Academic design

Inaugural lecture
Prof.dr.ir. Kees Dorst
October 23, 2013

/ Department of Industrial Design

TU/e Technische Universiteit **Eindhoven** University of Technology

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Where innovation starts

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Introduction

Universities are realizing that to achieve real impact in society, it does not suffice to concentrate solely on the technical complexity of the big challenges we face. Where the sciences help to analyze and understand complex issues, and engineering turns this understanding into brilliant technical solutions by sophisticated problem solving, design in its process and approach connects this technical prowess to the complexity at the human side of the issue.

The good news is that all around the world design disciplines are moving into academia. Many universities now have very successful design departments that educate academically trained, high-level design practitioners. But the rapid growth of these departments, popular as they are with students in this visual age, has meant that there has been very little time to step back and reflect on the nature and development of academic design. The formation of an academic design practice that can take its rightful place among other academic fields has been slow. From the perspective of the other academic disciplines, design still tends to been seen as 'different' (and this is not always meant in a positive sense). There are many misunderstandings on the nature of design, and there often is only a very fuzzy picture of what design can bring to its new academic context. As a result, design practices are not well integrated into academia.

In this inaugural lecture I would like to step back and explore with you how design can contribute to academic practices. I will propose a model of academic design and hope to show that, once integrated, such academic design practices can play a central role in a university in the 21st Century. We will begin this journey by stepping back, and mapping both design and academic reasoning on a fundamental level. An analysis of the similarities and differences will lead to highlighting one design practice, frame creation, as particularly interesting in the academic context. A deep dive into this frame creation practice leads to the creation of an integrated model of academic design and experimental research. Then we will look under the hood of the Industrial Design department at the TU Eindhoven, one of the places in the world where these key academic design practices are being developed.

The baby in the bathwater

In order to understand the possible connections between design and academia, we first need to understand the way in which design differs from other academic disciplines. To penetrate to the core of design thinking we can look at the way different kinds of reasoning are described in formal logic, in particular the way Roozenburg [1995] has taken the work of the pragmatist philosopher C.S. Peirce into design research. We will use a simple equation to describe the structure of a problem solving challenge. In is equation we distinguish: (1) the 'elements' in a problem situation, (2) the 'pattern of relationships' in a problem situation and (3) the 'what', the 'outcome' of a reasoning process (see Figure 1).

Figure 1

The general structure of a reasoning process.

To analyze the various reasoning patterns that are used in academia, problem solving and design, it suffices to compare different 'settings' of the knowns and unknowns in the basic equation at the beginning of the reasoning process, see Figure 2.

Deduction - At the start of a process of Deduction, we know the 'elements' in the situation, and we know 'how' they will interact. This allows us to reason towards an outcome. For instance, if we know that there are planets in the sky, and we are aware of the natural laws that govern their movement within the solar system, we can predict where a planet will be at a certain point in time. The calculations to support this prediction are very complicated, but in the end the reasoning itself towards a firm prediction is not problematic. Our forecast can be verified by observations, confirming that we have considered all the players in the situation correctly and have a sound grasp of the pattern of relationships through which the sun and the planets in the solar system interact.

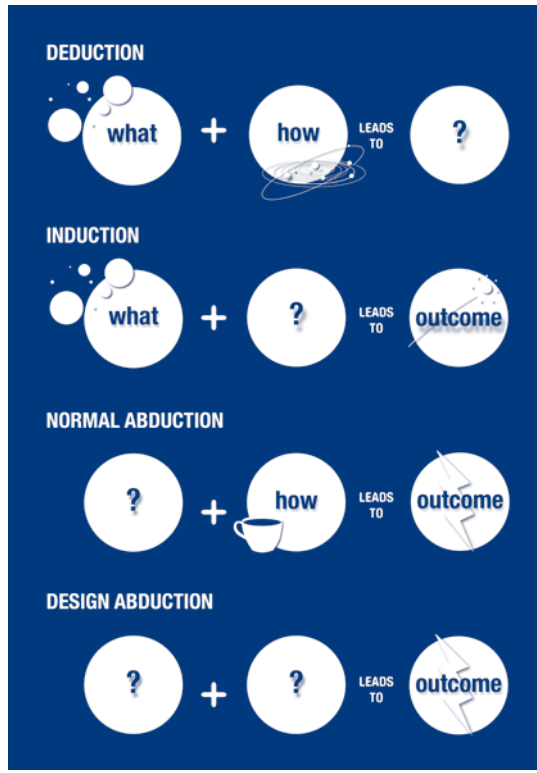

Figure 2

Four basic types of problem solving challenges that lead to different patterns of reasoning: Deduction, Induction, Normal Abduction and Design Abduction.

