

# RELIGHT MY MODEL: NEW MEDIA IN IDEATION WORKSHOPS

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## ABSTRACT:

We present Skin 2.0, an ideation technique aimed at ideation workshops at the early stage of designing consumer products. With Skin groups of designers explore colors, textures and graphics on physical objects such as clay and paper models in real time, on real scale. Skin projects light with a projector mounted on a tabletop. Objects on the table are augmented with graphics. Graphics are composed with an embedded collection of inspirational images and live captured materials with a small video camera.

We developed this technique during a series of workshops in packaging industry. We found participants actively collaborating and generating new designs. Exploring the use of Skin in these workshops put forward how participants want to browse and compose graphics and new issues and benefits of new media in creative group sessions.

## I. INTRODUCTION

People's appreciation of products is largely dependant on the product's color, its' shape, graphics and texture of the material. Typically designers first address the shape characteristics by means of idea sketches. Only after the shape of the product has crystallized, attention is given to color and texture of the materials used. Our main interest is to explore whether it is possible to bring the consideration of color and texture of material into the early ideation process, to see whether this leads to richer idea generation. On the one hand such inclusion of color, graphics and texture could lead to better integrated products. On the other hand, thinking of these design aspects could spur inspiration (i.e., thinking of a fuzzy pink product, is likely to spur softer lines used in the shape of the product.

Consumer products are oftentimes designed by multidisciplinary teams, involving stakeholders from e.g. marketing, information technology, usability, and engineering. Creative group sessions and workshops are commonly applied to generate new ideas and facilitate collaboration in the early creative phases of the design process (van der Lugt 2002). The workshops not only provide new product ideas, they also help the various stakeholders to establish a shared understanding of the task at hand (Kleinsman 2006).

These creative workshops contain cycles of and selecting. Upon exploring the problem, rough ideas and themes are developed into concepts. Facilitators steer this process, using flipcharts and whiteboards for note-making. Sometimes, visualizers are involved who translate written or verbalized ideas into idea sketches (Mintzberg and Westley 2001). Such visualizations aid the shared visual memory of the group (McKim 1972) and they help communicate the session results to the company.

In regular design meetings designers make fluid and extensive use of sketching as well as building small prototypes. Here participants actively contribute and explore the solution space by doing first (Mintzberg and Westley 2001): building foam and paper prototypes and playing interactions.

This is in contrast to the processes of stakeholders in creative problem solving sessions. Even though these stakeholders actively participate and contribute to design solutions their input is primary in oral or written language. Involving facilitators and visualizers makes for an efficient multi-stakeholder process, but it also means that such meetings do not fully support the intuitive, doing-first types of exploration of the solution space. Ward et al (Ward, Smith and Finke 1999) argue that such an generate- and explore cycle- provide a better fit to the human creative process better than the alternate diverging and converging phases in creative problem solving meetings.

Involving the stakeholders in the ideation process has strong parallels to the ways in which in co-design users are brought into the design process. They are all involved in design-like activities without having prior education in design. Sanders and William (Sanders and William 2001) tackle this issue by providing users with generative-toolkits, ambiguous visual stimuli that enables users to express thoughts, feelings, dreams and new ideas.

The new media, such as blogs, youtube, wikipedia, enable people to actively participate and contribute without explicit mediation of a professional. The following qualities are characteristic for the new media:

- 1 Collaboration: the media is specifically aimed at groups of people.
- 2 Decentralized: there are no levels; all members participate without being mediated by a third party, such as a facilitator as focus of attention
- 3 Interactive: the media facilitate two-way communication.

New media tools and techniques make use of the new media to support collaborative activities. Our basic assumption that we explore with applying new media tools in creative group processes is that these qualities enable all stakeholders to fully engage in a fluent creative process. For this, we added a fourth quality:

- 4 Digital Physical Transition. The media is open, tangible and accessible for groups, not confined to a computer screen or laptop.

In this paper we present Skin 2.0, a technique that allows participants to digitally explore and create materials, colors and graphics on physical objects. The aim of Skin is to engage participants in unmediated, active exploring and creating by doing. We will discuss Skin's potential as a technique for creative group sessions to support the transformation from selecting and specifying concepts into active playing and creating concepts in order to foster creativity.

