

PARCEL: DEVELOPING PERFORMATIVE PROTOTYPES IN ARCHITECTURAL DESIGN

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This paper defines a field of operation for recently initiated research project *Prototype development within architecture*¹, through the activity of the Krets research group and by references in related fields. Key issues are how the prototype transgresses borders between design, production and performance and how it can act as a protocol of communication, internal and external to the design process.

Krets

Krets is an architecture and design research collective², interested in the architectural project as an investigative tool, with a focus on the material and technological as well as the social and the cultural aspects of design, production and performance³. The collective uses a collaborative platform to explore new modes of production and performance where the nature of design within practice and research becomes reconfigured.

Krets follows an innovative approach in which the potential of a given material⁴ is explored as opposed to specification driven design and goal oriented research. Series of investigations are conducted through prototypes, as parts of a design project, further developed into architectural proposals. The prototype is the basis for collaboration within the group, performing as a platform for experiment and communication as well as an archive of developed concepts and proposals. It operates in different media, ranging from physical or digital models, through drawings and diagrams to operational installations, accessible by external parties.⁵ As opposed to the idea of the prototype as the test result of a process, or a template for others to follow, the prototype is used within the process. The prototype must therefore both perform and be deformable.

Krets has the dual agenda of developing new modes for explorative working methods within practice and to find new definitions for project and design based research. This approach entails that the prototypes developed are seen as not only means towards a design proposal but also as investigative tools for a wider research. The research group operates in different contexts as a collective. Individual members are active in research and practice outside of the group.

¹ The author initiated this research project in the spring of 2005, working towards a technical licentiate, at the KTH School of Architecture.

² Krets was established in 2003 and consists of architects Marcelyn Gow, Ulrika Karlsson, Pablo Miranda, Daniel Norell and Jonas Runberger. Supported by the Academy for Practice-Based Research in Architecture and Design (AKAD) and presently active in the academic field, affiliated to the KTH School of Architecture. <http://www.krets.org> <http://www.akad.se>

³ The connotation of 'performance' is multiple: indicating the establishment of new relations between a designer (performer) and a consumer (audience), as well as the performative and responsive qualities of a specific artefact or environment. When applied to prototypes it indicates its capacity to react to stimuli and give feedback to design implementations.

⁴ Projects are often initiated in an interest for a cultural phenomenon, a situation or a technology used in other disciplines.

⁵ In this way the Krets prototypes shift between abstract states, with design team protocols, to more open states in which guests can participate.

Architectural practice and research

One approach to the problematic dichotomy between theory and practice within architecture has been to look for a theory of practice. A number of contemporary practices today have adopted a working model of ‘thinking as doing’ in which the architectural project is an engine for innovation. The approach requires the establishment of a learning organisation in which a practice ensures the continuous development of its operation. Today innovative work within conventional architectural practices in general is primarily conducted through open or invited competitions. Management that promotes innovation and development during daily work is rare. The discipline of architecture is often considered to be unique and few associate to other fields, even though conditions may be similar.

Former Royal Dutch/Shell manager Arie de Geus speaks of the *Living Company* as a model for companies that act as an entity, and the *Learning Company*, sensitive to its environment. Important tools are simulations and scenario planning⁶, meant to be used as instruments for foresight, not for producing predictions but changing the mindset of the people who use them in order to prepare for unforeseen developments. Other important features include ‘transitional objects’ or toys, allowing simulation of reality through playing, which as opposed to gaming does not have a winning move, only an experience. Like prototypes, scenarios and transitional objects are grounds for innovation as well as collaborative platforms for mutual understanding between members of an organisation⁷. The prototype should, as a toy, entice the user, encouraging participation.

Architectural theorist Michael Speaks has defined practices with “high design intelligence quotients”⁸ as bodies that look for opportunities to explore new fields within any given problem, establishing alternate and parallel design agendas. Looking at experimental practices at the periphery of the architectural arena, Speaks argues that practice may shift in the near future, driven by similar interests and forces as Geus’s *Living Company*. Today these practices exist outside of the traditional building discipline, operating through conferences, competitions and exhibitions, requiring a mode of operation that incorporates alternate parameters for design. A fundamental prerequisite for this type of agency, according to Speaks, is that “the relationship between thinking and doing becomes more and more blurred so that thinking becomes doing and doing becomes thinking, engendering highly collaborative, interactive forms of practice”. He further argues that an approach based on prototype innovation allows addressing existing but unknown conditions that enables the discovery of opportunities that could not be predicted in advance.

