounding box exploring more pitched roof typologies.



Façade & Plan shape.
Two floors.

Insights from Experiments

TIME LIMIT

The time limit might have affected the digital work flow when handling more complex floor plans (the residential buildings). Participants spent more time resolving where windows could physically fit than exploring façade aesthetics.

FLAT ROOFS

The high occurrence of flat roofs today is probably heavily driven by economic incentives such as maximizing BOA (Boarea/ rentable space) - but maybe the prevalence of flat roofs could also be tied to the digital design medium.

KNOWLEDGE LIMITATIONS

The digital outcomes may show the participants limited knowledge in using the programs, rather than an absolute limitation of the software. Advanced modelling can produce complex curves, but “defaults” might take over when time is short (and knowledge limited).

THE FOCUS

Giving students the assignment of designing a façade also gives the façade more focus. In my experience, during my studies, the façade design is often not as prioritized.

PROJECT BIAS

While participants were instructed to focus on the creative task, their prior knowledge of my project could have introduced a degree of participant bias - something that could unintentionally influence their design process, a factor that must be considered when evaluating these results.

DAY 1:
Group A - Hand
Group B - 3D

Fill in Proficiency Form.
50 minutes - Apartment Building
10 minutes - Break
50 minutes - Public Building.
Fill in Experience Form

DAY 2:
Group A - 3D
Group B - Hand

50 minutes - Public Building
10 minutes - Break
50 minutes - Residential Building
Fill in Experience Form
Fill in Comparative Questionnaire.



Drawing façades. Photo taken during experiments.

Survey Results

The surveys assess participants performance over several metrics, including cognitive load, frustration - and their own opinion of the design outcomes. By analysing both the survey data and the participant feedback, this report tries to find the advantages and constraints found in each method during the design phase.

PROFICIENCY

In the study, the proficiency levels among participants were relatively even between the two mediums. On a scale from 1 to 5, the average proficiency for hand sketching was 3.1, while the one for 3D modelling was slightly higher at 3.3.

THE MEDIUM

The experience of using each tool revealed a clear psychological and operational split. Combined data from the different sessions showed that hand drawing was perceived as significantly more helpful to the creative process, scoring 4.4 out of 5, compared to 2.8 for 3D modelling.

Participants reported that 3D work-flows were often marked by frustration (2.8) and a sense of being rushed (2.7), largely due to the “technical burden” of the software. When working in 3D, the students often felt they were solving a technical problem rather than designing, leading many to “give up and do what is simple”. In contrast, hand drawing was described as more thoughtful and intentional, where every line was a direct result of a design choice rather than a software limitation.

	GROUP A + B
PROFICIENCY HAND (1-5) 1 (Beginner - I rarely sketch) 5 (Expert - I sketch daily/professionally)	3.1
PROFICIENCY 3D (1-5) 1 (Beginner - I struggle with basic commands) 5 (Expert - I can model complex geometry quickly)	3.3

	COMBINED (DAY 1 & 2)	
	HAND (A+B)	**3D** (A+B)
RUSHED (1-5) 1 (No Rush) 5 (Very Rushed)	2.3	2.7
FRUSTRATION (1-5) 1 (Relaxed) 5 (Frustrated)	1.5	2.8
MENTAL EFFORT (1-5) 1 (Low Effort) 5 (High Effort)	3.0	2.9
SUCCESS IN DESIGN (1-5) 1 (Failure) 5 (Perfect)	3.3	2.9
METHOD HELP OR HINDER? (1-5) 1 (Hindered Greatly - I fought the tool) 5 (Helped Greatly - The tool aided my ideas)	4.4	2.8

	FINAL EVALUATION	
	HAND (A+B)	**3D** (A+B)
WHICH METHOD ALLOWED YOU TO BE MOST **CREATIVE**?	87.5%	12.5%
WHICH METHOD WAS **FASTER** FOR GETTING THE INITIAL IDEA DOWN?	75%	25%
IF YOU HAD TO PRESENT A CONCEPT TO A CLIENT IN 20 MINUTES - WHICH WOULD YOU **CHOOSE**?	87.5%	12.5%

EVALUATION

The final evaluation overwhelmingly favoured manual methods for the early stages of design. When asked which method allowed for the most creativity, 87.5% of participants chose hand drawing, noting that it allows ideas to be put to paper immediately and enables more organic forms that are harder to control in 3D.

Ultimately, while 3D is seen as a more “complete” design tool that clients can easily understand, its technical constraints often hinder the creative freedom and speed required during the more conceptual phase.

Testing by Design.

Proposed Methodology

The experiments indicate that using 3D software too early in the design process can actually limit creativity and lead to more repetitive façade designs. In response to this, I have developed a methodology that focuses on tool awareness - recognizing that the medium we choose directly shapes the final architecture.

By starting the design process by developing different ideas and then moving to refinement, we make sure that we don't just settle for what a program gives us, but are exploring multiple design possibilities for our project.

The process can be divided into these stages:

ANALYSIS

The design process begins with an understanding of the site and its specific context. By exploring the placement of the building, concepts and volumetric relationships - architects can determine the project's constraints and potential before designing more into detail.