Induction - In Induction, we again know the 'elements' in the situation, and - if we take the planets as an example - we know the outcome of the interaction of the elements, in the sense that we can observe the movement of the planets across the night sky. But suppose we do not yet know the laws of gravity, the pattern of relationships that governs these movements.... Can we use our observations of the movement of these planets to formulate such a law? We can't logically deduce such a law from observations. We can observe the movement of the planets, and create meticulous descriptions, but the formulation of laws that explain this behavior is fundamentally a creative act. Induction is crucial in the progress of science: astronomers propose different working mechanisms ('hypotheses') that could wholly or partially explain the observed phenomena, and test them by using the hypothesis to predict a future outcomes, and check whether these are accurate by matching them with observations. The progress of science comes from

discussions between scientists, who challenge and falsify each other's hypotheses until there is agreement that a certain proposed pattern of relationships is probably 'true', as it matches current observations.

Deduction and induction are the two forms of reasoning that are used in analysis, and they serve to understand and predict real world phenomena. But Deduction and Induction are not enough in the world of productive practice, if we want to MAKE something that is new and creates value for people. In productive practice, we need a different reasoning pattern: Abduction. In Abduction we set out to create a new 'what', a new 'element' for the problem situation, so that the interactions in the system lead to a desired outcome. Abduction comes in two forms.

Normal Abduction - In 'normal abduction', we know the value we want to achieve through the desired outcome, and also the 'how', a pattern of relationships that will help achieve the value we seek. The missing element is a 'what' (an object, a service, a system) that still needs to be created. This is often what we do in engineering and design: solving a problem by creating solutions that will function within a fixed pattern of relationships.

Design Abduction - In Design Abduction, the starting point is that we know something ONLY about the nature of the outcome, the desired value we want to achieve. So the challenge is to figure out 'what' new elements to create, while there is no known or chosen 'how', a 'pattern of relationships' that we can trust to lead to the desired outcome. Thus in design we have to create or choose both a 'how' and a 'pattern of relationships'. As these are quite dependent on one another, they should be developed in parallel. This double creative step requires designers to devise proposals for both the 'what' and 'how', and test them in conjunction.

An example can help to clarify the difference between these two types of abduction: say that the 'outcome' we want to achieve is an energy rush when coming to work in the morning. In Normal Abduction, we would also already know the 'how', say that this is to be achieved through coffee – and we might even have a proposed method of brewing coffee (dripping, squeezing, using steam) so we can start developing a 'what', engineering the machine to make the coffee for us. In Design Abduction, on the other hand, we would only know the goal (quick rush of energy before work) but not know how to achieve it. Hence if go for coffee we would still need to choose a brewing method, create a design for a machine and then judge whether this would do the trick (Is it quick enough? Is it economical?

Is it environmentally ok?). If all the coffee machines we can think of do not satisfy the criteria, we might need to start considering other ways of creating the energy rush.

This comparison between the four different reasoning patterns establishes the design professions as thinking fundamentally differently from fields that are predominantly based on analysis (Deduction, Induction) and problem solving/engineering (Normal Abduction). As these three reasoning patterns are often most closely associated with academia, one could argue that therefore design, with its peculiar type of Abduction, should have no place in the university. But I will argue that this is not the right position to take, and that design has something new and important to offer to academia - *there is a baby in the bathwater*.

The method in their madness: frame creation

To understand what design can bring we need to delve a bit deeper into how Design Abduction actually works. As outlined above, the challenge that faces a design practitioner is to develop a 'What' and a 'How' in parallel. That is an almost impossible task, as there are just too many degrees of freedom in the equation. Design practitioners have found a way around this by using a bridging concept, a 'frame' (see Figure 3).

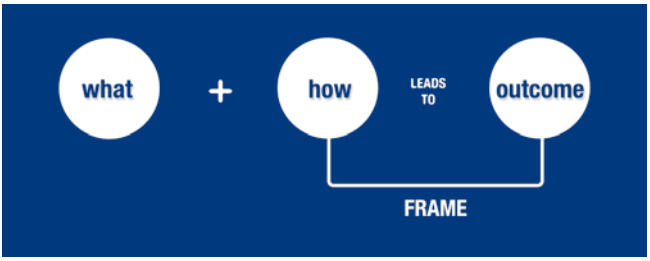

Figure 3

The place of framing in Design Abduction.

A frame is the implication that by applying a particular pattern of relationships we can create a desired outcome. A frame contains a hypothesis, the statement that the problem can be fruitfully approached AS IF it can be solved by a proposed 'how'. If we go back to the example above, then the chemical stimulus of the caffeine leading to feeling energized is the frame, the approach to the problem. But this problem might be reframed by proposing that there are also social ways of being energized (by an inspiring conversation), or by delving deeper and saying that what we really are looking for is not so much the energy rush, but a level of concentration – then meditation would be a way to achieve the clarity of mind that is otherwise achieved by coffee...

