

INNOVATION THROUGH DESIGN

By Bill Moggridge

ABSTRACT

The development of a new category of bicycles based on the *Shimano Coasting Platform* illustrates the process of design-led innovation as a case study.

The global economy affects design everywhere in the world, pushing companies in North America to transform themselves from implementation to innovation. Bill Moggridge describes the changes in design process at IDEO, as the company has evolved over the past ten years from a product design consultancy to an *Innovation through Design* company, using design thinking to help clients navigate the speed, complexity, and opportunity areas of today's world.

The nature of design practice is analyzed, divided into four levels of contribution; general awareness, specialist skills, interdisciplinary design thinking and design research. Each of these levels is discussed and exemplified by the case study example.

CONTENTS

Shimano Coasting Platform - Case Study

LEVELS OF DESIGN

- General Design Awareness
- Specialist Design Skills
- Interdisciplinary Design Thinking
- Design Research

Shimano Coasting Platform – Case Study



Trek Lime Coasting Bicycle using Shimano Components



Coasting Bicycles from Trek, Photo IDEO

Shimano¹ makes the best components for bicycles. If you look at a high performance human powered two-wheeler, whether for road, track or mountain, you can expect the running gear and brakes to be from Shimano, designed by their R&D team in Osaka, Japan, and manufactured in one of their plants in China, Malaysia or Singapore.

Lance Armstrong dominated the Tour de France for seven years, causing a steady growth in the market for high performance components in the USA, fuelled by athletic Lycra-clad riders upgrading their bikes for a faster and smoother ride. When Lance announced his upcoming retirement, the strategists at Shimano realized that an era was ending, that less people would want to replace their high end machines, and that most athletic riders were already using Shimano components. They faced market saturation and probable stagnation. They turned to IDEO² for help in deciding what to do.

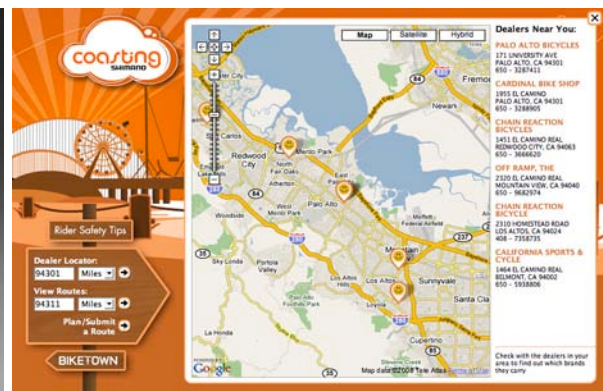
A design team was formed, combining disciplines and including people from both IDEO and Shimano, and they set about discovering what people thought about riding bicycles, searching for underlying perceptions, habits and latent desires. They found that there were lots of people who were not riding anymore, but who remembered fondly the pleasures of biking that they had enjoyed when they were growing up. They missed riding, but they were put off when they saw all the specialist athletes streaking by on the roads in professional looking clothes, so they could not summon the energy to become cyclists again; they used their cars instead. This looked like a potential opportunity for Shimano! Bring riding back to the people who just want to be able to get on a bicycle in whatever clothes they are

wearing and ride down to the store or cruise around the park, enjoying the fresh air and the view with a comfortable riding posture and the minimum of effort.

What components would be needed to create a new opportunity for this kind of riding experience? If you visit Copenhagen or Amsterdam you see lots of people riding around the city in normal clothes and an upright posture, but they are riding classic bikes designed many decades ago. What would be the modern equivalent of these? Perhaps Americans would like something lighter and easier to ride; an automatic gearbox so you don't need to change gears; a comfortable seat with storage inside it for your wallet? The design team set about brainstorming for possibilities. They created reference designs to test the ideas with the people who might enjoy riding, and also the companies that design bicycles for the market in North America, as they are Shimano's direct customers. The ideas were welcomed, so the engineers at Shimano started developing the components in detail.