⁶ De Geus, Arie, *The Living Company: Growth, Learning and Longevity in Business*, Nicholas Brealey Publishing, 1999, p. 56

⁷ Ibid., p. 81, citing D.W Winnicot, *Playing and Reality*, in which the author coined toys transitional object as allowing a child to experiment with reality without fear of consequences, helping the child to transit from one level of understanding to another.

⁸ Speaks, Michael, *Design Intelligence*, article in exhibition catalogue of *Latent Utopias: Experiments within Contemporary Architecture*, steirischer herbst 2002, p. 73. Speaks has also investigated practices performing in this way in a series of interviews titled *Design Intelligence* in Japanese magazine *A+U* during 2003.

Architectural representation with prototypical qualities

Prototype development within architecture is related to recent developments within product development, programming and other disciplines with a design component. Rapid prototyping is already an important tool for many experimental practices. Architecture however, rests on a tradition in which representation has become highly refined and a language in itself. The plan, the section, the elevation, the axonometric, the perspective and the model are used on a daily basis and acquires material qualities for the architect when dealing with predictions of space, operating at a distance from the architectural object. This process could be infused with a prototypical approach in order to promote innovation and to further refine the design process. The prototype bears many resemblances with the 'working model' as opposed to the 'presentation model'. In order to distinguish the characteristics of the prototype, both in relation to the term prototype as used by other design fields, and the way the model is used within architecture, definitions of the two will be reviewed.

Architect and researcher Anders Johansson sets up three important criteria for his definition of the model.⁹ It has a "distinct purpose in its use", it "is possible to manipulate over and over again" and it "must be possible to see as a world, and be an entity in its own right". He also states that a model is a (secondary) system that represents another (primary) system, "used when the presentation of the primary system in itself is not available..."¹⁰ An important aspect of the model is that it is accessible and possible to manipulate, it must therefore be developed into an articulated system with internal characteristics.

In the case of the architectural model, Johansson assumes that it's created with the purpose of making a change in a physical space (primary system) possible. The model (secondary system) is created initially as a representation of this space. Changes are simulated by manipulation in the model, later implemented in the primary system, requiring a necessary relation between the primary and secondary systems. The model is the laboratory for experimentation, momentarily suspended from reference to the primary system. Johansson also describes the possibility of the process of model construction bringing about a deviation from reproduction of site, resulting in the model being cut off from the represented space, and acquiring the status of a 'work' in itself. This deviation entails that the model must acquire characteristics that makes it self sufficient in some aspects, not unlike the prototype.

Michael Schrage, co-director of the MIT Media Lab's E-Markets Initiative, defines the prototype as a way of "communicating how organizations use media to manage their innovation processes."¹¹ He further declares prototyping to be a multimedia process in which prototypes are developed in steps. The media chosen has high effect on the design environment and may even evoke new designs. The prototype both answers and raises questions. It's not the product of a methodical development path; instead it "emerges from interactions around iterations of the prototype".¹² The innovation process does not come up with finished prototypes; the prototypes themselves drive the innovation process. Schrage concludes by asking himself how organizations must change when the prototyping no longer deals only with individual products, processes and

⁹ Johansson, Anders, *The Architectural Metaphor: Textual Models in Spatial Construction*, doctoral dissertation at the Royal Institute of Technology, 2003, p. 235

¹⁰ *Ibid.*, p. 43

¹¹ Schrage, Michael, *Serious Play: How the World's Best Companies Simulate to Innovate*, Harvard Business School Press, 2000, p. 7

¹² *Ibid.*, p.128

services but also with hybrids that raises fundamental questions about the organization itself. This would also apply for architectural research and practice alike, with the development of alternate discourse and methodology.¹³