Thus a frame is an approach to a problem – and while frames are not necessarily new or original, we normally only talk about 'framing' as a conscious activity when this involves a real shift in perspective. This framing step in Design Abduction is intellectually similar to Induction: as in Induction, a pattern of relationships is proposed and tested. Research into design practices has shown that designers

indeed spend a lot of time reasoning from desired outcomes via frames to possible design solutions, and back again to reframing the problem when the design solution turns out to be inadequate [Dorst, 1997, 2006-2]. This reasoning pattern can lead to the impression that designers are just playing around with ideas a bit in what may look to be a childishly playful, trial-and-error process. Yet this is the only way to create progress in Design Abduction, and designers have developed sophisticated practices to achieve a good framing of the problem situation. Design is fundamentally different from other forms of reasoning, but it is not as random and irrational as it may seem. As Nigel Cross said, quoting Hamlet in his valedictory lecture [Cross, 1996]: *"Yes they are quite mad. But there is method in their madness"*.

The creation of new 'frames' to approach problem situations is a key and rather special element of designer's problem solving practices [Whitbeck, 1998]. While this framing of problems is a universal human ability, and thus cannot be claimed to be exclusive to the design professions, it is particularly important (indeed, central) to the design professions. My research has shown that expert design practitioners have developed unique, sophisticated multi-layered practices for creating new frames – this actually is in stark contrast to the relatively happenstance approach that many academic disciplines have to Induction[1]. These observations have been interpreted and refined into a nine-step model of a frame-creation process (see Figure 4).

As an example of frame creation in action, we will now have a closer look at one of the projects of the Designing Out Crime centre at the University of Technology in Sydney, dealing with problems in the city's entertainment district. We will briefly go through the nine steps to illustrate them:

Archeology *- There have been continuous problems in Kings Cross, the entertainment quarter in Sydney. This area, with its bars and clubs and its slightly grubby nightlife, attracts about 30,000 young people every Friday and Saturday night. The problems that occur include drunkenness, fights, petty theft and minor drugs dealing. Late at night there is alcohol-related violence and people do get*

[1] In research methodology we do find many methods to critically appraise (falsify) a hypothesis, but the moment of invention itself (in Kuhn's terms: the Context of Discovery) barely gets a mention. Scientists seem embarrassed at being caught creatively guessing how something might work, and claim authority by stressing the deductive prowess of their work – inadvertently resorting to the 'spark of genius' as the origin of induction. This is where the sophisticated processes, tools and methods that designers have developed for the inductive step can directly benefit other academic disciplines.

Figure 4

A nine-step model of frame creation in design.

hurt. Over the years, the local government has been trying to solve this problem by using these 'strong arm tactics', increasing the police presence and installing CCTV camera's. Clubs have hired more security personnel. All these extra security measures don't seem to enhance public safety.

***Paradox** - In initial research, designers from the Designing Out Crime centre quickly realized that the heavy-handed law-and-order approach didn't work at Kings Cross because there were no criminals: the people concerned are overwhelmingly young people wanting to have a good time.*

***Context** - The key stakeholders include the police, club owners and the justice system as well as people living in Kings Cross.*

***Field** - The broader field of possible stakeholders also includes educational establishments (schools, universities), teachers, parents, counselors, young tourists that stay in the cheap hostels in the area, youth organizations, sports clubs, the 3FM radio channel, people living in the surrounding suburbs, transport providers (buses, taxis, trains, etc), the tourist board, hospitals & care facilities, breweries, etc...*

***Theme** - Our research has shown that one of the deeper themes underlying the youngsters' behavior at their age is 'identity'. They seek to socially position themselves through interaction in their particular group. The way this works for the different groupings of youngsters varies, and this diversity potentially leads to friction. Kings Cross is the place where all of this comes together in an area that has very little structure to it, and where there is actually very little to do besides visiting the four main clubs. While the young people come there for a fun evening out, late at night drunkenness and boredom lead to violence.*

***Framing** - Using a metaphor (a 'frame') to help us understand the issue, one could say this situation could be compared to a good-sized music festival (30,000 young people on a festival terrain). The 'identity' theme could lead to frames like a 'rite of passage', ritualizing some of the conflict and showing-off that inevitably occurs.*