Demonstrating the Skin prototype to the design community, we learned that designers often focus on the technical limitations of the tool in comparison to their existing tools. However, we found that when designers actually used the prototype in their practice they solely discussed their designs in terms of materials and experience, and that the technical limitations were no issue at all. These experiences showed us the importance of exploring tool use in practice using real-world projects.

Tools might be studied in an isolated experimental micro stage of a development process. However, in order to study their use and benefits we have to make the tools work in organizational practice. Then, we need to

adapt the design to the work practice and context of particular design teams within a specific organization. Similar to complex software systems, their impact cannot be completely designed or tested prior to their use (Fisher 2002). The problem field requires an explorative research approach as it tries to gain understanding in currently non-existing new situations. The methodology of intervening in practice is drawn from action research. Action research is an iterative process involving researchers and practitioners acting together in a particular cycle of activities, including problem diagnosis, action intervention and reflective learning (Avison 1999) .

The study in this paper describes our exploration of developing Skin as new media technique for multi-disciplinary ideation workshops on packaging design with engineers, usability and marketing people. First, we will briefly review some related work. Then we will provide an overview of the design of Skin: The main characteristics of the prototype, but also some of the principal insights that we gained in the process of designing Skin. We will describe the study, which consisted a series of iterative cycles, each involving Skin being tested in a practice-based workshop. We will present and discuss the results. Finally, we will provide directions for future work.

## 2. RELATED WORK

In art practice, projecting light has been applied for a long time, Peter Greenaway for instance, uses projections as an integral part of his visual style and storytelling. We uncovered few related tools and prototypes that were relevant for design.

At the MIT medialab, Ryokai developed the IObrush (Ryokai, Marti and Ishii 2004) an augmented brush for children to create paintings. The brush allows children to take samples from the real world, and paint with the samples on a digital canvas. The physical interaction of the brush encourages children to explore their personal environment in a playful context.

Shaderlamps (Raskar, Welch, Low and Bandyoadhyay 2001) is an augmented reality system that uses physical objects as a canvas for 3D computer graphics. The objects are illuminated with virtual colors and shading. The system tracks the position and orientation of the physical objects and the projector projects a shaded virtual 3D copy on the physical object. With a virtual brush the object can then be colored and annotated.

Our research builds on the efforts to explore the transition of virtual and physical media, with an emphasis on the opportunities of new media tools in techniques to support designer.

The InstantTemplates tool (Saakes and Keller 2005) photographs hands interacting with a product and projects the photo on a paper. Designers can use the projected image as a template to draw on. InstantTemplates was built as a tool to support the sketching of physical interactions by letting designers draw over projected photographs, similar to drawing classes where templates are commonly used as a background underneath the drawing paper.

The Photo Boarding technique (Saakes and Keller 2005) is a means for conceptualizing experience of product use. Digital photos of playacting sessions are printed in rough grey-scale that invites designers to annotated and drawn upon. The printed photos then are composed into a storyboard like posters to retain and communicating the played interaction.

Cabinet (Keller, Hoeben and van der Helm 2006) is a prototype for merging collections of digital and physical visual materials. It consists of a table interface on which images are spatially grouped and thereby provides a non-linguistic way of search and retrieval. Physical images can be added seamlessly to the cabinet's collection with a build-in digital camera.

### 3. DESIGNING SKIN

Skin is an experiential prototype, to study the benefits of augmented modeling in the early stage design process. (Reference omitted). Similar to Shaderlamps (Raskar, Welch, Low and Bandyoadhyay 2001), Skin augments physical objects such as foam models with colored light from a projector. But Skin projects materials, textures and colors as flat 2D images, without any tracking or knowledge of the 3D object. This loss of accuracy has two very large advantages: On the one hand, any object can be used as long as it is white or light colored. On the other hand, the rough and ambiguous projection that occurs when moving the objects in the projected light and seeing patterns and graphics deform gives rise to serendipity: unexpected new combinations. We experienced that an accurate visualization on the shape as a whole is less important; designers seem to zoom in on areas of interest.



Figure 1. Skin 2.0.