SKETCHING

This phase is all about active exploration, whether you are using a pen, physical models or digital tools. The key is intentionality. It is entirely possible to explore artistic and conceptual ideas directly within 3D software. However, the experimental surveys provide an important reminder - the exploratory process is deeply cognitive, and physical sketching might be a more effective way to unleash our creativity without facing technical constraints. But ultimately, the exact method of sketching is left entirely up to the designer.

3D PHASE

Once a concept is decided, the "winning sketch" could then be translated into a final three-dimensional model. This transition will inevitably uncover new technical challenges and conflicts - being the first confrontation between an abstract idea and the actual physical reality.

In this phase we make adjustments and changes until we have a refined finalized building.

FINISHED RESULTS

When we have a finalized project, how do we visualize it? Rather than defaulting to the common hyper-realistic render - we might want to visualize different projects in different ways. The objective is to communicate the soul of the architecture - with visuals that matches the unique character of each specific project.

HUMAN SCALE

In the digital age, it is dangerously easy to become detached from the reality of the spaces we create. When working in 3D, the computer screen often creates a sense of "scale blindness" - where volumes are manipulated without a real understanding for the body that will eventually inhabit them.

To combat this, the designer must add their own body as a scale bar when designing - both by hand and digitally. Because to design the experience of a space, we first must understand what that space actually feels like.

ARTIFICIAL INTELLIGENCE

Artificial intelligence could also be explored in our creative process. Not only as a site analysis tool - but in the digital design phase.

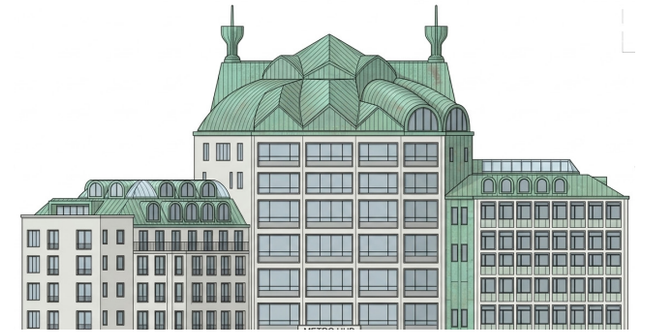
Instead of spending hours applying material maps in the model, we can now use AI to try various ideas and materials instantly before committing to it in the final model. AI also provides the possibility to break away from the look of generic rendering. We can use it to apply different stylistic choices to our visuals - such as the soft quality of a hand-drawn sketch or the look of a physical wooden model.

However, the use of AI also raises questions regarding copyright and the protection of artist's original work. Since these AI-models are usually trained on existing architectural and artistic imagery (without consent) - designers must be very careful when navigating this new tool. AI can give us a lot of new possibilities, but the tool should mainly try to support the creative vision of the designer, rather than replace the artistic responsibility entirely.

THE METHOD

This method is about emphasizing our role as architects in an era where the digital tool dictates a lot of outcomes. By thinking carefully about our tool selection - and perhaps prioritizing a more hands-on concept - we can support a workflow that aligns with our natural cognitive process, allowing for intuitive and genuine creative exploration.

Ultimately, by maintaining a critical awareness of our mediums, we ground our practice in human intention. This allows us to create diverse architecture that resists the homogenizing trends of the digital age.

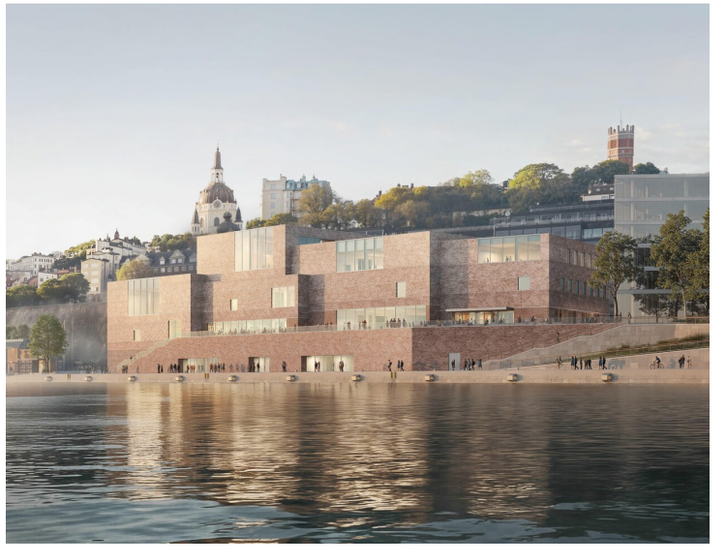




AI-Generated elevations developed using Google Gemini on one of my own projects



 Sketch of the Guggenheim Museum in Bilbao by Frank Gehry.



The Nobel Center's primary role is to highlight the discoveries and lives of Nobel Prize winners through various exhibitions and public events.



Illustrations: David Chipperfield Architects

Redesigning the Nobel Center

THE BUILDING

To test this methodology I have chosen to work with the proposal for the Nobel Center in Stockholm, designed by David Chipperfield Architects. The project has created significant public debate and a lot of criticism - leading many to want to stop its production entirely. Much of this critique centers on the building's minimalist design - which could be a direct result of digital 3D modelling.

