Creativity and Use of Physical Models in Architectural Design

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Abstract. The paper is taking up the subject of architectural models in the context of creativity theory and design teaching methods in three parts. In the first part the author is reviewing creativity theories of Donald W. MacKinnon and Edward de Bono and looking for relations and parallels between work on model and creativity. The architectural model as a tool or medium will be compared with elements of theory of creativity and ideas production. In the second part some experiences from world leading architectural practices are surveyed in the attempt to answer the question why scale model is still crucial to the creative process of practices such as OMA, MVRDV and Neutelings Riedijk. The third part presents the authors’ own observations from the didactic process in which work on model was central. Conclusions will be drawn to complement and summarize the paper.

1. Introduction - What is creativity?
Creativity is not a talent, nor it is related to IQ. It’s not an ability that one has or not. Instead it is a way of operating, which one can teach oneself and practice it to get better in it.

1.1. Technique for producing ideas - James Webb Young
In his short book „A Technique for Producing Ideas” (1965), James Webb Young, advertising specialist, in concise and instructive way answers the question of “How do people get new ideas?”. According to him creation of an idea is not a miracle or accident but a process, comprising of certain steps, which not only can be described but also repeated as many times as it is needed. Young divides the method of producing ideas in following five phases or steps:
1. Collecting of raw material. This material is related to current, specific problem (studies concerning the given, actual problem) as well as material from continuous upgrade of state of general knowledge (education, experience).
2. Conscious mind-processing of collected material.
3. Incubation phase, where intuition (the subconscious) is allowed to make synthesis.
4. Actual birth of an idea – the eureka moment - „Eureka! I’ve got it!”.
5. Development and final shaping of an idea for practical implementation.

1.2. Theory and research of Donald W. MacKinnon
Similar five step characteristic of creative process is presented by American psychologist specializing in creativity Donald W. MacKinnon. This scientist after practicing with Carl Gustav Jung in Zurich established and directed the Institute of Personality Assessment and Research on the University of
California in Berkeley. Between 1958-9 a team of psychologists under his direction conducted unprecedented study of creativity among American architects. Invited to this research project were recognized architects of their time including world famous figures like Eero Saarinen, Richard Neutra, Louis Kahn, George Nelson, Mies van der Rohe and Walter Gropius. The last two refused to take part in the study making excuses of too much work. The creativity study consisted of an array of tests and interviews conducted by psychologists and was aimed at finding the answer to questions like: What makes human being creative? What are the biographical conditions and personality traits necessary to realize the potential of creativity?

Trajectory of creative process according to MacKinnon:

- **Preparation period.** This first phase embraces a long time of acquisition of skills and knowledge through education and practice. Influences and motivations activating the mix of intelligence, talent and curiosity stimulating for creativity.

- **Focused efforts.** Definition of the problem. Application of different approaches to analyze the problem in hand. Diagnosis produced as an outcome of hard, focused effort, during a short period of time, often with large cost of psychical energy and physical exhaustion. The solution however remains elusive and the problem unresolved.

- **Incubation.** Statistically the chances of finding the working solution in this phase are rather low. Instead of that it is a period of frustration, tension and discomfort. The subject often withdraws completely from working on the problem, focusing on something completely different, which opens the door for the unconscious process of solving the problem.

- **Insight.** The eureka moment, in which a promise of credible and working solution appears, which is accompanied by excitation. After intensive engagement and later temporary withdrawal the mind produces an answer.

- **Verification.** The subject is methodically testing an idea with in-depth study of its consequences before treating the problem was solved.

2. Notes on creative process, creative person and creative product from the reading of Donald MacKinnon and John Cleese, with regard to architecture

First task of a person who will solve a problem in a creative way is a proper analysis of a complex situation, narrowing down and simplifying the problem until the crucial difficulty of the task is isolated. Abundance of knowledge may be threatening or even suffocating for creativity. It’s not by coincidence that the most prominent figures of the twentieth century architecture - Le Corbusier and Mies van der Rohe - had no formal (university) training in architecture. Naive novice is taking up subjects (and usually succeeds), which an expert would never even try. Part of the most creative achievements in science were accomplished by people, who educated in one field, jumped to other, where they formulated new problems and carried out innovative experiments using the knowledge they brought from their previous fields and experiences keeping the naïve perception of a ‘stranger in a strange land’. An additional factor supporting the creative attitude is freedom from pressure to establish your professional identity [too] early in life.

