

Thanks to the support from our industrial sponsors, the chair of Design Theory and Methods for Innovation, launched in January 2009, develops basic research on the understanding and modeling of design reasoning (C-K theory, logics of the unknown, creative engineering...) as well as the management of innovative design (RID, KCP...).

The chair has forged numerous scientific partnerships: it supports and co-chairs the international network on "Design theory" of the Design Society involving scholars from numerous countries.

The results, tools and teaching material developed by the chair have been widely disseminated among companies and academic institutions in various domains (Engineering, Management, Industrial and Artistic Design) in France and abroad.

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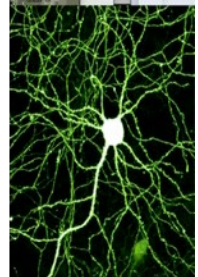
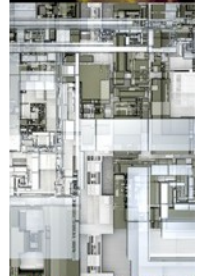
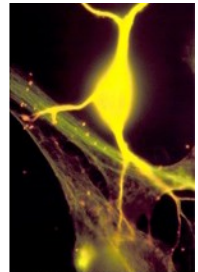


# design theory and methods for innovation

[www.cgs-mines-paristech.fr/tmci/](http://www.cgs-mines-paristech.fr/tmci/)

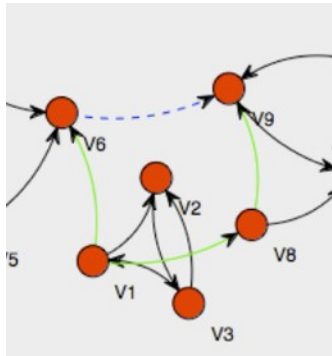


THALES



## THEME 1

### Foundations of design theory and reasoning in the unknown

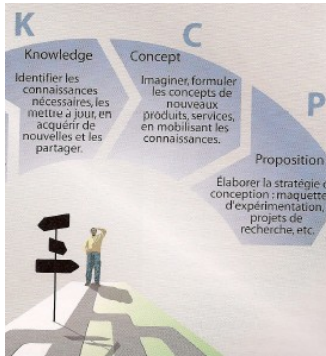


This theme explores the underpinnings of the reasoning in the unknown and the development of C-K theory

By exploring the different mathematical interpretations for C-K theory, significant results were obtained using Forcing in Set theory along with intuitionistic logic. Furthermore, studies have been made on the impact of different models of knowledge in the construction of design reasoning. It has been established that most of the traditional design theories can be seen as singular cases of C-K theory. Finally, further research on the basic hypotheses of C-K theory have unveiled ties with debates in philosophy of mathematics and science.

## THEME 2

### Organization, management and methods for innovative design



This theme explores the organizational and managerial forms consistent with the rationale and social needs of innovative design

It has strengthened the methodologies based on KCP that rely on an extensive field experience and whose different impacts are now well understood and evaluated. It also seeks to develop a range of new tools inspired by C-K theory that responds to specific practitioners' issues (patents, control of upstream research, evaluations of innovative projects...). It finally explores original forms of partnerships, and studies the interactions between innovative design and expertise development within the firm. The final aim is to build a new corpus of management systems and tools for innovation governance.

## THEME 3

### Psychological, cognitive and cultural determinants of innovative design



This theme explores the explanatory power of C-K theory for the study of psycho-cognitive creative thinking

Mostly experimental, it is based on a partnership with the group of neuroimaging and cognitive sciences at Sorbonne Paris-Descartes. This work has already shown that C-K theory allows to predict and explain conflicting observations in the literature. Research also confirmed experimentally the impact of C-K theory training on the creative abilities of subjects. Finally, these studies provide insight into possible links between design theory and learning theory both for adults and children. This work has a direct impact on training in industry or in academia.

## THEME 4

### Design regimes, ecosystems; economics and history of design



This theme explores the conditions for innovative development across an industrial sector or an ecosystem (business, government, communities, territories, associations, ...)

Design theory enables the introduction of "Design functions" in the economic theory of the firm. This allows predicting and characterizing several sustainable design regimes for the growth of the firm. This model has been confirmed by research supported by the ANR-RITE program. Each regime requires different cognitive and social dynamics, which explains the relative development (or lack thereof) of new ecosystems. So-called "orphan" innovation (a strong demand, but no emerging innovations) are explained. These results led to a program on new steering tools for innovative ecosystems.

## THEME 5

### Creation and reception; Identity of objects and new critical discourses



This theme considers objects and techniques that are "strange"; that is, objects whose design process and reception process is different than traditional models.

The hype on internet of things, new robot-like objects, tele-activities and hybrid approaches between artistic and technical creations are particularly fertile domains to make sense of emerging regimes of creation and reception. This theme explores the constitution of new identities of objects in society and the generation of new paradigms of design and conception that arise from critical discourses about these innovations. More generally, this theme investigates foundational research questions about languages of description and creation. Studies are being conducted in partnership between PSL and Institut Mines-Télécom.

## PUBLICATIONS

- Over a hundred publications in journals and conferences
- 2 special issues in top-level journals
- 6 books
- 9 PhD projects

## AWARDS&DISTINCTIONS

- Outstanding paper award ICED'09 Stanford (2009)
- Best Phd Prize of ANDESE Nordine Benkeltoum (2010)
- Peter Pribilla Foundation Prize (2010)
- Laureate of Academy of Technology Membership, Armand Hatchuel (2010)
- Sustainable Development Innovation Trophies; Cap Gemini (2010 and 2011)
- Reviewers' favorite paper ICED'11 (2011)
- Nomination for Best PhD Prize; FNEGE AIMS, Sophie Hooge (2011)
- Pascal Le Masson et al. Nomination for best paper for CIM (2012)
- AFCI Prize (2013), ManPower-HEC Prize (2012), Syntecc-SFM Prize (2013) for the book "Refounding the company"
- Best PhD Prize, AIMS, Marine Agogué (2013)

## CONFERENCE ORGANISATION

- Design Theory SIG annual
- CIM Community Meeting
- 20<sup>th</sup> IPDM Conference

## FORMATIONS

- More than 1500 students trained on innovative design since 2009
- Several hundreds of professionals formed.