Experiments in Education

When addressing the learning organization surrounding innovative design work, it is interesting to make comparisons to design education. Recent years has seen a new found interest in the pedagogies of architectural training.¹⁴ Marc Angéilil directs the first year of architectural training at the Swiss Federal Institute of Technology since the mid 90's, establishing a new pedagogy in which the experiment has become an important feature, bringing unforeseeable qualities and allowing new venues and territories to be explored. The working environment of the design studios is described as a mix between a forum for debates, a library, a drafting room, a workshop and a construction site. Three modes of praxis are distinguished: the technical praxis concerns how analytical and material techniques are put to work, the intellectual praxis puts emphasis on the understanding of design as a strategy for the production of thought, and the intuitive praxis promotes invention through intuitive and associative thinking subjected to critical analysis.¹⁵ The pedagogy of this first year of training is aiming at taking on the 'how' one can design to continuously redefine the 'what' and 'why'.¹⁶

The year starts with intense design exercises, revolving around the theme of space, program, power structures and technology. Finally this production is formatted into "process-portfolios", establishing connections between disparate fragments through a process of mapping the development. The produced material in form of drawings, sketches, models, diagrams and maps is treated as a territory for exploration, as this post-production assembles all material into one 'work' with diverse paths of interpretation.¹⁷

The work then turns to a more overlapping series of explorations initiated through a provisional map of an urban territory. While providing representation of a territory this map again acts as terrain for explorative work. As the map starts to deviate from reality, through the mix of objective and subjective readings of the city, it takes on prototypical qualities. Groups of students collaborate on maps which must be able to negotiate different approaches and interests, and operate as systems in motion. Finally, individual work within the framework set by the collective explores the term 'program' in relation to function and narrative events. Disregarding the traditional way of producing one final proposal, students produce a series of alternate propositions. The prototypes emerge through collective and individual work and manage to encompass an urban analytical approach as well as a projective innovative approach. They shift from abstract representation to propositional form, based on speculation of human behaviour and forces at work in urban development, maintaining an ambiguity through the multiple proposals.

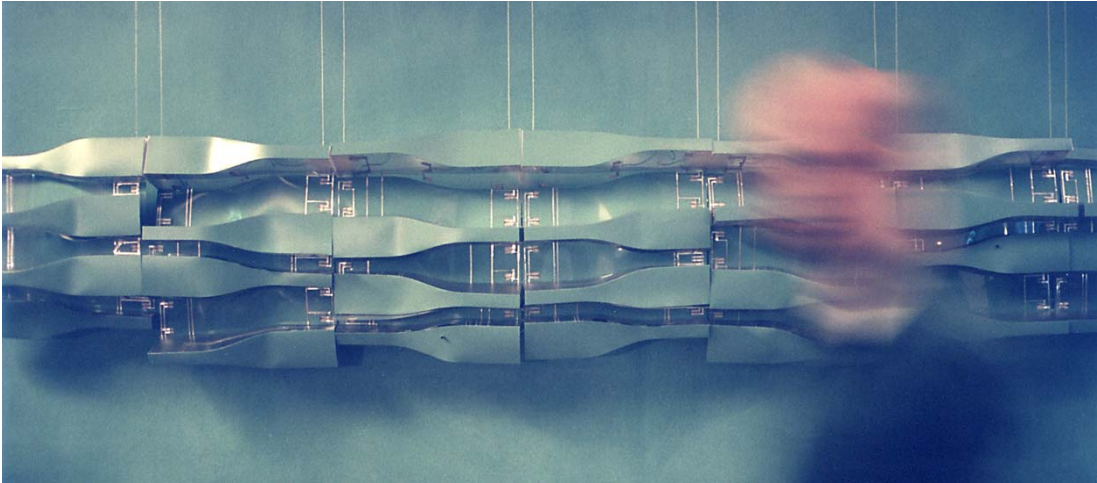
¹³ AKAD is currently defining a discourse around practice-based research, through projects, seminars and articles. <http://www.akad.se>. See also Grillner, Katja and Ståhl, Lars-Henric, *Developing Practice-based Research in Architecture and Design*, in Nordic Journal of Architectural Research, nr. 1 2003.

¹⁴ Krets members have conducted several innovation-driven courses at the KTH School of Architecture since 2000 (www.runberger.net/teaching.htm), as well as a series of workshops internationally.