Rem Koolhaas, one of the most creative and influential architects of his generation, before studying architecture was educated as journalist and worked as reporter and screenwriter. Peter Zumthor before studying architecture worked as a cabinet maker in his fathers’ furniture workshop. Daniel Libeskind before taking up architecture was accordion virtuoso. Zaha Hadid before entering Architectural Association School of Architecture in London was studying mathematics in her home country Iraq. Another condition for creativity is a kind of courage. A courage to be destructive to enable to build something better, a courage to follow own intuition rather than logic. Trust your own instinct! Tune into what you yourself think and feel and do not act on outside expectations, opinions or dogmas. I know that this is not easy – we are all influenced by what other people think and feel. I think that there is a close link between creativity and freedom. Therefore, rely on yourself – that is the most important. That’s how Rainier de Graaf from OMA, one of the leading architectural practices encouraged students for taking part in one of international competitions.
Creativity works better in a group. If two or more people throw ideas back and forth they can reach more interesting and original places than they would get to separately. Threat for group creativity is a person who makes others feel uncomfortable – they lose confidence and it is end of creativity. Therefore one should play with people that one likes and trusts. One should never say anything that might hurt others, never say ‘no’, ‘wrong’, ‘I do not like it’. One should always be positive and try to build upon what was said: ‘It would be even better when...;’, ‘I do not understand clearly, could you explain it again?’, ‘Continue...’, ‘What if...?’, ‘Let’s pretend that...’. One should try to create as relaxed atmosphere as possible.

A creative person in its intellectual aspirations connects the opposites of expert knowledge with childlike naivety and fresh perspective. Creative reorganization of situation demands balanced, free, spontaneous overlook of situation, naïve and childlike embrace of what is there. This kind of attitude encourages the use of imagination in the form of analogies, parallels and metaphors, which are so vital for in-depth reorganization of any problem. Creative solution has to be true (working) and beautiful.

2.1. Creative process / open and closed mode / conditions encouraging creativity

In his creativity studies MacKinnon proved that the most creative people possessed the ability to get themselves into a certain mode of operation, which allowed their natural creativity to work. He described this certain mode as an ability to play. Creative people operating in above mentioned mode he defined as „childlike”, because of their ability to play with ideas, explore them not for some immediate, practical aim but for indulgence, play for the sake of play.

Open and closed mode of operation

The way people operate at work can be described within two modes: open mode and closed mode. Creativity is impossible in closed mode. Most of our time at work we spend at the closed mode. We feel that there is a lot to do and we have to hurry to make it in time. It’s active and slightly anxious mode in which we are also impatient and tense. There is no space for sense of humor there. In this mode we act very purposefully, it may lead to a great stress.

While operating in open mode we are relaxed, outgoing, less focused on the purpose, more contemplative, more keen on humor, which always accompanies the wider perspective, and consequently we are more in play mode. In open mode curiosity for its own sake can work, because we are not under pressure to quickly perform a specific task. We can play and that allows our natural creativity to work. We have to work in open mode when we consider a problem, but when we reach the solution we have to switch into closed mode in order to implement the solution. When the decision is made we are efficient only when we decisively stick to it, undistracted by doubts whether it’s right or wrong. When we made the decision we should focus on implementing the chosen solution, after implementation we should switch back to open mode, to check the feedback of our action in order to evaluate whether direction we chose is right, and should we continue to the next phase of our plan, or should we create alternative plan, in order to correct any error, we can notice. And then again we go back to closed mode in order to introduce the next step. And so forth. In other words, to be more efficient we have to be able to switch modes from open to closed and back. Although we often tend to stick in a closed mode. Under pressures of everyday life, we tend to keep tunnel vision in cases where we really need to make a step back and consider a wider context.

In open mode we should bring our thoughts to subject which we have under consideration. There will be interferences like daydreaming, but one should try to bring thoughts back to the subject – similar like with meditation. If one keeps ones thoughts around the problem constantly, sooner or later one will be awarded by ones subconscious – probably while having a shower, or while having a breakfast – suddenly a new thought will appear. Of course on condition that one spend time deliberating over the problem.
Conditions which allow for open mode and creativity

**Dedicated Space** - You can’t be in play mode and creative, when you are under everyday life pressures, because in order to deal with them you need to be in a closed mode. Hence you need to create a space away from those needs and it means to cut yourself off. You need a quiet space with undisturbed calm.

