

## Sketching and drawing in the new age - the role of sketching and drawing in architectural and technical education

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**ABSTRACT:** Authors of this article focus on the confrontation between artistic sketching (represented by architectural works) and technical sketching (represented by engineering designs) in the *digital era*. The current discussion concerning the actual process taking place between the moment an idea comes into existence and the eventual final design or product is a natural continuation of the discussion associated with the start of the process that, in this respect, may be considered creative. The discussion was held at the *analogue* level until digital media took the stage. Sketching and drawing as a sole means of the *minus 30Y Generation* has been substituted with the uncompromising perfection of digital technology. The fact that the word digital originates from *digit* - finger, is definitely a paradox, as the digital technologies have condemned the fingers to *clicking*. In architecture, it is still useful to start the creative process with the *mind - hand - paper* sequence and, then, to follow up with technology to make it more precise. Sketching gives the architect - designer absolute freedom.

### INTRODUCTION

At the start of their endeavours, people in creative professions who attempt to enrich the material world and improve its quality might experience *a blank space fright*, akin to *horror vacui* [1]. No creative work, including that of an architect, ever starts from scratch. As a rule, it is inspired by a reaction to something in existence or the need to change something in existence. Each and every work of art is created in the existing environment - cultural, physical, natural, social - that moulds the author's mind and in this respect, the creative process consists of overlaying reality with a new layer: first an imaginary one (idea), then, the tangible one (sketch, drawing, final product). Architecture is the tool, the result and the formative instrument of our cultural ambitions. Although the process of solving a specific task never starts from zero and there is always a context for thinking and creative work, page fright (the *putting pencil to a blank page*) effect still occurs.

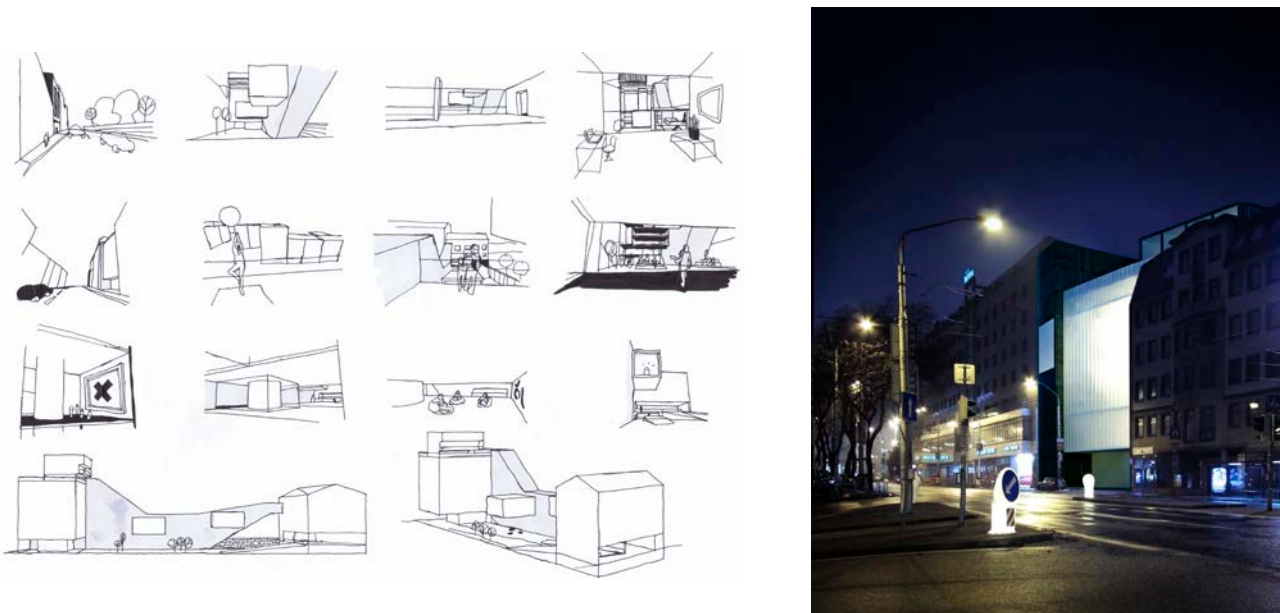


Figure 1: Gallery of Slovak University of Technology (student: Jana Pajchlová, 2012/2013). Example of a student project starting with sketches (on the left) with the final outcome as its visualisation utilising a digital 3D model.