STARTING POINT

Given the limited timeframe, I have decided to use the volumes of the current proposal as my foundation. My focus will instead be on re-imagining the center's exterior by redesigning the building by hand. This approach allows me to step directly into the sketching phase of my proposed method, testing how the physical act of drawing can alter the center's character.

DISCLAIMER

A necessary disclaimer to this exploration is that the original design process of David Chipperfield Architects remains unknown to me. Furthermore, the exterior constitutes only a single element of the building. Architecture is inherently complex, and the center is shaped equally by its sections, plans, and spatial placement. My work is not a solution - but rather an investigation into how the intuitive process of the hand can change how our buildings look.

"A proposal for the Nobel Center, of the more **grandiose style**."

The Visual Debate

When the proposal for the Nobel Center was unveiled, it was met with widespread public disapproval - and social media started to flood with AI-generated pictures of user's own architectural visions.

This shift represents a fundamental democratization of visuals, making the architectural conversation accessible to the broader public. People are no longer restricted to just criticizing the official proposal - but can now actively generate their own counter-visions directly into the digital sphere. This technology gives the public a powerful new voice, enabling people to express complex aesthetic desires that are normally hard to put into words.

Yet, as artificial intelligence allows the public to create their own "visions of happiness," we must remember that architecture extends far beyond surface aesthetics. It is crucial for us not to overlook the spatial complexities of the profession - but this visual revolution is proving that the public deeply cares about their cities and now has the tools to actively participate in shaping them.

"Probably too little volume for the Nobel Foundation's needs, but **brighter, more glass, and above all lower**."

Images and text taken from Facebook







"Here comes **my proposal** for the new Nobel Center!"

Sketching.

Sketching Process

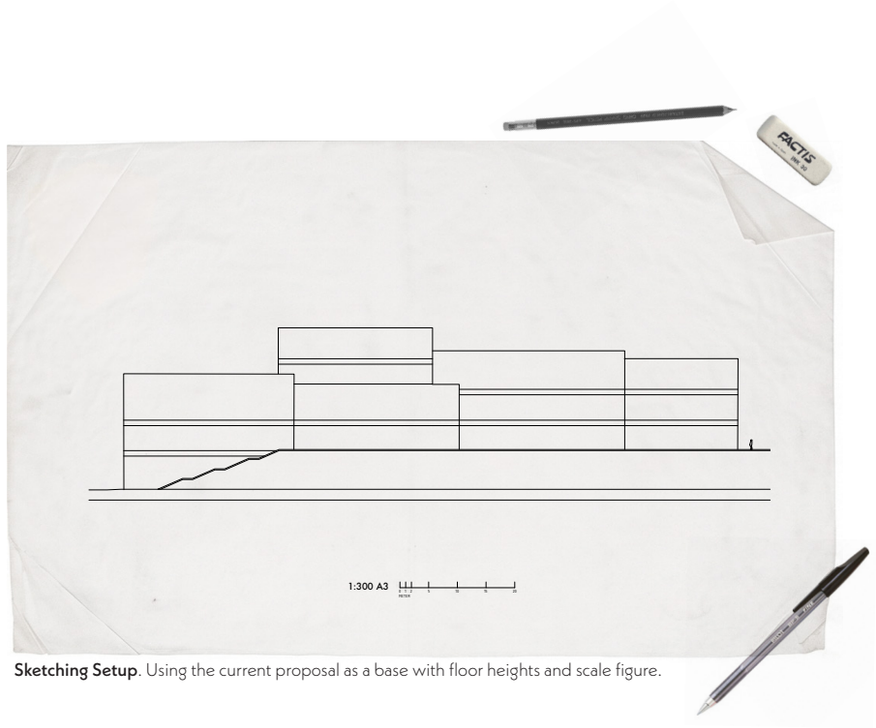
Mirroring the methodology of the experiment participants, the design process was initiated as an exploration executed entirely through the hand.

THE SETUP

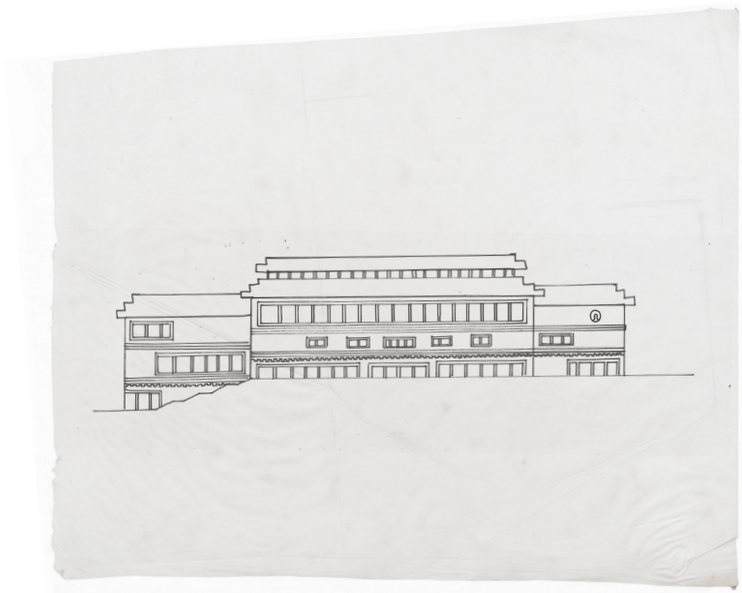
The investigation was conducted during three days, structured in two architectural scales:

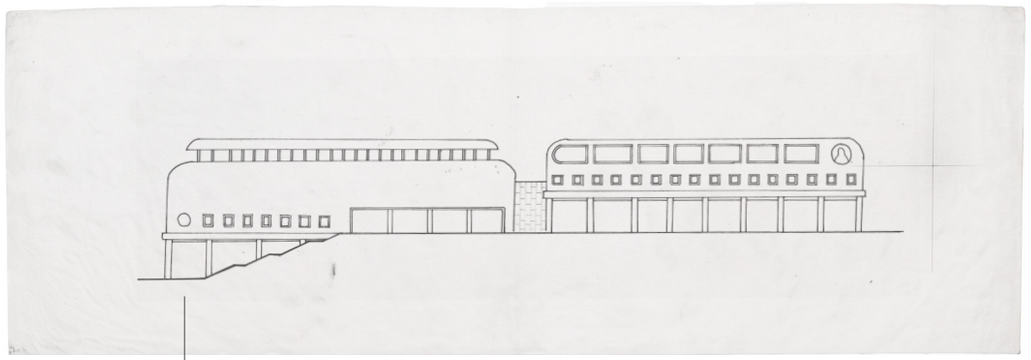
The Conceptual Phase (1:500): This scale allowed for a fluid, unconstrained investigation of compositions and volumetric relationships without the distraction of more detailed architectural elements.

The Iteration Phase (1:300): After establishing the concept, transitioning to a bigger scale offered a better understanding of the proportions and the ability to develop finer architectural details.

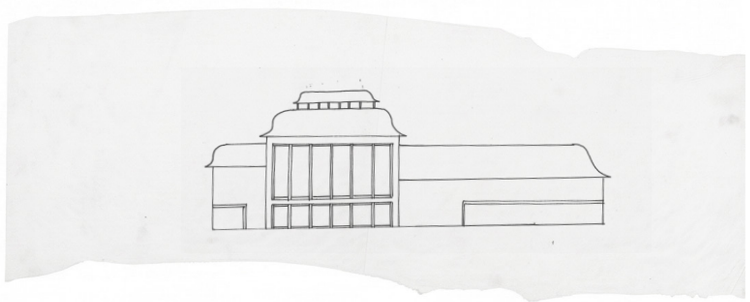


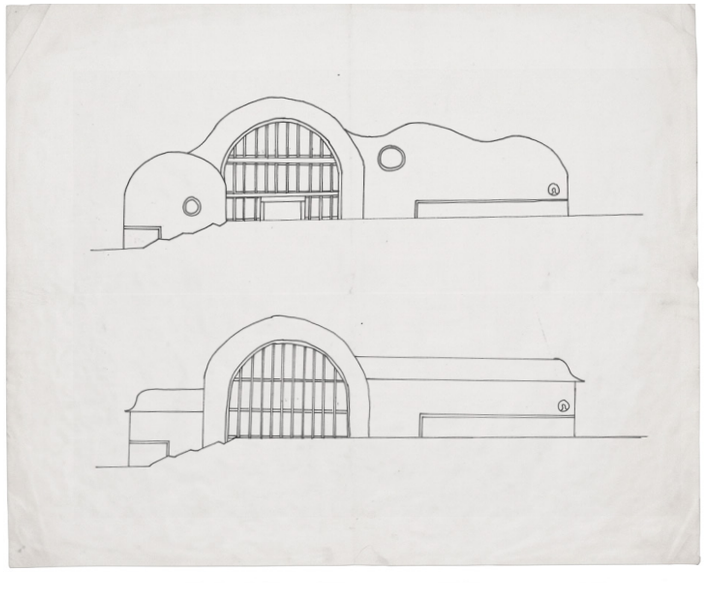
Sketching Setup. Using the current proposal as a base with floor heights and scale figure.