**Dedicated Time** - Space itself is not enough, it has to be secured for a certain time. This period of time-space oasis has to be distinctly specified and separated from everyday life (from closed mode in which we usually operate). According to Johan Huizinga „Play differs from usual life in location as well as duration. Its main characteristics are: specific location and finiteness. Play starts and in certain moment it stops. Otherwise it’s not play.” Now there is space for creativity, because play is possible when we are separated from everyday life. Getting to the open mode may take about 30 minutes, that’s why it’s worth to sustain time-space oasis for about 1.5 hour, that way we will still have about 1 hour for something to happen. It’s better to arrange for 3 separate shorter sessions in following weeks than one long session one day.

In his research MacKinnon noticed that the most creative people always played with problem longer, before they tried to solve it, because they were able to longer tolerate a discomfort and anxiety accompanying unsolved problems. If we have a problem to solve, until we solve it we feel a kind of internal excitation, tension or uncertainty, which are uncomfortable. We want to get rid of that discomfort. In order to achieve this, we take the decision. Not because we are certain that it is the best possible decision, but because taking up a decision will make us feel better. Creative people taught themselves to tolerate that discomfort much longer and because they put more time to contemplate their solution is more creative. Before making a decision one should ask oneself a question: „*When this decision has to be taken?*”. After answering this question one delays decision making until then, in order to give oneself maximum time to process the problem, what leads to the most creative solution. Concluding - you have to give your mind as much time as it is possible to come up with something original.

**Confidence / Courage** - Nothing blocks creativity better than fear of making a mistake. Play has a lot to do with experimenting and with freedom: „*What will happen if I do this? What would happen if we do that? And what if...?*” Characteristic of play is openness for all that can happen - awareness that whatever happens it’s all right. You can’t play if you are afraid that going in some direction is „wrong”, will be something „that you should not do”. You have to take up risks of saying and doing things, which can be seen as dumb, illogical and inappropriate and the best way to such attitude leads through awareness that when you are creative there are no things that are wrong. There is no such thing as mistake, anything (no matter how dumb) can lead to a breakthrough.

**Humour.** Humour takes us from closed mode to open mode faster than anything else. Laughter brings relaxation, humour takes us into playful mode. Humour is essential to spontaneity and playfulness, it’s indispensable for creativity, which is needed to solve problems no matter how serious.

3. Theory of Edward de Bono – parallels between Intermediate Impossibles and quick conceptual models

**3.1. Intermediate Impossibles**

Their use is counter intuitive and is usually in conflict with logical thinking, in which you have to be correct on every step. It doesn’t matter whether Intermediate Impossible is true or absurd, however it can be used as a jumping board to another idea, which can be original and working. Another example for when you play nothing is “wrong”.

Intermediate Impossibles is a term used for the first time in 1973 in a book „Po: Beyond Yes and No” by Edward de Bono to describe an aspect of lateral thinking, and is instrumental in creative process. It is an idea, which in itself is impossible or highly unpractical but it releases or leads to a better idea, which are feasible. This concept can be illustrated by a wobbly stone on which you could step to cross the river – they are not the best places to stay, but they help to reach the destination. Those bridging moments in creative process are key to open new directions, they can even lead to completely original
ideas. It’s the opposite of gradual change, which best fits to work on already existing idea. The use of
crazy or impossible idea, as a steppingstone for finding a real and original solution is fundamental for
many ideas generating techniques. In brief it’s raw ideas and opportunities, which help to create
something new.

The most important thing is to let the idea last for a moment for others to analyze and find a hidden
value in it. Playfulness is fundamental for creativity and funny ideas work as well as detonators, helping
others to enter the play mode. When playing with Intermediate Impossible you have to think that there
is no “bad idea” and delay judgment as much as possible. Forget the rules and logic for a moment.
Intermediate Impossible can be to some degree risky or instigative, but this kind of provocative ideas
can stimulate even the quietest member of a group to act. Provocations usually generate more discussion,
which results in more interesting questions and answers.

Half-shaped idea may encourage others to add their contribution. This new voice may not be compatible
with the direction of original thought, but it’s even welcome for the idea to go in a new and better
direction, which initial author would not even think of. Most of Intermediate Impossible look like a
product of a child mind. Childish way of thinking is characterized by openness to play and discovery
and readiness to jump into fantasy world. If one is able to think that way one can create far more
interesting ideas. This ability to enter the play mode is recognized by researchers of the subject as a key
feature of creative process.