During this study we developed the Skin tool into a collaborative tool for ideation workshops. Skin projects materials horizontally over a table, so the objects on the table are augmented, and not the table itself. The projector is mounted on an edge of the table in order to maximize the space on the table, to make the table accessible for multiple participants and to minimize the technology focus by hiding the projector.

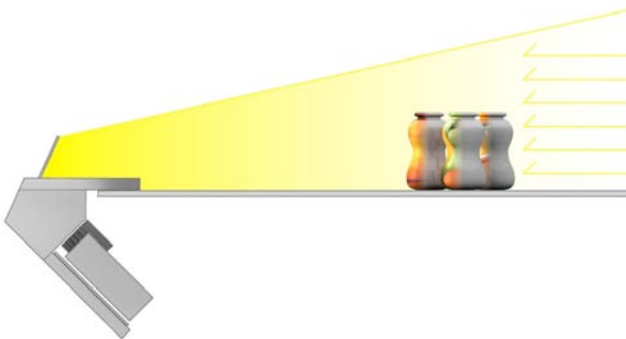


Figure 2. The surplus light of the projection is masked with a natural light source, for instance from a window.

The surplus light around the objects causes an unwanted, and distractive projection on the walls opposite to the projector, and has to be masked. Various methods exist to mask the surplus light: in software, by using non-reflective black felt, or by translucent surfaces. When designing this horizontal set-up we found that this surplus light is automatically washed out by a light source from the opposite direction, such as the natural light from a window. Hereby we eliminated the need for masking techniques in software, that require tracking or extensive calibration, or in the environment, that might restrict the creative search.

Currently Skin has two modes of creating graphics. The browse mode browses through preloaded collections of inspirational images. The grab mode captures new materials and graphics with a video camera. Grabbed images are layered over the images from the collections by means of a chroma-key.

## THE BROWSE MODE: BROWSING THROUGH COLLECTIONS

The collections of inspirational images contain both repetitive patterns such as stripes, fur, brushed aluminum as well as larger size graphics such as plants, flowers, and cd-album cover art. A paddle controller scales and tiles the image; the projector flood-fills the objects on the table with the generated image. The effects can be experienced instantaneously on the objects on the table.

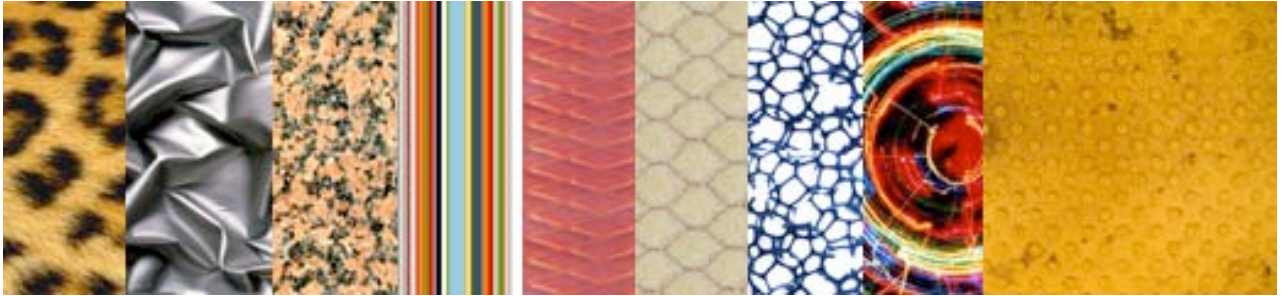


Figure 3. An example of a collection of patterns, images and graphics.

A button on the controller flips to the next image in a collection and each collection contains between 10 to 15 images. Collections can be selected with physical cards, showing a preview of the images in the collection. Collections are grouped into themes, such as exotic locations, food, music, and plants, all relevant to the goal of the design effort.

The cards have a RFID tag glued on the back. By placing the card on a reader the system recognizes the material by the id of the tag. The corresponding collection is selected and the images are projected.



Figure 4. Graphics are browsed with a controller and physical cards select a collection.

In addition to the cards for selecting collections we experimented with cards for displaying brand specific graphics and graphical elements, specific for the theme of the workshop. The images of these cards are layered on top of the images of the collection.

## THE GRAB MODE: LAYERING ARTWORK

During the study we found two additional needs. Firstly, the need to add new materials to the collections, materials participants found in their surroundings. Secondly, the need for extending the function of layering artwork and composing graphics into collages.