***Futures** - To now pick up the first theme: what would one take care of when organizing a music festival? It turns out that a well-run music festival would provide many facilities that are not available at all in Kings Cross, but that could easily be designed in. Some examples (out of about 20 solution directions): (1) when organizing a music festival one would make sure that people would be able to get there, but also to leave again when they wanted. In Kings Cross, the peak time of young people coming into the area is about 1AM, and the last train leaves at 1.20AM. Getting a taxi later in the night takes about 2 hours. So once you are in the entertainment quarter you are basically crammed into a single road until the trains start running again at 6 am. That is ultimately very boring and frustrating. Apart from the obvious improvement of providing more trains, the designers also*

proposed a system of temporary signage on the pavement, to help party-goers reach a different train station that has trains running throughout the night. (2) In organizing a music festival, one would also create chill-out spaces and offer continuous attractions to make sure that people will move around, and their experience does not completely depend on what takes place on a single big stage. As it happens, this entertainment district has a few big clubs that are the only attractions. As a result, young people who have visited a club and go back out on the street might find that the queue for the next one is too long. If they decide not to join the queue, they are out in the street again with nothing to do. The designers proposed that problematic pattern of behavior can be minimized by providing a smartphone app that tells people how long the wait for the next club is before going out onto the street. In addition, some of the laneways around the central street could be prepared as rest areas, with water fountains and a relaxed "lounge" atmosphere away from the crowds. (3) To counter the general lack of orientation in the area, the designers proposed a system of very visible young 'guides' in bright T-shirts, who help people find their way and who are also approachable when help is needed. These bright and cheery Info people create a more caring social environment.

To ritualize the coming of age, urban sports might help the young males and females to show off their abilities without resorting to violence. Also, different kinds of qualities, not just brute strength or bravado, can then be expressed. Kings Cross could be redesigned to be a safe podium for this...

***Transformation** - A prerequisite for all of these solution directions is that the Sydney city authorities take the lead in becoming the 'organizer' of the metaphorical music festival, facilitating a process in which the stakeholders will be brought together to structure the Kings Cross environment along these lines. For the city authorities to engage in this way, the creation of these new experiences should tie in with the city's broader strategic goals.*

***Integration** - The emergence of a 'path to action' in dealing with the city at night led the Sydney city authorities to commission research on the present nighttime activity in the whole inner city, followed by an extensive consultation process on the nighttime economy. This resulted in a confident new strategy (called 'Open Sydney') setting out 100 concrete action points for the immediate, medium and long-term future. By entering into the process in this way, the Sydney city authorities have become an actor in the city in a completely new way. From just being an infrastructure provider they have become an active force, as a curator or perhaps even conductor of life in the city.*

In this frame creation process, the oscillation between analysis and creation that is central to Design Abduction [Dorst et al, 2001] is combined with a movement of zooming in and out (from the problem to its context and back again). Central to these movements is the fifth step, where an analysis of underlying themes leads to the deeper understanding from which new frames can be created. The first four steps lay the groundwork while the last four steps explore the implications of the potential frames and the designs they could lead to. The key thing to pick up from this example is that in frame creation the designers step out of the normal flow of conventional problem solving (in this case: creating countermeasures to criminal activity), looking much more broadly beyond the current context, to then have the themes that will drive the creation of new approaches to the problem (the frames) emerge from this complex 'field'. These themes are the point where the frame-creation process most closely touches academic practice, and where we can integrate design and experimental research – creating a truly academic branch on the tree of design disciplines.

Integrating academic design and experimental research

These sophisticated frame creation practices are a form of Induction, and through the creation of smart themes design and experimental research can be combined into an integrated practice. This integrated practice can be graphically represented as follows (see Figure 5).

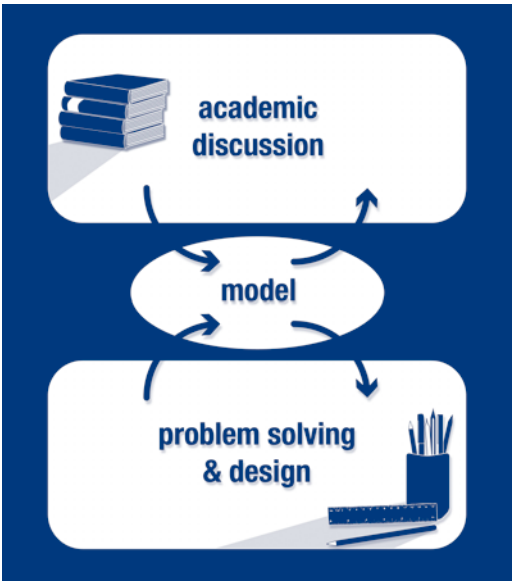

Figure 5

Combining design and experimental research.

The central model that sits *between* the field of design practice/problem solving (in the real world) and the field of academic discussion (the world of thought) has a dual nature: it can be seen as the 'theme' and 'frame' when we look from the side of design, as part of the frame-creation process. From the side of academia, it can be seen as an experimental model that has been derived from academic thoughts and discussions, translated into potential (experimental) action.
To illustrate this we can refer back to the Kings Cross example: a lot can be learned about contemporary forms of creating an identity by observing the results

of the design interventions in Kings Cross – and these lessons can feed back all the way to reflecting on the core models and theories that lie at the basis of these interventions. Thus theory and practice interact[2].