3.2. Use of Intermediate Impossible

Intermediate Impossible are used consciously or subconsciously in various aspects of creative process
in three main ways

1 - ice breaking / brain storming
Encouraging people to imagine things which are purposely dumb at the beginning of a brain storming
can be a great way of ice breaking and opening door for creativity. When you do not know how to
start or you stuck in the process, you can start producing random combinations and let intuition decide
whether any of them may lead to something interesting.

2 - productivity
Most often Intermediate Impossible are used in cases we deal with a certain problem to solve and we
want to quickly generate ideas. In this phase they are described by the father of the term - Edward De
Bono. The most important thing in the process is not to reject the ideas too early, delay judgment,
abstain from expressing ones’ fears concerning success of an idea until others get a chance to develop
idea up to next level and discover new places.

3 - prototype to sacrifice
Or a process of co-creation – working on a product or service with potential users. Having an idea with
potential we build sacrificial prototype, which we can present to others. Term “sacrificial” means, that
we are ready for the potential users to tear our prototype into pieces (sometimes literally), while
expressing their thoughts on the project. People are much easier with saying what’s wrong than what is
right with the idea. This kind of prototype should be half finished (open for changes), that way it will be
easier for potential user to develop the idea. Just like in case of other Intermediate Impossible we put
aside doubts concerning feasibility. The prototype may represent the idea which is unfit for mass
production or cost ineffective. Those prototypes are not or should not be finished solutions, their purpose
is to make the idea better in cooperation with future user. Best prototypes are color or branding neutral,
thanks to which user reaction will be free from common opinions or prejudice, the user will fill the
missing elements and bring more then in a simple conversation about finished, fully developed product.
This kind of prototype may bring up a lot of questions about feasibility or profitability – but it should
be put aside – the purpose is to improve the idea with the user.

Intermediate Impossibles will often give more questions than answers, in a way it is their purpose: to
provide a new set of questions in relation to initial take on a problem. In case of getting stuck in the
routine of old way of thinking they change its direction in search for something new. The most important
thing about using Intermediate Impossibles is their certain fragility. As ideas they should exist long enough, for someone to find their hidden value. The best summary of that is a quotation from Edward De Bono: “Instead of rejecting the idea at once, one should look at it for a bit longer and find some good aspects, which one might miss out on when rejecting it too early.”

3.3. The role of Chance and Mistake in creative process

“The forms come from attraction and chance – they disappear when they can’t survive. But those which are able to manage give birth to new individuals, their memory keeps the features of parent couple. Until deviation of particles – chance – gives birth to new species, which will be again sustained by overwhelming power of memory: ‘Immeasurable variety of animals appeared as a result of continuously repeated failures.”  

Michel Foucault, The order of things, Words and things, ch: Monsters and fossils, s.205, 206, 207;

Accidental occurrence of some event in proper time during creative process can play important role in providing clues or material needed for creative act to appear. Conditions in which accidents like mistake, error, misunderstanding are more or less likely to happen and conditions in which chance incidents if appear have the potential to bring desirable creative effects can be analyzed and studied.

**Discovery by mistake / error. The role of misunderstanding.**

„Scientific method is based on acknowledging that hypothesis is right until it is proven to be wrong. Then you take the other, better hypothesis. Experiments are conducted in order to prove that hypothesis is wrong. Because of the human nature most experiments are planned in hope for hypothesis to be confirmed. Whole weakness of this situation is that the existing hypothesis are determining and limiting our field of view and a kind of evidence that we look for. Therefore often we need an error, a mistake, a chance incident, some unusual event in order to „drop up” evidence, which we did not even look for in the first place, going by hitherto „law-abiding” hypotheses. Can we do anything about it? The simple answer is: change the procedure. Instead of testing the best hypothesis, spend as much time and effort on searching for equivalent, alternative hypothesis. Not in order to reject them in favour of other, better one, but in order to widen our vision of reality.”  

Edward de Bono in „Teach Yourself How To Think”, 1995, s.30

Physical architectural models in design process stimulate imagination far more than computer models. Misunderstandings and mistakes allow new shapes to appear and they open new possibilities releasing unplanned scenarios. Every flaw, defect or imperfection of physical model (their openness for interpretation) allow for mistakes to appear (for example in interpretation of a model). Mistakes often lead to discoveries, to new things.

Often while working on physical model people discover things accidentally. Something spill on the model, or someone walks by and moves things on the model accidentally. Thanks to that a new vision emerges and completely fresh approach to the subject might arise. While working on computers those things never happen.

„There were situations when a misinterpretation of a model became an architectural solution for the building. Seattle Library – they made a model of some part of it and it was taken for a model of whole building.”  