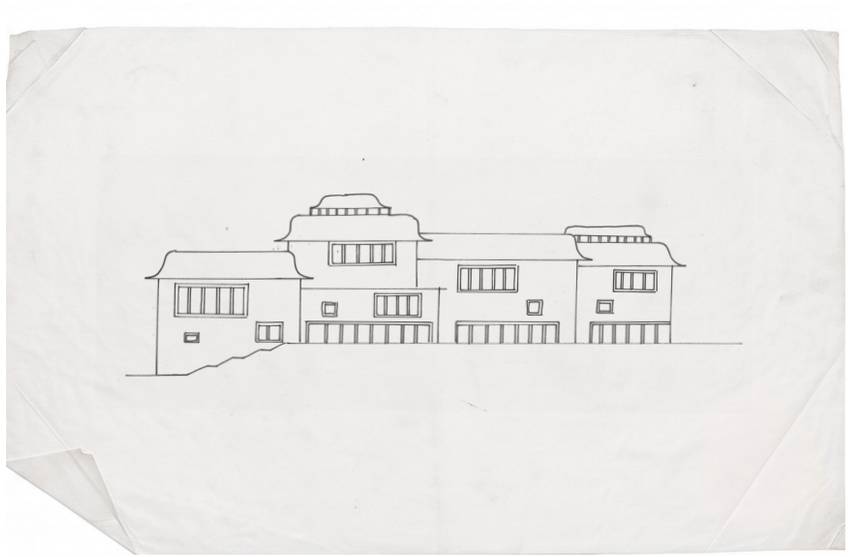


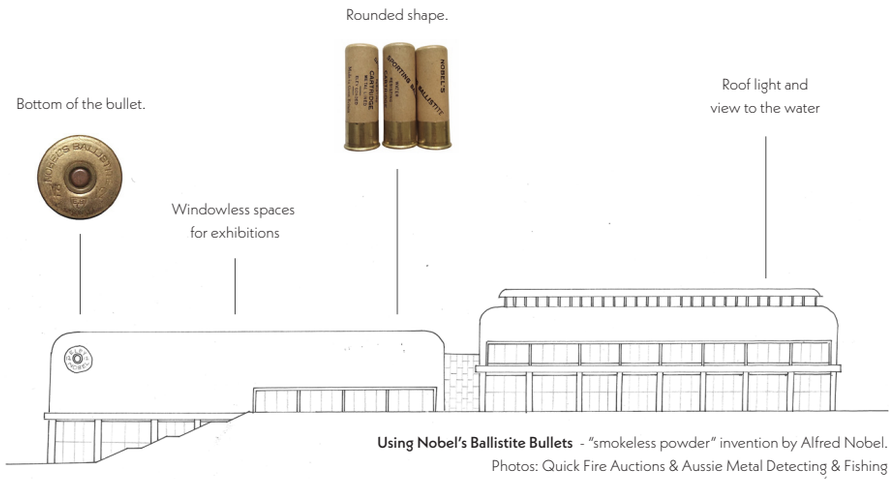


Choosing this sketch
to further develop

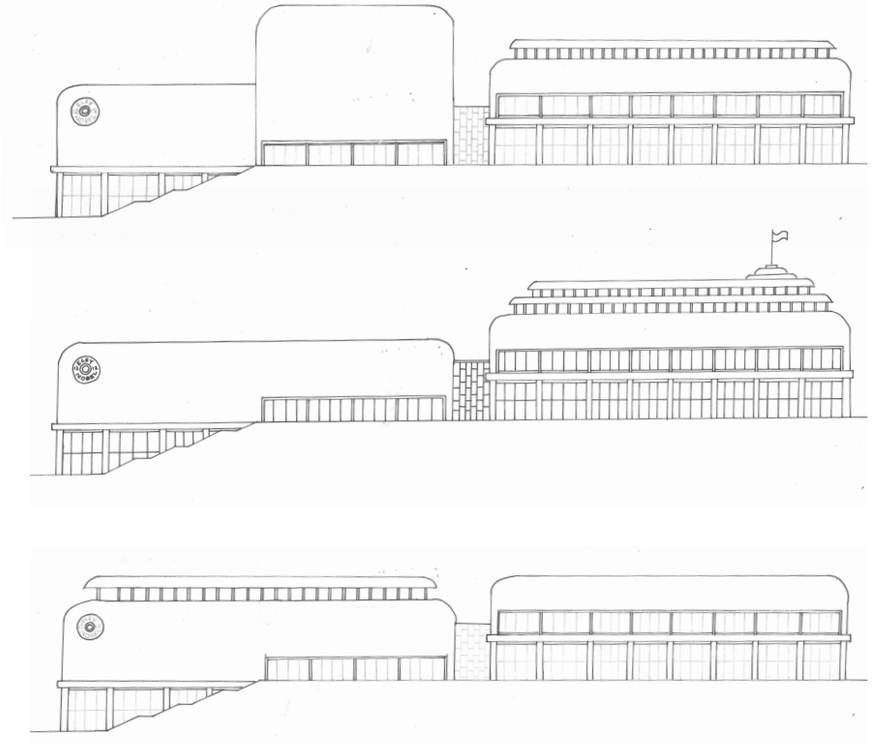








Using Nobel's Ballistite Bullets - "smokeless powder" invention by Alfred Nobel.
Photos: Quick Fire Auctions & Aussie Metal Detecting & Fishing