Each architectural work starts with an idea, which is limited solely by the imagination and courage of its author. Architecture is the materialisation, projection of the idea through the prism of current technology potential and the artistic ambitions of society. The idea alone, no matter how precise, is hardly architecture; it is an independent creation of the human mind impossible to show other than indirectly, since it is too elusive, ephemeral. Despite its essentiality, an idea is an incorporeal quantity and an architect can *only* interpret it more or less precisely. The best instrument for this purpose is the *thinking hand* - a concept by Juhani Pallasmaa, which involves the interaction between the hand and the mind of the architect and the drawing instrument (pencil), while these three phenomena function in a complex harmony. *Architecture is ...a product of the thinking hand. The hand captures the corporeality of an idea and transforms it into a specific image* [2]. *The blank space fright* is a temporary stage during which the human eye and, subsequently, the mind have not yet received a feedback in the form of the sketch created by the hand - the work instrument of the mind in the corporeal world.

Architecture is a means for accomplishing our cultural ambitions concentrated in our mind. First of all, one has to teach the students to think - to contemplate architecture and, then, to choose a suitable instrument for materialisation or interpretation of their ideas. Utilisation of these instruments is a craft. The process of transforming an idea into something corporeal is crucial, as the idea can easily be weakened or lost completely. It occurs most often in between the individual work stages - during the transition to another medium of *production* of the architectural work - from an idea to a sketch, from a sketch to a computer drawing or from a design to the implementation (production) of the architectural work. The authors of this article would like to focus on the confrontation between artistic sketching (represented by architectural works) and technical sketching (represented by engineering designs) in the *digital era*. With their article, the authors intend to instigate discussion as to the extent that is relevant, necessary and essential to encourage the thinking hand skill in this *new age*.

## BRIEF HISTORY OF SKETCHING

The current discussion concerning the actual process taking place between the moment an idea comes into existence and the eventual final design or product, is a natural continuation of the discussion associated with the start of the process that, in this respect, may be considered creative. The discussion was held at the *analogue* level until digital media took the stage. The generation active in the 1980s - the *minus 30Y Generation* - was used to the sequence: mind - decision - hand - design - check - revision, etc. Between the mind, eye and the feedback, there was only a barrier comprising the author's skills and the technical potential of the visualisation material and technology. The sketching and drawing as a sole means of the *minus 30Y Generation* has been substituted with the uncompromising perfection of digital technology. Drawings, with their own degree of stylisation, have been replaced by photorealistic rendering that divests the vision of the future form of the work of any deductions or imprecisions. The same applies to physical designs that have gradually become a means of presenting the final work, not a tool used in the creative process.

Supporters of a larger-scale implementation of digital technologies in the creative process argue that authors can concentrate more on creating the concept, because they spend less time on manual drawing. In addition, they have the option to check the outcome immediately, thanks to visualisation or animation, and also to correct the result quickly, without manual re-drawing of all the output being necessary. It might seem that by shifting the core of the creative work to the computer, the nature of the work does not change, that its quality even increases. Computers are supposed to provide a more efficient tool for working with human ideas. In his book *The Thinking Hand*, Juhanni Pallasmaa does not reject computers; however, he criticises the tendency to compare hand-made drawing with computer drawing. *Lines drawn with a charcoal, pencil or a pen are expressive and emotional ...They can express hesitation and assurance, judgement and enthusiasm, boredom and excitement, affection and repulsion. A line drawn and traced by hand is dimensional. ...In comparison to the expressive richness and emotional liveliness of a line drawn by hand, a computer-drawn line is a laconic and uniform connection of two points* [3].

Similar to architectural creative work, which is considered to be technical art, design in technical disciplines is exposed to various *fashionable* trends and principles as regards teaching design and the implementation of technical designs. The best-practice method is applied, which is adapted to the current period and technocratic trends. Before the onset of sophisticated digital systems used in designing in *open-space* offices, concepts of construction details and whole systems were created during face-to-face meetings of more or less specialised designer teams. This work method involved the personal contact of designers, engineers, possibly even future users and enabled an exchange of opinions concerning the design and its functionality, and also on-line optimisation based on their experience and the *emotion- or feeling-based* approach.