Alain Fouraux / oma

„Sometimes you make something and accidentally leave it somewhere and someone else looks at it and sees some completely different idea than you. That’s what is always happening in the office. That’s another advantage of models – there are always mistakes.”  

Erez Ella / oma

„We are not afraid of making any mistakes in our work and I think if someone makes nothing wrong, makes nothing right as well. Affirmation that some things have to go wrong to allow for something really good to happen is a vital part of working process. To understand the relationship between the
work on models and making mistakes, between making and experiencing means to think architectonically.” Ole Scheeren /oma.

4. Creative work on models / evidence and experiences from leading architectural practices
At our office we work a lot on the sculpture of projects...their three-dimensionality and volumetry. Architects have always used drawings, computer-aided nowadays but the scale model is still the most interesting medium. As a sculptural medium it's the best prototype of the building scaled down by a factor of 10 or 20. Starting from this very basic spatial concept you make bigger and bigger models, developing different parts of the building. Then finally you build the actual structure with the contractor. Then it's finished, Willem Jan Neutelings in “Dutch Profiles”

In Rotterdam ideas are never judged before they are materialized. The intellectual level of our labour is extremely low. We generate models without censure. Rem accepts no assumptions. He only wants evidence and lots of it. Most models look clumsy and rough. We cannot spend a day building an exquisite model in the wood shop if we have to make 10 more for the next meeting. Fenna Haakma Wagenaar, outtake from 'Astorology', in 'Content' AMOMA / Rem Koolhaas / &&& Simon Brown, Jon Link, Taschen, 2004, p.205;

What strike me the most in a positive way, in the work of the office it was extreme amount of work on models, on three dimensional objects. Not only computer aided drawing or 3d modeling, but mainly physical small scale to check various possibilities in context of a given location. Small models in signature blue foam – that is the base. During my studies in Wrocław i made quick working models from time to time, but it was not the main element which you had to carry out while studying, it was always kind of above the program element. Whereas there it was really fundamental and still I try to use it in my work. Unfortunately the reality in Poland is so that there is often not enough time and money for a in-depth work with the models, but in spite of all I think that it is a very good determinant to do the comparison of forms in an appropriate physical scale not only on computer screen. Michał Gdak on work at OMA, interviewed by the author / from: bryla.pl / I worked for Koolhaas

Work process in the office has one rule: ‘play with architecture’. It’s constant play, creating various versions of a project. One builds models representing thousands of options of form and volume. [...] What counts is an idea and testing each design possibility. Irena Nowacka on work process at MVRDV, interviewed by the author / from: bryla.pl / I worked at MVRDV

What in a way we have as a problem is that we need to imagine things before those things are invented. When we make models they are also very simplistic, but they are not simplistic by weeding things out, they are simplistic because we don't know everything, so we have to see something in something before it's there. Model like this was made (shows a blue foam, simple model 1:500) and currently we have the project, currently we like the project, currently we are convinced about the project. This was one of 40 different ideas how to inhabit this courtyard. There were a number of them promising, and a number of them not, but I mean It's not so obvious that you choose this one, you know. And everything that I say about Rotterdam and the layer of styles, and ..all of that is made up as you go along. I mean the moment that we decide to pursue this direction and that's what I mean is also about the degree of underbelly in the practice, is simply what we feel is the most evocative idea, what we intuitively feel is the idea that simply will bring forward most of the next ideas. It's a kind of ability to see something into something where there is basically not that much to see yet. Scientific research and analysis and all of those things that whenever people describe it like that although I feel flattered, but I at the back of my mind also rise an eyebrow a little bit, because deep down I know how incredibly intuitive even those processes are. And also it's very weird that in a design process you have to work very hard, but the key element to success is the ability to delay. The ability to delay a decision until you know that you see what you see, and it is hugely exhausting at times, because
you have time pressure, you have deadlines, people expect things etc. etc. and all that while you need to keep your head cool and delay until you are ready, until you see what you see; and you need to delay, you almost need to look at a development in slow motion in order not to miss some very essential bits. In a way what I would like to state most is never to submit to the idea that you have to produce something, but always have the delight of discovery drive the process, and in that sense your own intuition is much of a measurement as any expectations placed upon you. And often, when you rely on your own intuition you will find that in the end you are more ambitious, then when you simply kind of try to fulfill expectations; and in the face of a lot of pressures I think that is an important thing to keep close to yourself at all times. Reinier de Graaf about the working process at OMA

5. Physical model in education

Western European architectural education is still based on hand modelling. It is promoted in leading schools, which for many years are on top places in charts for best architecture departments in the world. Those are ETH in Zurich, Delft University of Technology and London Metropolitan University. Students search for structure and form and present their projects producing models in different scales, including making parts of buildings in 1:1 scale, using real materials. Handmade models are even more common than hand sketching – they just use models as sketches often. Drawing is not even a subject of entrance exams in architecture schools in England or Holland.