We therefore removed the cards with graphical elements and added real-time capturing of new materials using a video camera. The camera is mounted on a swiveling arm to scale and position the graphics captured with the camera, the images of the camera are real-time projected on the objects.



Figure 5. A participant composing graphics in the grab mode.

A second paddle controller scales and tiles the captured graphics. By moving the camera and thereby manipulating the sampled image, edge effects -commonly found when tiling patterns- can be minimized. The button on this controller switches between a tile mode and a single-shot projection of the graphics, in order to create for instance a non-repetitive brand name.





Figure 6. Physical materials and cut-out brand specific graphics can be grabbed with a camera and layered over the digital collection.

The captured materials are mixed with the graphics collection through chroma-keying. Green and blue are the most common colors to make transparent, but we choose black because a store check revealed that black is the least common color in packaging graphics.

## IMPLEMENTATION

Skin software is written in Quartz Composer (Apple) a dataflow engine for interactive graphics, commonly used to create screensavers and visual effects on Mac OS X. The software supports webcam input and various graphics effects such as tiling and chroma-keying can be performed in real-time. The physical interface was prototyped through the phidgets toolkit (Greenberg, Fitchett 2001) that connect to Quartz Composer through a midi channel. The software and hardware toolkit allowed us to quickly build and refine prototypes while maintaining high quality and fast image generation.

## 4. STUDY

The study is situated at Procter & Gamble in Brussels and was done in collaboration with Cre8-Innov8, packaging design & prototyping group. This group facilitates intense multi-disciplinary two-day workshops in which new product ideas are developed for commodity products such as washing powder, potato chips and toothpaste. The packages consist of containers of carton or of inexpensive plastics and shrink-wrap foils with printed graphics in order to make the product appealing. Often the container itself cannot be changed due to various constraints, and the graphics provide the only means to differentiate.

Typically, these ideation workshops have about twenty participants, whose expertise ranges from packaging design, product engineering to marketing research and usability testing. The Cre8-Innov8 group facilitates such

workshops for various product divisions. The group consists of designers, visualizers and facilitators. These are considered to be the domain experts in this study.

## EXPERIMENTAL SETUP

We approached the study by using our current tools as a starting point and refining their use over the course of a series of workshops. Starting with existing tools allowed us to learn substantially with a minimum of time spent on developing prototypes.

In the first part of the study we established shared understanding between the facilitators in Brussels and the researchers in Delft. We looked into the practice of the P&G workshops by means of a contextual inquiry (Holtzblatt and Beyer 1996) we observed and participated in workshops in order to provide baseline for our study and we demonstrated our tools to the P&G people. We concluded the first part with a workshop. This was the first experience of the tools in a workshop setting, for both the practitioners as well as the researchers.

In the second part of the study we intervened in two workshops. The workshops were planned, conducted and evaluated in collaboration with the Brussels group and at the end of each workshop we reflected on the tools together with the participants.

The sessions and reflections were captured on video. We redesigned the tools and updated the intervention plan for each workshop according to the reflections on the preceding workshop. Both tools and intervention plan were tailored to the workshop subject. All the workshops in the study had real-world goals, and the results were relevant and used by the company in the latter design stages.

The aim of the second workshop was a new party pack for a potato chips brand. This workshop was held in Delft with 15 participants, facilitated by the Delft researchers and participated by design students and the Brussels group.

The third workshop was held at P&G in Brussels, to experience the tools in the Brussels' context. The aim of the workshop was related to laundry care, with participants from marketing and engineering.

## INTERVENTION PLAN

In each workshop we planned two rounds of idea-generation, in the first round the structural ideas were generated and grouped. In the second round promising ideas were further developed into concepts through physical prototypes with paper and foam modeling and using Skin to explore graphics. In this second round we grouped the participants in smaller teams of three to four persons. Each workshop was concluded with a plenary presentation and review session.



Figure 7. Reviewing and organizing of photographed concepts generated using the Cabinet software on a large shared display.