What makes this central modeling activity in the space between design and academic discourse doubly important is the fact that through this modeling of reality, we are abstracting from everyday problem solving – and this creates a new vantage point, creating an overview that allows us to look further forward (see Figure 6).

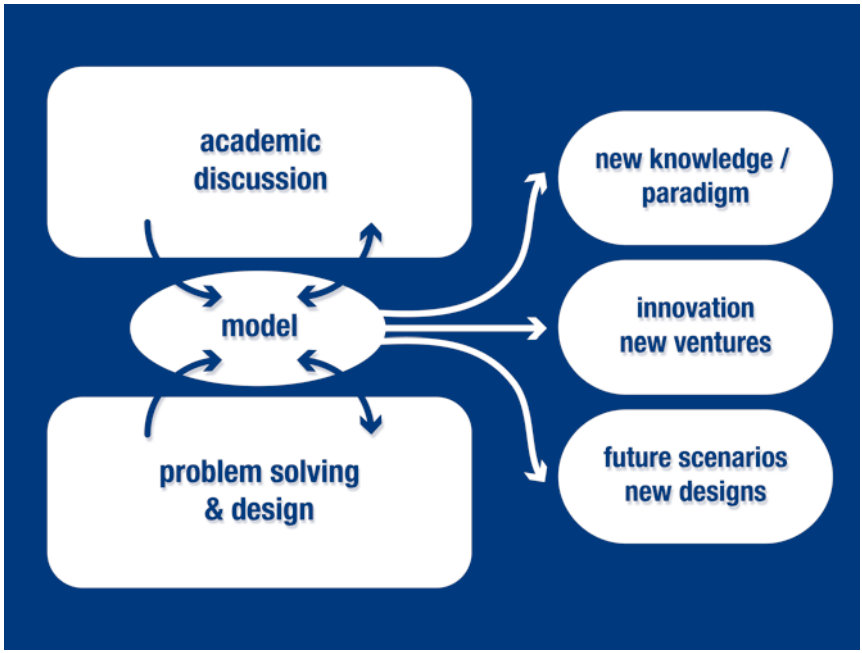

Figure 6

The abstraction of the model creates the possibility to extend our thinking into the future.

[2] Please note that in classical academic discourse, theoretical knowledge is seen as higher than practical knowledge – the latter is seen as 'applied theory' rather than a source of knowledge in itself [Lakoff, 1999]. Conner [2005], however, shows how great academic breakthroughs are often rooted in the need to better understand something for practical purposes. Seen from the world of academic thought, the application is an important driver for academic discussion and the locus for the experiments. Practice embeds and embodies theoretical thoughts, and throws up the questions that drive many academic discussions.

The modeling allows us to create scenarios that express new possible futures for the field, not just dealing with extant situations and discussions but to develop scenarios that really project further into the future than professional practice can normally see. The integration of design and experimental research can thus lead to new knowledge, new ventures and new development scenarios/designs. In this integrated model there are seven arrows, designating activities that need to be running for this integrated academic design and experimental research practice to work (see Figure 7).

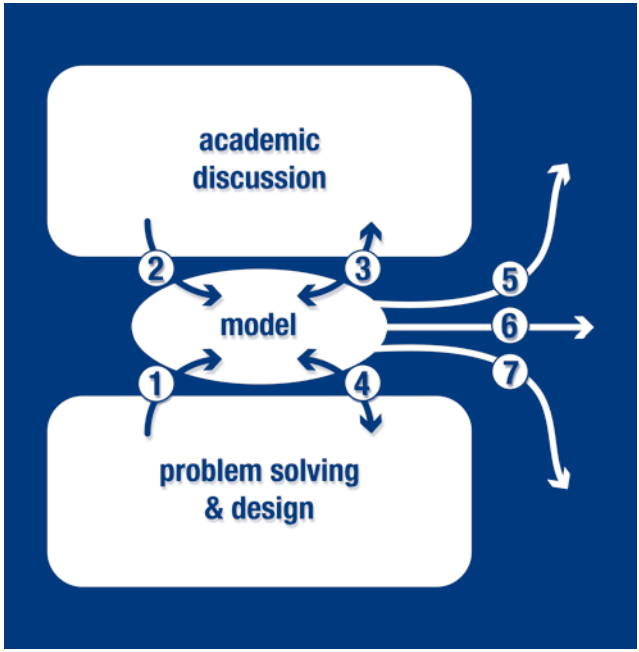

Figure 7

The processes that constitute the integrated practice.