Similarly leading architectural practices of the world are still using traditional models, which by many practices were put to history and replaced by digital modelling on computers. One would be surprised to discover how many recent architectural masterpieces started their existence as a small blue foam model.

Fundamental difference between working model and presentation model is described accurately by Matthew Frederick in his small book „101 Things I Learned in Architecture School“ on page 72:

Three-dimensional models - both material and electronic – can help you understand your project in new ways. The most useful model for designing is the building massing model – a quick material (clay, cardboard, foam, plastic, sheet metal, found objects, and so on) study by which you can easily compare and test design options under consideration.

Carefully crafted, highly detailed finish models are not useful as design tools, as their purpose is to document design decisions already made rather than help evaluate ideas under consideration.

In our teaching we try to remove drawing as much as possible for most of the time, instead what we do by working with models we tend to, at the end of the semester say: now survey your models, now you make the drawings of a survey. And they put the drawings up on the wall […] and you just look at their faces and you think: yup, because they can’t believe what they drawn, because of course they designed it in three dimensions, they would never draw it. Most of the projects they make can only be made by thinking three dimensionally. So I think they see something through that process. […] And I think the model making, which you can see in our office, is such a fundamental part of designing. In our opinion. The other offices I know don’t model at all. They somehow have this amazing imagination that they can conjure up every single three dimensional junctions. They are better than we are. We have to build it and see it. But actually of course I know that we do it because we see opportunities in that process. So we’d like to encourage the students to realize that models are a tool, just like a computer is. […] The paper or foam board models in this studio and in our teaching studio is really the kind of focus of work. Stephen Bates outtake from the interview on Education, Research and Practice in Architecture / by Jan Schevers TU Eindhoven.

5.1. Creativity and work on physical model. Observations from didactics

Concept models produced in an early stage of project work have their nearest parallel in creativity theory in Intermediate Impossibles (term coined by Edward de Bono for description of an aspect of lateral thinking, stands for something that is not solution in itself, but may lead to solution) – especially in the
form of described above ‘sacrificial prototypes’, which are sometimes torn apart or rebuild in the project development process.

Students who in their work on project spend more time on searching in the early phase of design process, but in the later phases as well (for example elevation options etc.) achieve far more original and creative solutions than their colleagues, who do not work on models and limit their searching time to minimum. Projects by the first ones are often richer, more interesting, more thought through, more consistent and have more integrity.

Directed and stimulated work on model – instruction to examine a minimum of three extremely different variants - releases new layers of creativity, because between the extremely different variants there may be transitional variations, sub-options of the main ones.

Simple program-and-mass studies on the models in an early phase of design process allow for quick testing of various ideas of mass distribution on the plot. Small (scale 1:500), quickly generated models from cardboard, styrofoam or other available materials can contain spatial ideas, organizational ideas as well as structural or material ideas. Work on context model of nearest neighborhood of a given location presents immediately spatial relations of designed object – its scale in reference to nearest buildings (relationship with building line, height and shape relations).

Figure 1. Working models for a laboratory project by architecture student M. Puchała, tutor: T. Sachanowicz

Working process on the models can be compared to natural selection, which results in rejecting weaker objects with smaller potential, while better ones prevail.

That’s just tragic, that you can spend four years of your life studying the design of three dimensional objects and not make one. It’s great if the ultimate result was to be a graphic image, that’s fine. But how on earth can you do that if what you’re responsible to produce is a three dimensional object? […] So many of the designers that we interview don’t know how to make stuff. Because workshops in design schools are expensive and computers are cheaper. A computer rendering can make a really dreadful design look palatable. Johny Ive on working with models
6. Conclusions

Physical model today is still one of the most stimulating tools for architects. Architects need and enjoy physical contact with space, materials and masses they are shaping and designing to become real life objects - buildings constructed using real materials in the future. Use of physical model in design process has a lot in common with elements of creativity theory in fact, on an early stages of design process, it is equal to Intermediate Impossibles from Edward de Bono theory. Working with physical models gives better results in architectural education. There are still opportunities in the use of physical model in professional practice as well as at school.

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