The use of the simplest depiction instruments - a pencil and a white sheet of paper - was an indispensable part of this design concept method. Sketching of technical structures, as well as details, with all the people involved present, provided an opportunity for direct exchange of ideas and, thus, also for a quicker search for the best solution. The sketching was another form of communication, of speech, while the drawing evoked a finished, published text. The key quality of hand-made drawing was that it involved the search for the *spirit* of the solution and the idea of its shape and functioning.

Juhani Pallasmaa calls attention to ...*the seeming finality of the computer image, when compared to the natural indistinctness and inherent hesitance of the drawing hand which only thanks to repetition, the trial and error and the gradually achieved assurance and correctness accomplishes a satisfactory result.* [4]. The poet Billy Collins similarly insists on writing using a pen, not a computer keyboard: *With the keyboard, everything seems to be completed, stiffened, while writing on a sheet of paper gives me the feeling of gracefulness and the impression that everything I am writing is temporary for the moment* [5].

## SKETCHING TODAY

In the current era of automated technocratic designer work, sketching still remains irreplaceable. It enriches the creative work with elements of artistic design and presentation of spontaneous collective ideas, and helps to reduce the routine pre-defined catalogue and database solutions offered by the *non-living* part of the team - the digital technology, since they tend to suppress the creative spirit of unconventional solutions. The strictly routine-like technical work in a 2D or 3D environment with automated computerised additions within a user network comprising many workstations, often with tens or even hundreds of kilometres separating them, restricts the personal input of creative individuals within the group dialogue, in which the *authenticity* of primary solutions, beautiful in the distinct technical clarity of the original idea/vision tends to disappear. A weak concept of a work/design can be hidden more easily with its quality visual presentation. In the later stages of the process, any *return* to the starting point of a solution is problematic, and in case of any changes of the concept it renders all the work of those refining the details useless.

A small example is the modification of the upper metal flange of a laboratory bioreactor (Figure 2) with a thin-walled glass vessel. The joining of glass and metal parts usually constitutes a construction problem in cases of change in the temperature and pressure, and the cyclic stress in the node with the highest stress exposure frequently results in equipment break-downs. The original solution from the manufacturer, with unsuitable and unprecise centring in the connection node, caused constant cracking of the upper section of the vessel. Therefore, it was necessary to design an efficient and conceptually simple modification. The discussions about the re-design with the laboratory technician, glass-maker and designer/engineer gradually produced two potentially better solutions. The initial sketch design was created as a result of ideas and arguments between the three professionals. The design with a simple centring ring eventually became an alternative more acceptable to the user from a technical perspective, from which detail assembly drawing was prepared without delay.

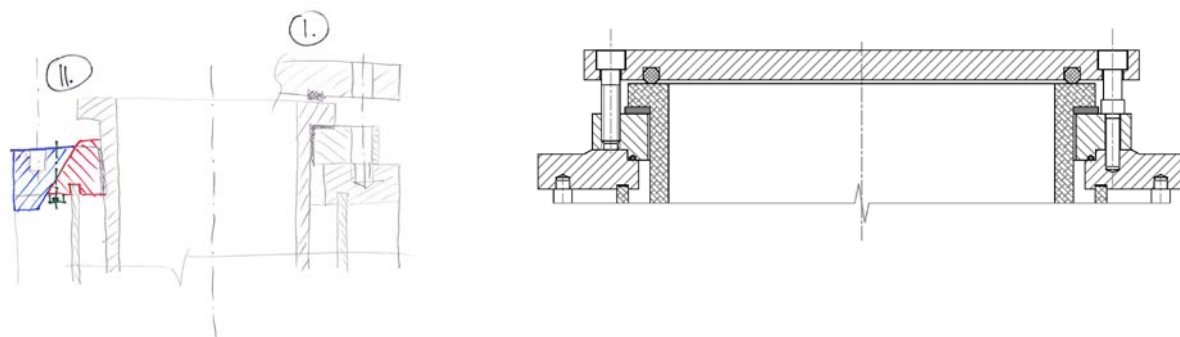


Figure 2: Construction details of the upper metal flange of the laboratory bioreactor. Left: two sketches of alternative solutions. Right: structural drawing with the final details.

