

## Aarhus School of Architecture // Design School Kolding // Royal Danish Academy

### Communicating (by) Design 2009

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*Publication date:*  
2009

*Document Version:*  
Publisher's PDF, also known as Version of record

[Link to publication](#)

*Citation for published version (APA):*

Elkær, T. N. (2009). *Communicating (by) Design 2009: Short Paper*. Paper presented at Communicating (by) Design 2009, Bruxelles, Belgium.

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## **Computer-Aided-Ideation. Rehabilitating the physical representation.** *Using Computers to Aid Creativity in the early stages of Design – or not!*

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**Abstract.** The paper discusses the current change of role and status of the representation as a means to communicate design in the digital era. It outlines two opposite directions for the development of software-technology, and brings forward current research, on the didactic aspects of introducing digital software into the curriculum of architecture and design education. The paper describes a workshop held at the Danish Design School, where students proficient in using digital media, are challenged to use analogue models instead, to rediscover and utilize some of the creative potentials offered by this medium. My research interest lies in establishing a discussion on the importance of the ambiguity in a physical representation, as opposed to the finite interpretations offered by the digital modeling environment, that the profession is accustomed to work within.

**Keywords.** Ideation; Representation; Ambiguity; Heuristics; Design education.

### **Introduction.**

Many of the young design students these years question the real need to learn to draw traditional, technical, orthographic paper drawings, and they see no need for spending valuable time in modelshops creating elaborate cardboard models. As part of my current research into the subject “Computer-Aided-Creativity”, I’ve been interested in discussing this topic with a group of students in the first half of their design education.

The discussion took place during a workshop where three different assignments were given to students who usually work with computers as an integrated part of their design process. The title of the workshop was “Re:Presentation” and the 24 students were asked to work individually without access to their usual computerlabs or laptops. Instead they were given scrap paper and cardboard leftovers to communicate their design proposals in a very short time. At each “crit” the design students were told to present their own design-intent but select another student’s work for their next assignment. This has boosted their creativity, allowed them quickly to “kill their darlings” and opened their mind to see hidden potential in their fellow students work.

### **Re:Presentation (From 2D line drawing to cardboard model to digital 3D model).**

The 24 students in the workshop have applied for either *furniture* or *spatial-design* as their future discipline. The workshop compels the students to recall topics previously introduced in the first semester such as design history (De Stijl), colour theory (rhythm’n’hues), proportional studies, freehand sketching and orthographic drawing.

The students were all given the same 2D paper drawing with (importantly) no annotations, orientation or scale. The drawing depicts “something” from either the top, front or side view, but it is ambiguous in the sense that at least two 2D drawings are needed to fully describe any 3D model. The students were reminded that this is also the case on existing computer-displays, and they were asked to *imagine* a depth in the 2D drawing and use colours to emphasize this perspective depth. The second exercise was then to build a physical model of *another* student’s interpretation and *finally* to

create a digital 3D model of one of the physical models, using any of the 3D modeling software available: SketchUp, Cinema 4D, Rhino, 3dsmax, SolidWorks or AutoCAD. Most of the students selected to use either SketchUp or 3dsmax for this assignment.

I also expect to present the findings of a future workshop at the Nordes 2009 Design Conference: “Engaging Artifacts” - (<http://ocs.sfu.ca/nordes/index.php/nordes/2009>).

In that workshop the results from the above-mentioned workshop will be given as a starting point, and the students will realize the digital 3D models using model shops.

The thematic framework of this second workshop (and partly the first) is the studies called “Laboratory Exercises exploring Space and Volume” (Elliott 1986) and the early 1920’s work conducted by students, avant-garde artists, and architects at the Higher State Art-Technical Studios (Vkhutemas/Vkhutein) in Moscow. Renowned faculty members at the time were: Vassily Kandinsky, El Lissitzky, Kasimir Malevich, Alexander Rodchenko and Vladimir Tatlin ([www.euroeducation.net/euro/ru541.htm](http://www.euroeducation.net/euro/ru541.htm)).

### **Emerging software and its impact on the design process and “creative thinking”.**

40 years ago, Negroponte (1970) argued that a designer’s “*creative thinking*” can be affected by the “*machine*”, and suggested that the designer should distinguish between “*heuristic of form*” and “*heuristic of method*”. According to Negroponte, this would enable a more symbiotic relationship between the individuals and their tools.

As Kvan & Mark (2003) point out, it is still a frequently expressed opinion of academics and architects, that computers are “just another tool” filling an ancillary role in the design process. Benton (2007) argues that recent studies have shown that many users, particularly of the “Building Information Model” tools, strongly disagree:

*“Our design concepts and ideas need to become less ambiguous, so as to translate them into the tools, and we need to communicate the ideas earlier to other collaborators. This ultimately pressures the time a designer has for discovery and exploration of design ideas”.* This directly contrasts Negroponte’s (1969) suggestion: *“Heuristics in method presents an opportunity to coalesce multiple agendas of individuals and tools....without removing ambiguity, which is so desired in creativity”.*

The advent of new software such as “SketchUp” developed by @LastSoftware, and “Silo” developed by NeverCenter, has now offered an alternative to traditional CAD or BIM solutions, and since their recent introduction enabled the designer or design student to sketch directly in 3D on the computer, without the need for any reference drawings or any previous considerations whatsoever of dimension, proportions or scale of the designed object.