¹⁵ Angéilil, Marc, *INCHOATE, an Experiment in Architectural Education*, Swiss Federal Institute of Technology, Zürich, 2003, p. 29

¹⁶ Ibid., p. 11

¹⁷ Ibid., p. 295



(on previous page) *The first PARCEL installation at Stockholm Arts+Science 2004, at the Stockholm Concert Hall.*

The PARCEL project

The PARCEL project¹⁸ emanated from an interest in the temporal aspects of disposable articles and printing matter. Prototypes were set up to study the structural aspects of folded paper and plastics, the potential of printed circuits and the cellular intelligence of programmed micro-controllers, aiming at finding spatial and architectural implementations produced by well established methods within the packaging industry.¹⁹ The cellular principles of the programmed intelligence suggested a similar approach to the physical components. A system of partially folded units with specific curvatures and sets of folds was developed, in which the structural logics gave a vertical positioning, suggesting the idea of a wall paneling system. The units retained qualities of the sheet, while achieving volumetric capacity with a striated and non-uniform expression. The name PARCEL originates from the way that the singular units are partially enclosed, enabling them to contain electronics but not hiding them from view, as well as the distribution of parts.²⁰

The production patterns developed were used as master for the punch tool setting cuts and fold lines, original for printed circuits and instruction for electronic components. In essence, the complete information for the production of one PARCEL unit was integrated in a single drawing. In this way the formal logics of the PARCEL prototypes were imported from printed matter and disposable articles, transferring their qualities to an interior scale²¹. The punched plastic sheets were equipped with computational intelligence through the programmed micro-controllers,

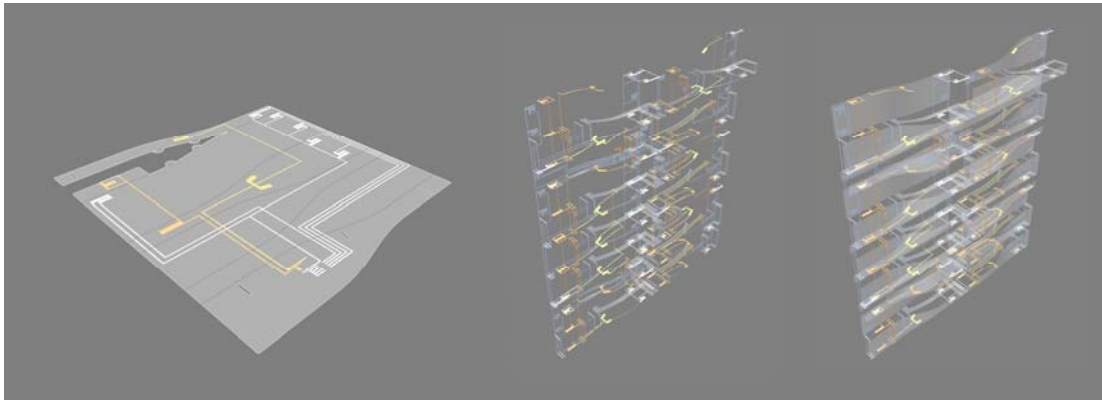
¹⁸ A Krets project is defined as a field of related collective research, often based around series of prototypes. The PARCEL project was developed by Krets members Pablo Miranda, Daniel Norell and Jonas Runberger in 2004.

¹⁹ The prototypes encompassed structural cardboard models, material studies of conductive paint, tape and glue, algorithms and electronic component configuration, setting up a number of different venues and protocols for the collaborative process.

²⁰ Parcel; to divide into parts and distribute. To make into a parcel; package.

²¹ This can be seen in analogy to the remediation concept of New Media, in which different media takes on the characteristics of each other. Hayles, N. Katherine, *Writing Machines*, MIT Press Mediawork Pamphlet Series, 2002, citing Bolter, David Jay and Grusin, Richard, *Remediation: Understanding New Media*, The MIT Press, 2000.

microphones, LED lighting and speakers.²² When combined, the wall-paneling system integrated information technology and infrastructure as well as illumination and sound.



Renderings of conductive paint as printed on unfolded PARCEL unit and the assembled electronic network with and without visible units.