As the next step, it was easy to transform the design into detailed production documents and drawings. This example of the time-tested method from the hand-sketched concept to the digital production documentation has its merits, especially, in activities in which the designer spirit is needed for creating concepts of prototype solutions and inventive, unorthodox solutions. Hand-made sketches are an effective means of communication in a team where not everybody has the technical background needed to read sophisticated technical documentation; however, they comprehend the *finger-painted* images without problem. And that is the very reason why even in the current age of robust intelligent digital designing systems, the hand-drawn concepts are still irreplaceable.

## RELATIONSHIP BETWEEN TECHNOLOGY AND ART

The relationship between free drawing and precise technical drawings offers several analytical perspectives. First of all, it is the freedom of thought at the beginning of the creative process and the need to transfer the idea to the person actually creating the product, provided that is the objective of the process. In the case of teaching, the final outcome is usually the simulation of the result via projection and in rare cases, also its verification using a functional model. One would like to point out that the focus is not on analysis of the relationship between the seen and the depicted, but the presentation of a vision.

From a historical perspective, the relationship between technology and art, free drawing and the precision of a future product is described in the book *Math and the Mona Lisa*. The many editions of the book are a testament to the attractiveness of the book to its readers. In late 1950s, British scientist and writer C.P. Snow ...identified two distinct intellectual cultures: intellectuals among humanists (including artists and writers) and intellectuals among scientists (natural scientists and mathematicians) [6]. We strive to overcome prejudice towards each other, since ...the communication between the two groups is tense at best and non-existent at worst [7]. Artists use visions and metaphors, scientists need numbers and mathematics [8]. Atalay's interpretations are important because he is not only a scientist appreciating art, but a scientist and a visual artist. We cannot forget Leonardo Da Vinci in this context (Figure 3).

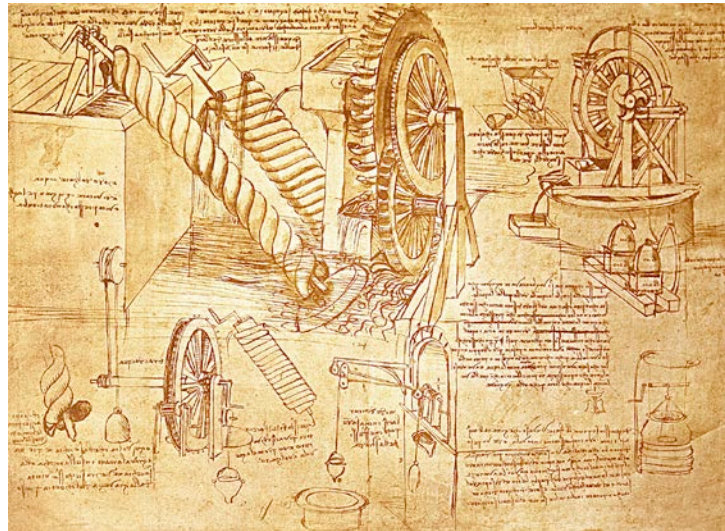


Figure 3: Drawings by Leonardo da Vinci - regardless of the type of technical objects he created or depicted in the drawings, they are still considered masterpieces.

One implements requirements regarding the visual and artistic aspect of drawing as a natural part of architecture teaching; one assesses talent during entrance examinations and when teaching visual art and architectonic drawing. *Education system must cultivate and nurture skills such as imagination/visualization and empathy* [9]. Alvar Aalto in his book [10] mentions drawings of a *dreamy landscape with rolling hills and hillsides bathing in the light of many suns* that eventually resulted in the design of the town library in the Finnish town of Viipuri. Another possible perspective for analysis of the relationship between free drawing and technical drawing can be found in the artistic works of Aalto. Initial sketches are more on the free creative work side than on the side of architectonic syntheses, and they focus on the atmosphere, visual associations or literary *librettos* of the project, while their link to the final product is established afterwards.