(1) Themes are frames formulated through a frame creation process, based on problems and issues from practice. (2) In making the model, the themes are matched by the learning from the discussions in relevant scientific fields. (4)Then we can create design interventions, and reflect upon them on the basis of these models, in an iterative process. (3) Reflection on theory, based on the experiments with the models (resulting in academic papers into the 'parent disciplines', again in an iterative process). If the integrated model is successful in combining academic rigor and practical relevance within an approach that can be seen as

novel and challenging the paradigms and conventional wisdom in both worlds, this can lead to (5) the creation of new academic knowledge, possibly including a shift in the paradigm, (6) new ventures, and the longer sightlines into possible futures can lead to new development scenarios and radically innovative designs (7).

The creation of such an integrated academic design and research practice has been pioneered in the collaboration between TU Eindhoven (TU/e) and the University of Technology, Sydney (UTS). Over the last five years, teams from both sides have been working together in the area of 'Designing Out Crime', creating innovative ways to deal with the need for safety and security in society through more than 90 projects (see www.designingoutcrime.com and www.designingoutcrime.nl). The Kings Cross project described above is part of this initiative.

The research agenda behind the Designing Out Crime centre springs from the current debate on crime prevention within the academic field of criminology. That debate is a dialectic between two extremes: the position that one should create countermeasures that prevent crime happening (e.g. fences, locks), and the alternative position that one should focus on the creation of a social environment in which crime is less likely to occur, say through stimulating social cohesion in a troubled neighborhood. Central to the 'Designing Out Crime' approach is the pledge to avoid the knee-jerk reaction to incidents that invariably lead to the introduction of 'countermeasures', as those make us more fearful and wary in public spaces, destroying the social fabric of society. But the direction of social cohesion ignores the complexity of our modern-day societies and hasn't delivered many convincing solutions either. Both approaches suffer from a propensity to come up with rules and blanket solutions that are supposed to cover every situation (aka Crime Prevention Through Environmental Design (CPTED) and Situational Crime Prevention (SCP), see Ekblom [2012]). The Designing Out Crime centres in Sydney and Eindhoven have used their projects to explore crime hotspots in a different way, that focuses on reframing the pattern of relationships between people and their environment in concrete problem situations. This approach (exemplified in the 'music festival' and 'shaping identity' frames for Kings Cross) has already led to highly successful solutions for Kings Cross and for the comparable area in the city of Eindhoven, called 'Stratums Eind'. Together the projects create the case for building a new paradigm in crime prevention, as presented on the Design+Crime conference in 2012 [Asquith et al, 2013]. In Figure 8 we can see how these Designing Out Crime activities and results can be mapped

onto the integrated academic design and research model: the Kings Cross project contributes to forming a new paradigm for criminology, it leads to new intervention scenarios, now and in the future, and it places an existing stakeholder, the Sydney city authorities, in a new entrepreneurial role.

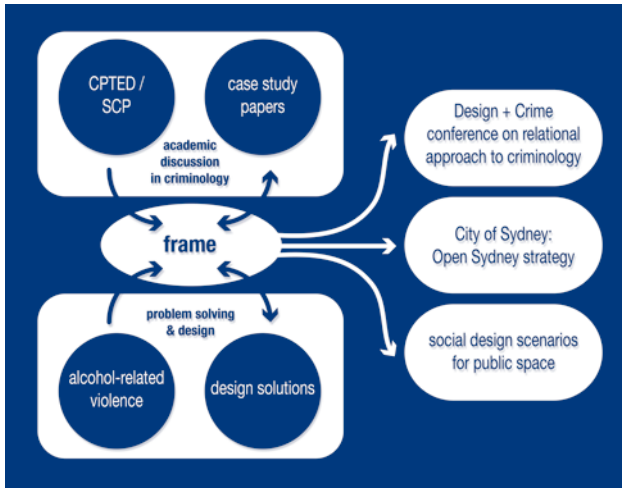

Figure 8

The Designing Out Crime centre's Kings Cross project mapped on the integrated model.

Another example of such an integrated academic design and experimental research practice that comes from the collaboration between UTS and the TU/e can be found in the 'Materializing Memories' project initiated and directed by Dr Elise van den Hoven. This research program was sparked by the realization that with increasingly ubiquitous media creation devices, such as camera phones, creation of personal media is no longer the problem but curation and retrieval are. Most media are created for mnemonic reasons and used as memory cues - but with media retrieval failing, human memory is not well supported. This program investigates the effects of physical and digital media, their creation and curation on memories in everyday life. That knowledge will be used to design, implement and evaluate interactive systems that facilitate remembering and forgetting. Please note that in this second example, the project inspiration has come from developments in science and technology (arrow 2 in Figure 7). In this case, academic design takes the role of operationalizing research from science and technology – in ways that will surely be interesting for companies like Océ/Canon and others: the human theme at the basis of their 'printing and copying' business models is actually the support of memory and forgetting.