The local digital conduits within the single PARCEL unit form a network with all other units when assembled into an installation, with physical connectors also closing the electric links. The physical and electronic architectures were both a cellular and parallel model, as opposed to traditional sequential computer processes. The sheets created depth from surface, and picked up the background color of the surroundings, reinforcing this. In addition, the printed conductors were present as abstract patterns, providing PARCEL with an operative ornamental character.²³

The immaterial reactive characteristics of PARCEL are based on white noise, often used to control sound conditions in an environment. Surrounding sound is picked up locally through microphones to be dispersed to other units of the installation through the integrated network. During this transfer the sound signal is transformed by other inputs and emitted through loud speakers and LED lighting, establishing local environments. The interchangeable units of PARCEL, each with specific formal and operational characteristics allows dynamic recombination by users/visitors while the installation is in operation. The striated pattern of the complete installation can be reconfigured at will and the emergent behavior of the distributed intelligence in the local environments changes.²⁴

The transfer of strategies from other fields to an interior architectural scale introduces an oscillating ambiguity between graphic and spatial infrastructures. The multifunctional quality of the graphic pattern as instruction for production suggests an ornamental transition from graphic to electronic to spatial infrastructure. PARCEL blurs the relationship between model and building - in this case the wall, and prototype and product - in this case the wall panelling system, in its

²² The materials for PARCEL include: Punched and folded PVC sheets, Screen printed acrylic, Printed circuits, conductive foil and glue, programmed algorithms in microcontrollers, LEDs, Plastic membrane speakers, microphones, diodes, power regulators and resistors.

²³ The first PARCEL installation was implemented in the Stockholm Arts+Science 2004 event, at the Stockholm Concert hall. The vibrant green color of the interior walls behind the installation was sampled, and printed on parts of the folded pieces. The conductive pattern also played against the ornamented interiors of the foyer in which it was located.

²⁴ At this stage, the PARCEL prototypes are open to participation by outside parties.

capacity to continuously react and interact electronically with its environment, as well as invite the visitor to recombine and transfigure the system.

PARCEL has been publicly presented at the Stockholm Arts+Science 2004, the *Design på gång* seminar at the Stockholm Cultural house arranged by the Swedish Association of Architects (2005) and the first *Dorbot-Sthlm* event (2005)²⁵. The PARCEL project was developed with support from AKAD, The Academy for Practice-based Research in Architecture and Design affiliated to the three Schools of Architecture in Sweden; KTH (Stockholm), LTH (Lund) and Chalmers (Göteborg). Special thanks to: Erik Hökby, Mattias Rubin De Lima, Lars Åstrand, Vinkplast AB and Packningar och Plast AB.

In PARCEL Krets addresses the component level of architectural production on an organisational, productional and performative level. The rational building industry of today is based on components with very specific geometry which shapes our environment.²⁶ This, and the tendency for closed systems for prefabrication in the search to cut costs for architectural production, limits the choices of innovative architectural design in a profound way. There is a necessity to find meeting points between the practices in the periphery of the discipline and the traditional building industry. The Swedish building industry has recently showed a renewed interest in Lean Production²⁷ and mass customization. Core principles from this approach within the vehicle industry incorporate continuous learning and development through a learning by doing attitude, in which all affected parties take part, as well as a focus on production as the value generating activity. Perhaps these methodologies could be applied to architectural production, including the 'product development' aspect of architectural design, as a mode of operation that can provide new opportunities for innovation?²⁸

²⁵ <http://www.artsandscience.se>, <http://www.kulturhuset.se>, <http://www.dorkbot.org/dorkbotsthlml>

²⁶ Linn, Björn, *Arkitektur som kunskap*, Chalmers Tekniska Högskola, 1998, p. 130

²⁷ Lean Production and mass customization stems from the Toyota Way of production. Liker J. K., *The Toyota Way*, McGraw-Hill, 2004.

²⁸ During the spring of 2005 the author has participated in conferences and workshops on this theme arranged by the Swedish Association of Architects as well as the Swedish National Board of Housing, Building and Planning, and is also co-author of a forthcoming report on Volumetric Housing Production, supported by the later.