We planned the Skin sessions within the frame of a larger study of New Media tools. All visual materials created by the participants, ranging from ideas on post-it notes to drawings and photos of Skinned prototypes, were real-time digitized and projected on large wall displays, using a modified version of the Cabinet software (Keller, Hoeben and van de Helm 2006). The collective memory was then fed back to the participants in three ways:

- 1 Throughout the workshops we immersed the participants in a slow-pace slideshow of images. The slideshow mixed inspirational images and materials of the collective memory in a ludic way (Gaver et al 2004). The slideshow provided ambient access to the generated materials with the aim of keeping the generated materials alive during the session. Especially the photos taken of participants engaged in activities helped them to remember and build on earlier generated ideas.
- 2 During the review phases the wall projection provided a way to group the materials spatially accessible to all participants and thereby provided a cognitive access to the materials.

- 3 During the concept rounds the smaller teams created 'rich digital summaries' of their concepts, again with a modified version of the cabinet software. They had access to all digitized materials of the previous rounds; including the photos taken of concepts created on Skin. The groups could create rich, expressive representations showing the concepts in relation to the ideas, moodboards and other visual material. Subsequently in the review session the summaries were merged into the collection and the groups presented their designs to each other on a large display. The summaries, created by the participants, were seen as the rich documentation of the outcomes of the workshop, to be used by the design team in the design activities following the workshop.

## PHYSICAL PROTOTYPING

Participants engaged in using Skin after a phase of generating rough ideas on post-it notes. To increase tinkering efficiency we prepared a large amount of white sub-assembled shapes that could be glued together into physical concepts, similar to Sanders' Velcro modeling set (Sanders and William 2004)

We located the tinkering shapes near the table of Skin in order to invite the participants to build shapes and explore materials concurrently.



Figure 8. White and sub-assembled tinkering shapes

In the first workshops we explored the use of Skin primarily as an inspirational tool. We assumed that the 'browsing through collections' mode would be most appropriate for this use of Skin. In the final workshops we used Skin primarily as a conceptualization tool and extended Skin with the grab mode, which we thought would be most appropriate for design synthesis.

## 5. RESULTS

The participants embraced the idea of Skin and found it easy to work with. We observed participants working on Skin in small groups creating and exploring and reviewing the various designs in an active and lively way.

*“At first I had the same comments as IT (the information technology group to whom we showed the tools during a break): with Photoshop I can do the same. But it is really helping me when we are building concepts. It helps me being active and it becomes a team effort.”* A participant from marketing.



Figure 9. Participants collaborating and interacting with Skin.

### SKIN AS ADAPTABLE TINKER TOOL

In the first workshops we provided the browsing through collection mode of Skin. We started with a single collection, but the participants felt restricted in their search for graphics. We therefore extended the single image collection to several collections related to the workshop's theme in the second workshop and added more workshop specific graphics to be mixed with the collection. We expected that the extended collection would give rise to more serendipity in the exploration.



Figure 10. A packaging concept made on Skin.

*"If we are doing powder cartons or something, some of the other big workshops we have done were you might have 50 or 60 concepts and there are quick to prototype and instead of finding colored material logos you could make white prototypes and then have some stock logos maybe some mountains or something and build yourself a little graphic and project it on."* a P&G visualizer reflecting on Skin.

The extended layering of artwork was well received; and participants found many graphics and effects they wanted to apply in their designs. The layering of images sparked many new ideas of how and when the tool could be put to use. Participants for instance, asked how they could display multiple patterns on a single shape. But it was not until we introduced the grab mode in the last workshop the layering was used to its full extent. The easy way of mixing cut-out paper graphics on the camera made it accessible and adaptable for the participants. We observed participants actively looking in their surrounding for patterns and browsed magazines for materials. They also created artwork with markers and pencils, composed collages and explored the graphics on their concepts. As we expected, the physical composing of artwork made the activity fit to the tinkering with physical prototypes. The observed behavior strengthens our belief that participants want to freely compose and create graphics rather than browse and select preloaded graphics.

*"The tool is specific, it didn't help me on the structural packaging design... For instance in a project where we are not going to brainstorm on the structural design of the packaging but we are going to brainstorm... because of whatever restrictions we can't change the structural design but we still want to want to make it stand out on the shelf because of the materials the graphics or whatever than this would be fantastic"* a P&G designer and facilitator reflecting on Skin.