A classic example of the power of an integrated design and research practice can be found in the life and work of MIT engineer Amar G. Bose (1929 – 2013). He embodied the integration of research and design/problem solving practices at a very sophisticated level. As a young Electrical Engineering student at MIT he was so disappointed in the quality of the high-end sound system he bought that he set out on a research path in acoustics. That led him to the realization that 80% of the sound you hear in a concert hall is actually indirect, reflected off the walls and ceiling. His acoustics research, in which he sought to model this principle, sparked the development of sound systems to replicate this effect. He founded the highly successful company that bears his name. While running his company, he kept up his research (and teaching) at MIT.

TU/e ID: creating Academic Design

I hope to have convinced you that design is fundamentally different from other academic disciplines – and that academic design distinguishes itself from other design practices by abstracting from the concrete problem situation (arrow 2 in Figure 7). But in order for academic design to reach its full potential, this abstraction is not enough: all the seven processes of the integrated design and experimental research practice, the seven arrows in Figure 7, need to be active. While some of these processes are quite common in universities (particularly in a broad University of Technology) for others, the working processes are yet to be mapped out, and new methods, tools and new organizational structures to support them will need to be created. This is the big challenge for universities that really strive to broaden their impact on society beyond the technical domain.

The department of Industrial Design at TU Eindhoven (TU/e ID) is at the cutting edge of the development of such a new, integrated practice. And it has been so from the start: TU/e ID was founded 13 years ago to develop a radically new design department for the design of complex *'intelligent systems, products and related services'*. The then state of technology meant that these systems hardly existed, and the way to design them had yet to be developed. The new, fledgling design discipline had to deal with unprecedented levels of complexity in technology, human behavior and interaction, while aiming to create a new category of design outcomes that would achieve values that were also yet to be mapped out. After a fairly bumpy start where necessity was the mother of many inventions, TU/e ID has developed a set of mature and very sophisticated practices. It is delivering hugely successful Bachelor and Master students and home-grown PhD's that are innovative designers and problem solvers extraordinaire. They truly embody the integrated design and experimental research practice, and many of them become entrepreneurs in their own right. The radically new academic design practices of these graduates are intimately linked to the research programs at the TU/e ID department: Designing Quality in Interaction, Designed Intelligence, User Centered Engineering and Business Process Design. The NWO Creative Industries Scientific Program and the newly formed cross-university Design United research school (encompassing the design

research at all three Dutch Universities of Technology) provide important support for further collaborative projects.

This very dynamic TU/e ID environment has worked as a continuing source of inspiration for me and my colleagues in design research. Personally, my first contact with TU/e ID stems from an assignment from the Board of the university to do a benchmark study on academic design schools around the world, in preparation for the start of the new department. The engagement in this planning stage resulted in the opportunity to contribute to the philosophical NWO research program on 'The Dual Nature of Technical Artifacts' that was co-authored by the Philosophy of Technology group within the then Technology Management department. Once the Department of Industrial Design was established I was asked to contribute to the new course, based upon my experience in product design and design research. This contribution had to be scoped quite carefully, as we realized that TU/e ID was actually developing a new academic design discipline, and that all the theories, models, methods, tools and knowledge that could be brought to bear had to be re-examined for relevance in this new context. This high-level reflection turned out to be valuable in itself – the lessons learned leading to three books and some of the most quoted papers in design research. The first book, *"Understanding Design – 175 reflections on being a designer'* (2003, 2006) was written to support reflection by design students and designers, *'Design Expertise'* (2009, with Bryan Lawson) was motivated by observations on the development of design expertise among students within TU/e ID's problem-based educational system. The third book *'Frame Creation - a design practice for driving innovation'*, the manuscript of which has just been finished, builds upon recent research and experimental academic design projects. Many of these have been done in the context of the 'Designing Out Crime' initiatives in Sydney and Eindhoven. This research is now being extended with the creation of a new 'theme' in the TU/e ID Bachelor curriculum, called Smart and Healthy Cities. This theme seeks to be a catalyst in applying the methods of frame creation and academic design to all aspects of city life - ranging from the issues of safety in public spaces to the broad areas of health care infrastructure, the future of work practices in the digital age to social wellbeing and sustainability.

There is much to be done in the development of the frame creation approach and the integrated model of academic design and research. With close colleagues at the TU/e ID and the Design Innovation research centre at UTS, we are working on extending our understanding of the integrated model through a five-pronged

research agenda. In Eindhoven the focus will be on investigating the methods support, management and organization of these practices (the arrows in Figure 7), with special attention to the creation of new entrepreneurial business models that can realize the value that is created through this integrated design & research approach. This combined TU/e-UTS research group with its growing network of international partners will play a leading role in developing academic design.