Context & Limitations

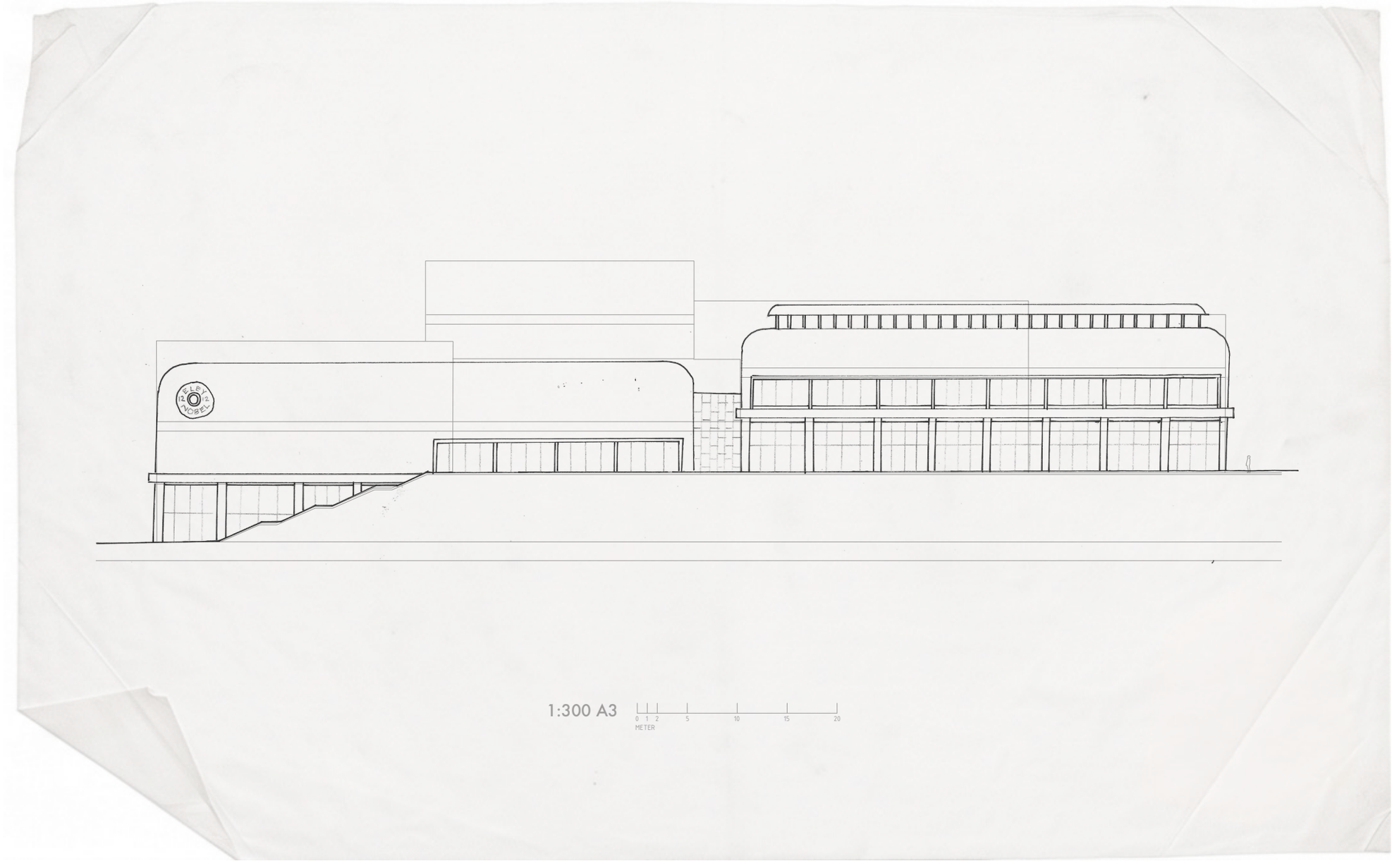
Rather than constraining the sketches to the official site plans of the Nobel Center, the design was approached with absolute freedom. The existing plans were intentionally set aside to allow for an uninhibited creative process, guided entirely by spatial instinct rather than restrictions.

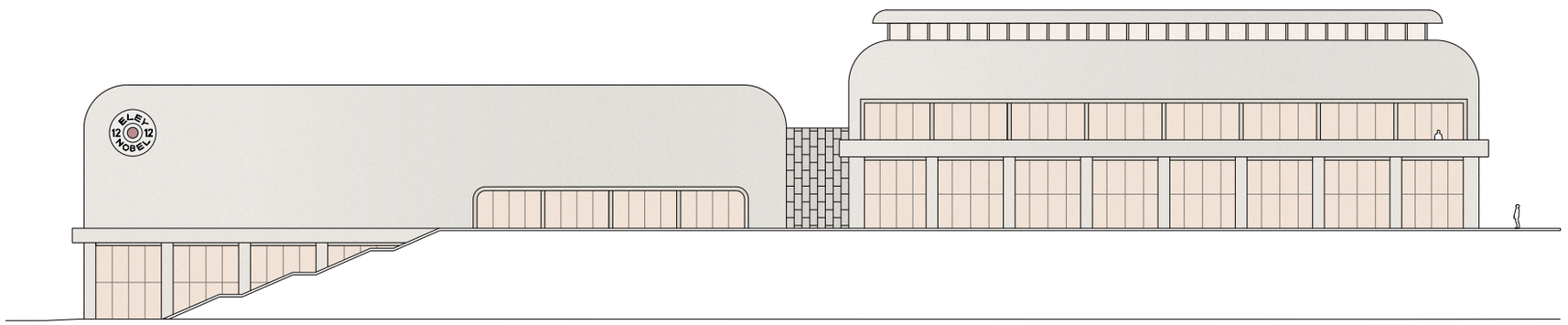
Before starting the drawing phase, I also studied the history of Alfred Nobel, his biography, and his inventions. This included compiling printed imagery of his industrial products to serve as visual references for potential design elements.