Technical sketches in the process of engineering design need not have artistic ambitions; this consists primarily of the freedom of creative interpretation of imagination. In general, imaginativeness remains the primary criterion. The visual quality criterion plays its role in creative disciplines where it is important also with respect to the outcome. In architecture and in visual arts, the freedom in depicting ideas goes so far that it is even possible to draw unreal space situations (Figure 4)

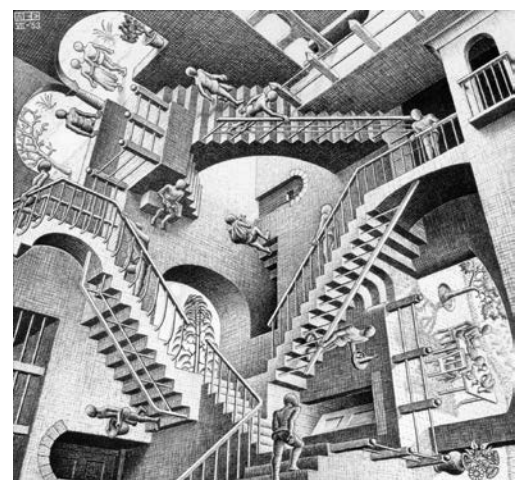
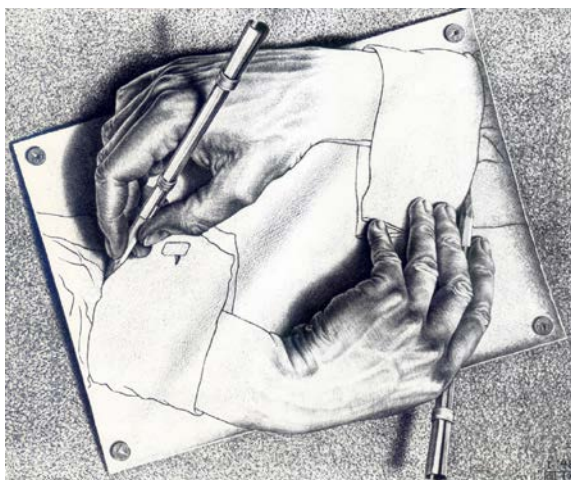


Figure 4: Left: Drawing hands by M.C. Escher, 1948 (source: <http://www.wikiart.org/en/m-c-escher/drawing-hands>), Right: Relativity by M.C. Escher, 1953 (source: <http://www.scottmcd.net/artanalysis/?p=548>).

Within the educational process in the Faculty of Architecture at Slovak University of Technology in Bratislava, the scale of the problem varies from the product design through architecture to town dimensions. Product and graphic design requires special attention, and Bohumil Kováč and Ľubica Vitková concentrated on the urban scale in their article *Urban design teaching in Slovakia* [11].

One of the possible analytic perspectives concerning the relationship between free drawing and precise technical drawing involves a dilemma as to whether computer-drawn images can be called sketches in cases in which they serve as a kind of inter-stage between a hand-made sketch and the final design. This applies to the computer-precision sketching frequently utilised in architectural work (Figures 5 - 7).

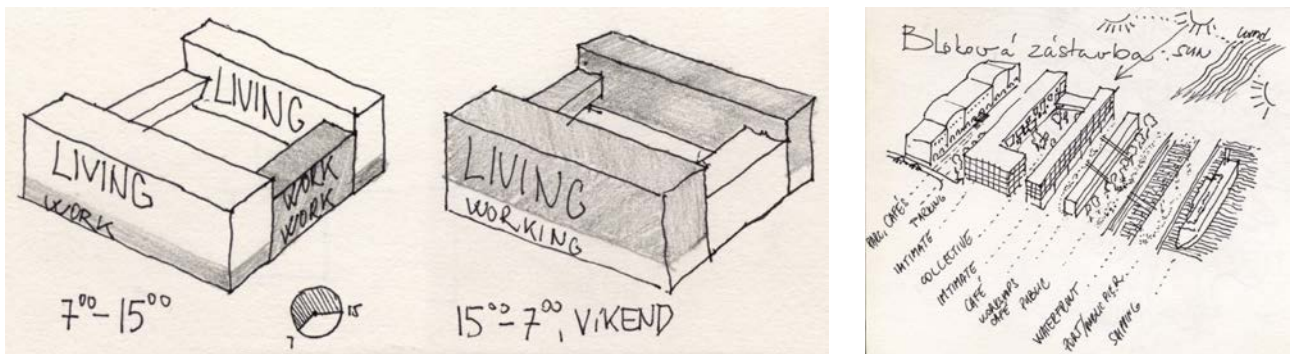


Figure 5: The Next Helsinki. Diploma project (student: Bc. Tomáš Kuric, 2015). Initial sketches of the design.