This research is driven by the realization that universities can bring the depth, breadth, overview and forward thinking that is sorely needed to get beyond the knee-jerk reactions and myopic crisis management that seem to characterize decision making in this day and age. Through integrating academic design and experimental research, universities can take this new role in society and become the foremost catalysts for change.

Acknowledgements

Looking back on my travels in design and research I am very grateful to many people (far too many to name, unfortunately – please don't feel disappointed if you are not named, and accept my humble apologies). I have had the good fortune to meet remarkable people that generously took me along on their journey and taught me what I know. I feel a real sense of responsibility to make the best use I can of everything that has been given to me over all these years.

In the 1990's I arrived in the Delft Design Methodology Group just at the special moment in time when empirical research into design practices and a robust discussion on the paradigms for understanding design that had been developing in Engineering and Architecture came together in a way that has shaped design research ever since. Nigel, Jan, Norbert, Henri, Rianne, Frido, Remko, Corinne – I owe you a lot.

Then in Eindhoven I came in just as design appeared on the radar of Philosophy of Technology, and was warmly welcomed by my colleagues in the Dual Nature program (Marc, Wybo, Anthonie, Lamber, Pieter, Peter, Kees and others).

Then I moved to the Department of Industrial Design, just as it was getting started. Being involved in this new endeavor among a remarkable group of colleagues was extraordinarily inspiring. Over these pioneering years of co-creating a new design discipline I have always felt supported by the management (Jeu and Aarnout, Sabine, Jos, Ingeborg, Han), the great support staff (Helen, Gemmie), the professors and colleagues (Caroline, Berry, Matthias, Jean Bernard, Lou, Panos, Ad, Alan, Steven, Lacides, Mark, Kees and many others) and have learned so much from working with these very special pioneering students (in particular Carlijn and Ber, the very first ID Masters). In the intense days of managing the 'Home Domain' I could not have survived without the support of Lisa, Wina, Berry, Elise, Panos, Bert, Simone, and many more. Currently, in the Business Process Design group, inspiration and reflection comes from discussions with Lu Yuan, Dirk, Elke, Ilse, Christelle, Sander... It is a real privilege to work very closely with Ad, Vera, Jeroen and others in setting up the new Smart and Healthy Cities theme. This is a great and inspiring adventure, working together on special

projects that combine the creation of solutions to real-world problems with fundamental research into frame creation and academic design. The recent arrival of our new full-time professor Lin-Lin Chen will strengthen our design research enormously and I am looking forward to working with her.

Through all these year the best friendship, inspiration, mentorship and support in troubled times that anyone could ask for has come from Peik, Dick, Douglas, Willem, Rens, René, Franklin, Andrew, Cees, Steven, Jeannell, Catrien, Leo and Phyllis … I cannot thank you enough.

When looking back on my travels in design and research, I see my progress on this journey coming from a series of fortunate arrivals, with the protagonist somehow ending up in really interesting environments at just the right time – and then meeting just the right people to help him learn and reinvent himself. How good is that. Gratitude for the first and most important arrival of all goes to my family, my parents, big brother and sister. They have given me the solid home basis and the confidence to travel. Paulien has been my companion ever since I left the nest. Thank you for getting me into adventures I could never have dreamt of, and showing me new worlds all the time. Your love, encouragement and unwavering support keep me going.

And so we travel on.

Ik heb gezegd.

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Curriculum vitae

Prof.dr.ir. Kees Dorst was appointed part-time professor of Design Skills for Interaction in the Department of Industrial Design at Eindhoven University of Technology (TU/e) on May 1, 2012.

Kees Dorst was trained as an Industrial Design Engineer at Delft University of Technology, where he achieved his PhD in 1997 (cum laude). He has worked as a product designer for various design firms and as a researcher, he has studied the ways in which expert designers work.

Currently, he is Professor of Design at the University of Technology Sydney (UTS) where he is founder and director of the UTS Design Innovation research centre and the NSW Designing Out Crime Center. He has been involved with the Department of Industrial Design at TU Eindhoven since its inception, and this part-time professorship is a next step in that productive relationship. He is setting up an ambitious design research program that straddles both institutions.

Kees Dorst continues to lecture at universities and design schools throughout the world, publishing numerous articles and several books – most recently 'Understanding Design – 175 reflections on being a designer' (2006) and 'Design Expertise' (2009) with Bryan Lawson. Currently he is finishing a commissioned book for MIT Press, 'Frame Creation – a design practice for driving innovation'.

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