Symbolism

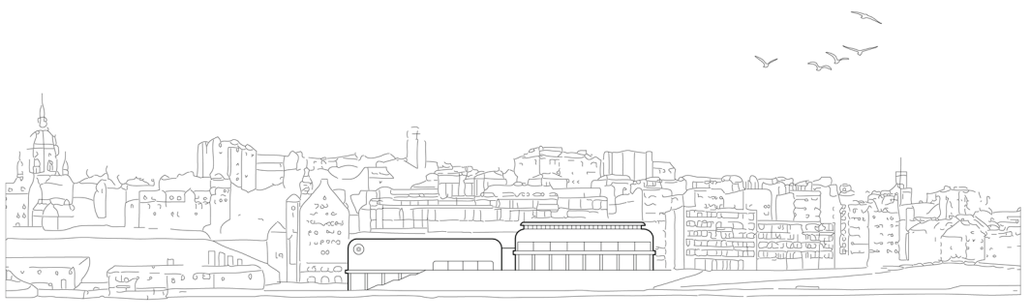
The final design is based on the tension within Alfred Nobel's legacy through two counterweighted volumes.

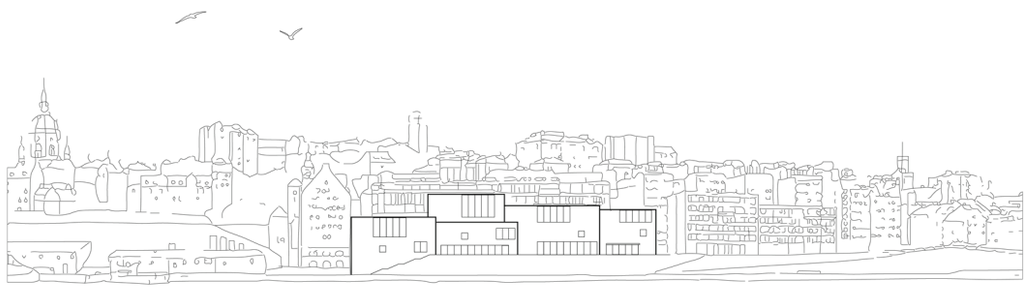
The left volume stands as the heavy, material reality of Nobel's inventions, carrying the gravity of the consequences of their destructive power. Dueling this mass, the opposing volume represents the pursuit of peace, literature and science - rising up to counter heaviness with enlightenment.


1:300 A3
0 1 2 5 10 15 20
METER


0 1 2 5 10 15 20 m

Comparison.



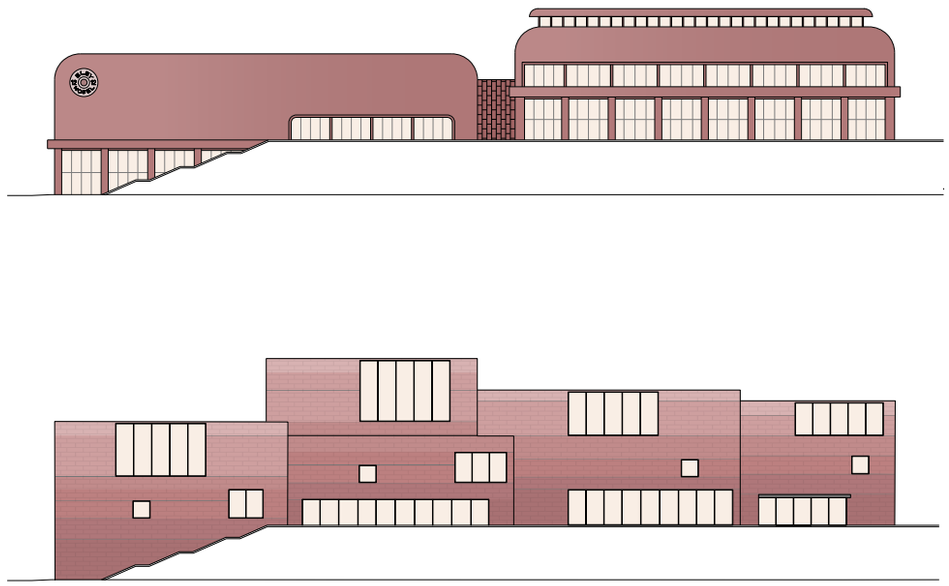


Comparing the Outcome

This comparison serves to analyze how architectural outcomes change when we use the hand as our primary early-stage design tool. However, evaluating a self-authored concept with an obvious project bias is difficult. I tried using the same evaluation method for this analysis as in the former experiments, but absolute objectivity (in both cases) is inherently unattainable.

The true goal here is not to prove that one design is universally superior, but to illustrate that different tools can lead to different outcomes. Of course, the medium is just one variable - different individuals or teams will always produce entirely different designs as well. Ultimately, the designs we prefer are deeply tied to our own subjective vision.

To reduce visual variables and focus the evaluation strictly on architectural composition, a similar façade color has been applied to the new proposal.



SHAPE

The upper design (Redesign Proposal) uses curved shapes and rounded corners. The lower design (Current Proposal) uses only straight lines and right angles, arranging rectangular blocks in a stepped pattern.

ROOFS

The upper design features curved roofs with the left volume having a row of roof light windows. The lower design has completely flat roofs on all building sections.

WINDOWS

The upper design splits into two contrasting halves: a solid, windowless section on the left and a highly transparent glass section with pillars on the right. The lower design uses a repeating grid of rectangular windows spread evenly across the building.

ORNAMENTATION

The upper design includes a round emblem on the blank left wall. The lower design has no added decorations, relying entirely on the building’s shape and surface texture.