We also expected that Skin would generate new concepts and new ideas, but at first the tool was used solely for the presentations, in order to beautify concepts. Concepts conceived as ideas in rough drawings, were subsequently physically prototyped before they applied graphics with Skin. We had hoped that the activity of physical prototyping and exploring graphics on Skin itself would lead to new ideas.

## SKIN TO GENERATE NEW DESIGNS

We further investigated the generative value of Skin and changed the intervention plan. We planned Skin at an earlier stage in the workshop. We started the workshop with an exercise introducing Skin in a playful way. During the entire workshop Skin showed a screensaver that slowly went through the materials to invite participants using in a non-obtrusive way. Furthermore we decreased the time spend in the first ideation round in favor of the physical prototyping. Now we observed that participants were inspired by Skin and could trace specific concepts back to incidental combinations of shape and graphic.

However we did not observe the participants working simultaneously on material exploration and physical prototyping. Participants first created the shapes and than looked for materials. Despite the effort of providing sub-assembled white shapes that made the construction easy, we didn't manage to integrate physical prototyping and material exploration.

## KEEPING RESULTS ALIVE

The use of Skin in this study consisted of the development from rough ideas to concepts that could be presented to a consumer review.

Capturing designs with a digital camera worked well for the review; although the participants made so many photos that they seemed to need a pre-selection grouping and selecting a few photos for creating concise digital summaries for the review. Still work has to be done to increase the presentational value of the photos; often the workshop background produced did not convey the concept well.

Other than improving the presentational value of the photo quality, capturing the rich experience of seeing the material on the shape in 3D might remain an issue. Often we observed the participants' excitement about small findings or interesting deformations that could not be captured or conveyed by means of digital images in the latter stages of the workshop.

## 6. FUTURE WORK

We have applied two ways of generating graphics within Skin: browsing through collections and layering artwork. Layering artwork, and “painting” objects with multiple patterns was most requested by the participants. Extending the currently implemented two layers to a layering / masking system might be an interesting approach. However care has to be taken not to make the tool and its’ use too complex and advanced. On the one hand because the tools needs to support fluent interaction by laypersons. On the other hand, when providing too advanced tools, would invite users to spend their time on creating few beautiful graphics, rather than producing many novel concepts.

Another direction would be to add controls that change specific attributes of the patterns rather than only the size, for instance color or contrast. We are in the process of conducting a study that specifically investigates how participants search and how browse, compose and tweak strategies interrelate.

The explorative approach of this study brought up many issues regarding the technique of augmented physical modeling that we would not have discovered when we tested the prototype in controlled experiments in our lab. Participating both with the domain experts and the participants of the workshops sparked many new ideas for further refinement and extensions. The rapid-prototyping of the tool itself allowed us to quickly update its’ functioning between the workshops. A further extension of this approach would be to embed the tool in the daily practice and similar to Fisher’s Seeding Evolutionary Growth and Reseeding model, (Fisher 2002) follow its’ use over a longer period of time, to see how it evolves in the hands of the users.

## 7. CONCLUSION

We did find evidence of a lively and unmediated exploration and concept generation while using Skin. The participants made many new designs, explored colors, textures and patterns on their physical concepts. They were excited and actively discussed their designs in groups. As the tool became more open and adaptable over the various workshop -when participants start building graphics themselves- the excitement about the use of Skin grew.

Skin did work as a part of the tools to tinker to foster creativity and sharing and expressing ideas with ambiguous visual stimuli. In the study two distinct uses of the technique emerged: first the conceptualization use: by exploring graphics; second the synthesis use: composing and layering graphics.



The study indicate that the not only the solution space is widened, more concepts are considered in the same amount of time, also the solution space is deepened, the physical/augmented approach provides a better view on a concept. Moreover, the technique might condense Ward's et al (Ward, Smith and Finke 1999) cycles of generating and exploring and so make the process more efficient.

However we did not manage to integrate the physical, augmented prototyping to its full extent. On the one hand the white prototyping materials might have still offered too much freedom and engaged the participants in construction and beautifying concepts rather than generating new concepts. On the other hand our explicit assumption that graphics and shape exploration would be a simultaneous process could prove to be wrong.

The results give rise to studies in adjacent field of designing products and specific studies that investigates the interrelationship of shape, color and graphics in the creative design process.

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