Every aspect of the design can be changed at any given time by changing the object parameters numerically, by using abstract translate gizmo’s, or by direct manipulation.

For many years this has been possible in programs like 3dsmax, Maya, XSI or Cinema 4D, but many architects regard these types of 3D software, coming from the million dollar film industry, as either “*too technical*” or something they as architects can’t spend time to master or even learn to use at a more primitive level.

This is contrasted by researchers/practitioners such as Ali Rahim + Hina Jamelle (Contemporary Architecture Practice), Hani Rashid + Lise Anne Couture (Asymptote) or Zaha Hadid Architects, who all use technology investigatively and extensively throughout the design process, and not just as a means of communication/presentation.

The direction they have chosen to pursue offers the architect/designer possibilities to animate or rather simulate flows of particles, fluids, and air. The above-mentioned software solutions, and e.g. “RealFlow” developed by NextLimit Technology all include in their standard educational packages entirely new tool sets to “construct” complex geometries using “springs” and “effectors” and actively experiment with natural forces like gravity and wind, or physical properties like tension or friction.

By tweaking these parameters the architect or designer is able to radically change a 3D volume or 2D shape, without actually “touching” or manipulating surfaces or curves themselves but rather changing strictly numeric input and evaluating the result.

By mastering one or several of these software “boxes”, many (young) architects and designers can create both visually appealing, intriguing, and highly detailed surface geometries and very professionally looking visual presentations with limited or no real effort.

This apparent “simplicity” can however also present a real problem, since it can be hard, as a student *or* as a professional, to judge or document exactly which of the endlessly possible experiments actually lead to the selected design. It can be even harder later to reproduce/recreate a similar effect in another project, or at a later time.

### **Didactic aspects**

Some of the didactic aspects of learning and using the emerging digital tools is pioneered by educational institutions such as Graz University of Technology in Austria, who use the NURBS based modeller Rhinoceros (<http://www.opennurbs.org>). Stavric, et al. (2007):

*“Architects are constantly searching for new tools – digital inspiration – in other disciplines and manufacturing processes.... in order to define an aesthetic which can reflect the new phenomena in architectural computing. Due to the rapidly growing digital possibilities students need to know and learn the new topics and tools, which are relevant in modern architectural design practice. Our students should be empowered rather than overwhelmed by the arsenal of digital tools available today”.*

Their paper suggests a change in direction from the focus of the late 90’ies on the mere technical aspects of using IT in the last part of the design process, towards the technique by which today you can extract information from conceptual models in 3D at a very early stage of the design process as part of the design ideation. This change in direction will greatly impact the education as well as the whole business of Architecture & Design and demand for *other* types of software to be further evaluated.

As part of my own research and ph.d.thesis, “Pitfalls and Opportunities in using Computers as part of the Design Ideation”, I am currently investigating emerging 3D software such as “Silo”, “MudBox”, “MoI / Moment of Inspiration” & “Grasshopper”.

In case of the workshop the benefits of selecting a simple yet versatile program like SketchUp as a tool, allowed for everybody to actually master the software in a relative short amount of time. Even the not so technically savvy of the students could experience their first real “success” in 3D and get a sensation of being “in control” of what happened on the screen, in contrast to most of the current “de-facto” CAD software used in studios and offices. When you are introduced to AutoCAD or MicroStation the user more often get a feeling of being an “operator” of the software *itself* rather than the architect/designer you usually regard yourself to be, or to become.

The design process of today still involves sketches, drawings, visuals, mood boards, mockups or other models depending on the discipline of design, but an increasing

number of these are developed, distributed and discussed using digital means such as CAD software, Photoshop, PowerPoint, Skype, email, Messenger, Weblogs and so on.

In the workshop I have conducted, 3D software was applied mainly as a vehicle for the integration of theory and practice, enabling a synthesis of the tacit (the art) and the explicit (the craft) and making the current status and role of the *representation* central.

### **Conclusion**

Returning to the title of this paper, my findings show that specialized computer software such as SketchUp indeed *can* be used to capture volatile ideas and generate 3D sketches and 2D presentations quickly, without the need of the multitude of secondary applications from Adobe's "Creative Suite". During the workshop many students regained an enthusiasm for the physical models and sketches. This suggests that they (when used appropriately) still have something to offer, and that the digital and physical models complement each other, if you work within a limited time frame.

### **Acknowledgements**

Thanks are due to my students at The Danish Design School, and my ph.d. Supervisor Per Galle for his patience and the numerous times he has commented this short paper.

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