Conclusion.

Experiment Reflections

The core of the study involved a two-day experiment with eight architecture students. The setup for the experiments focused specifically on the public-facing aesthetics of the architecture, rather than the internal spatial experience. The design of this experiment came quite intuitively, and the primary goal was to find a way to make the two mediums directly comparable.

Even though the experiments were effective in isolating the tool as the main variable, providing good comparisons, the study is quite small and could benefit from a bigger long-term study with more oblivious participants - including myself.

If given the opportunity, there would be several more experiments I would like to do comparing digital and manual mediums. These would include volumetric studies and more complex experiments that connect both the exterior and interior spaces - finding both the benefits and limitations of each medium in different phases.

An unexpected but rewarding outcome of the study was also its immediate impact on the participants themselves. Because they were in the midst of their own master's projects, some shared that the experiment reminded them of the value of manual tools. When they later got stuck in their digital designs, they went back to "think through the hand," using the physical act of drawing to continue their process.

My Process

Before bringing the façade experiment to the students, I ran a trial of the setup on myself. During this exercise, I found myself frustrated with the digital program, and that it actually restricted my creative exploration. Of course, every architect's cognitive process is unique - but for me, manual sketching showed itself being a vital tool for my conceptual thinking. However, I must also acknowledge that my frustration with the software is also linked to my own technical limitations.

In previous projects, I have especially enjoyed sketching volumes in 3D programs, where we can create shapes quickly and see them instantly in their context - whether from the street or from far away. It helps me understand how the mass truly "feels" on a site. As mentioned, all tools have strengths and weaknesses - we simply must remain aware of them and recognize how well they serve us as a designer at each specific stage of a project.

The decision to redesign the Nobel Center was a conscious choice to engage with the ongoing public debate, but personally, it was also an opportunity for me to to exercise complete creative freedom before stepping into professional practice. On a scientific level, it also reminded me of how enjoyable it is to draw by hand - which is, in itself, a significant benefit of the manual tool that is worth noting.

I also wanted to be clear that I do not think one medium is better than another. Instead, this research was made to remind us and utilize the full spectrum of our architectural tools. A teacher of mine recently mentioned visiting an architecture school where students no longer drew by hand at all during the education - and to abandon this tool entirely is, in my view, a pity.

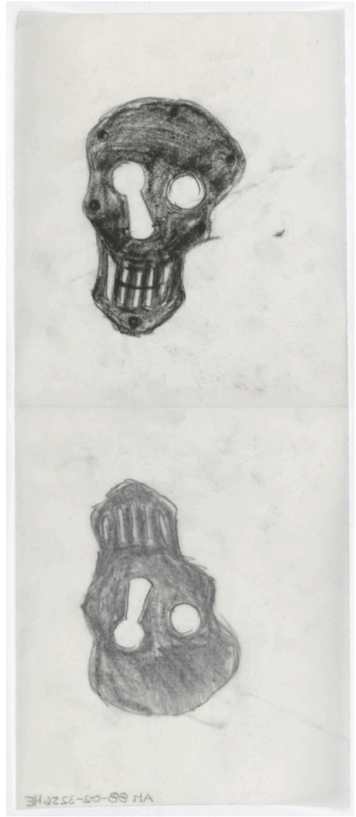
Looking Forward

So as we look forward, the transition back to diverse architecture is maybe not about style - but about the methods we use. A shift that intelligent technology perhaps could aid us with.

Instead of struggling with complex commands, a designer could simply prompt the system for a specific feature, such as a “fish head” ornament and receive fifty unique variations to choose from - or using drawing tablets where AI can turn hand drawn lines into three-dimensional elements instantly. This could free us from the constraints of 3D modelling something complex - allowing the architect to focus on the artistic intent rather than the constraints of the program.

Perhaps artificial intelligence will not be the end of the creative process, but a bridge back to it.

Photo: ArkDes



Keyhole Sketch by Gunnar Asplund for Skogskyrkogården



Conclusion

This thesis investigates how the choice of design medium affected the aesthetic variety and cognitive process in contemporary architectural design. By analysing the historical shifts and conducting comparative experiments - the study identified technical constraints associated with early-stage 3D modelling that lead to more repetitive and simplified façade outcomes.

The architecture students participating in the study reported higher levels of creativity and lower frustration when sketching by hand compared to using 3D software. This shows that although 3D tools provide technical precision, they can sometimes also disrupt the cognitive creative process.

Learning from this, the thesis proposes a design methodology that promotes a manual sketching phase. However, the framework is not presented as a strict rule, but as an example of a practical strategy that could help us create greater aesthetic variety. The approach is then tested through a redesign of the Nobel Center to see how the resulting architecture differs from the current proposal.

We must also recognize that how we work with our tools only addresses one dimension of the issue. The lack of aesthetic variety is not solely a result of software, but a result of a market-oriented housing system that treats buildings as financial assets where profit is to be maximized.

Ultimately, the real transition requires a shift in how we value “unnecessary” aesthetic labour. This means moving beyond the current “minimum-standard” framework - allowing for a truly thoughtful and unhurried practice where beauty can be created through deliberate acts of care.



Sketchbook of Helgo Zettervall

Photo: ArkDes

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