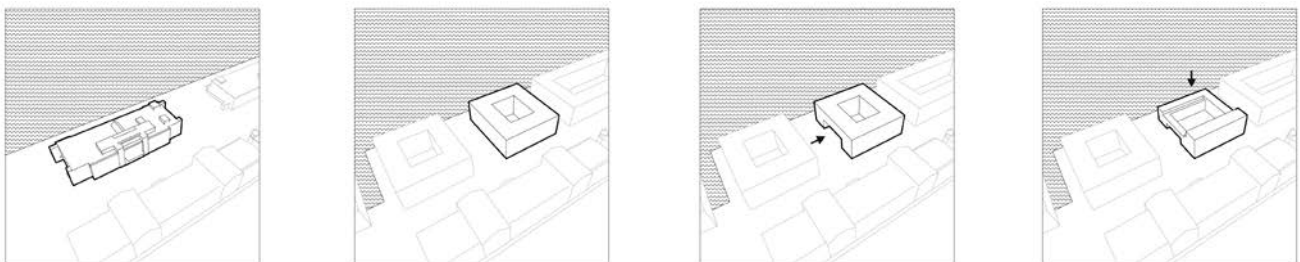


Figure 6: The Next Helsinki. Diploma project (student: Bc. Tomáš Kuric, 2015). Three-dimensional diagrams show the gradual development - formation of the town block architecture. They are made by computer, but represent sketching within the architectonic creative process.



Figure 7: The Next Helsinki. Diploma project (student: Bc. Tomáš Kuric, 2015); Final design of a town block. Left: axonometric projection of the pertinent block; Right: visualisation.

## SKETCHING IN THE AGE OF PARAMETRIC ARCHITECTURE

The beginnings of these digital technologies are characterised by a *simple* transcription of physical records into the digital binary world of 1's and 0's. The general development in architecture and design first brought 2D drawing tools and, then, the 3D building information model (BIM). These days, such tools play a key role in the later stages of designer work or in the process of implementation of the design, not in the stage of searching for concepts. However, a change in the paradigm might be brought about by digital architecture.

*Digital design (designer work) has evolved from simplification of conventional creation processes by means of automatization, through controlled parameter-based modification of many similar features, to generative*

*emergent complex systems. The transition from the parametric to emergent design comprises a transition from a top-down- controlled system to a bottom-up-controlled approach stemming from non-linearity [12].*

Digital design changes the creative work concepts, as the final form (product) is generated according to a set of parameters or a comprehensive agent system. With such a process setting, the result is impossible to predict for a human mind.

*The idea of an easily decipherable linear sequence of actions and reactions is replaced with a comprehensive system of agents that respond to each other and also to their environment in a manner too complex to reliably predict events. [13].*

In this case, sketching is either rendered totally useless or acquires a totally new role in the creative process.

## CONCLUSIONS

The fact that the word digital originates from *digit* - finger, is definitely a paradox, as the digital technologies have condemned the fingers to *clicking*. In architecture, it is still useful to start the creative process with the *mind - hand - paper* sequence and, then, to follow up with technology to make it more precise. Sketching gives the architect - designer absolute freedom. It enables a smooth transformation of an idea from the brain into an understandable format.

Sketches, as physical interpretations of a concept, may be revised. Even if it seems there is still room for sketching in the work of an architect, the question remains about how long to work with the sketch and when to start working in the digital environment of computers. The stage of the transition from analogue outputs into digital formats is where the loss or degradation of the original idea or architectural objective occurs most often. Many a time students say: *I was unable to elaborate the idea further, the software did not enable it*, etc, which is a paradox, since the perfect technology then limits the enhancement of the original idea or vision.

If the implementation of an original idea is to deliver a humane message, it is desirable to sustain the idea with emotionally rich origin and existence. The dominance of digital technology from the very start poses a risk for the sphere of work (*instant design*).

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