Production Components

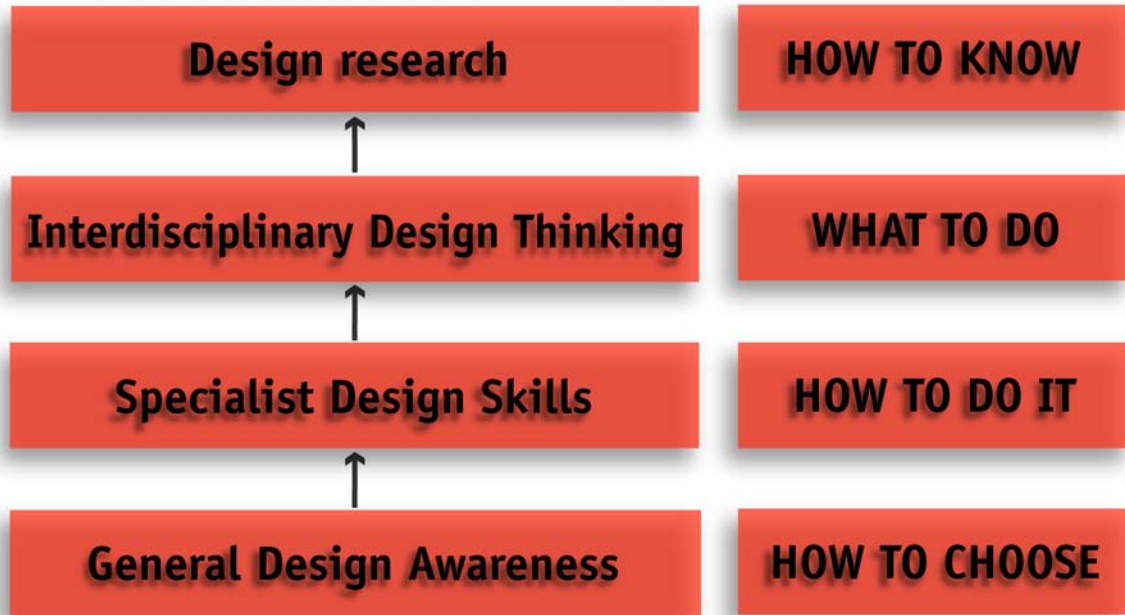


Website

The most dramatic innovation was the automatic gear change, as it gives a great feeling of the bicycle having some intelligence and knowing how to respond to your pedalling. It works as smoothly as the automatic transmission on a car, but the rider is the engine. Electricity is generated in the hub of the front wheel, powering the gear change mechanism in the hub of the rear wheel, and the electronics that control the changes are mounted in a separate housing attached to the frame. A coaster brake is applied by back pedalling, and the seat and posture make for a comfortable sense of cruising.

Creating components that allow people to enjoy a relaxing ride only overcomes part of the barrier facing those who no longer cycle. Where is it safe to ride? How can they find out about bike paths? What about retail? Will they be pressured to buy performance bicycles by athletic sales staff. The design team developed answers to those questions, launching a Coasting website³ and providing retail display kits, information packets and training for sales staff. Shimano also needed to reach a wide range of manufacturers who would be interested in developing new designs, to build a brand for the new category as well as enhancing the individual brands of each supplier. In the first year four companies created new designs within the platform and in the second year the total increased to nine. The platform has created a new category of bicycles for the market in the USA.

Levels of Design



You can think of design in four levels, forming a simple hierarchy. At the simplest level, people make choices about the design of their clothes or the environments that they live in, based on their awareness of design qualities and issues. Another level of sophistication is achieved by people when they learn specialist design skills; they become designers, knowing how to design with greater fluency and expertise. They become adept at the craft of designing, but they usually rely on other people to decide what to design, to define the brief. It is becoming more widely recognized that design processes can also advantageously be used to decide what to do, employing interdisciplinary design teams in processes that harness the powers of intuition, where the shared mind is more productive and creative than the sum of the individual minds. At the highest level, design research can give access to knowledge, both research for a particular project and also research into methods and processes. Let's look at the items in this hierarchy more closely, starting from the bottom.

General Design Awareness

In the Epilog to his book *Emotional Design*,⁴ Don Norman says,

"We are all designers. We manipulate the environment, the better to serve our needs. We select what items to own, which to have around us. We build, buy, arrange, and restructure: all this is a form of design. When consciously, deliberately rearranging objects on our desks, the furniture in our living rooms, and the things we keep in our cars, we are designing."

When someone chooses what to wear, how to decorate their home or layout their garden, they are exercising skills of general design awareness. These skills are most visible in countries like Italy or Japan that have a strong aesthetic culture

and tradition, but are improving fast in countries such as Britain where design is a subject offered as a major option in high schools, so that students can choose design as a mainstream subject and qualification as they develop through their teenage years.

Specialist Design Skills

Professional designers know how to create new solutions, based on a synthesis of all the relevant constraints. They have mastered specialist design skills, making them expert at deciding how a design can be formed, and how to create an elegant solution to the problem posed by the constraints, but they expect the context that they operate in to be decided by someone else, normally the boss or the client. This expectation limits the economic value the contribution made by designers. Most current design education is still focussed on teaching these specialist design skills, whether the design discipline is industrial design, interaction design, architecture, graphic design, web design, or more craft based disciplines like ceramic design or jewelry.



Trek Lime Coasting Bicycle



Raleigh Coasting Bicycle



Giant Suede Coasting Bicycle



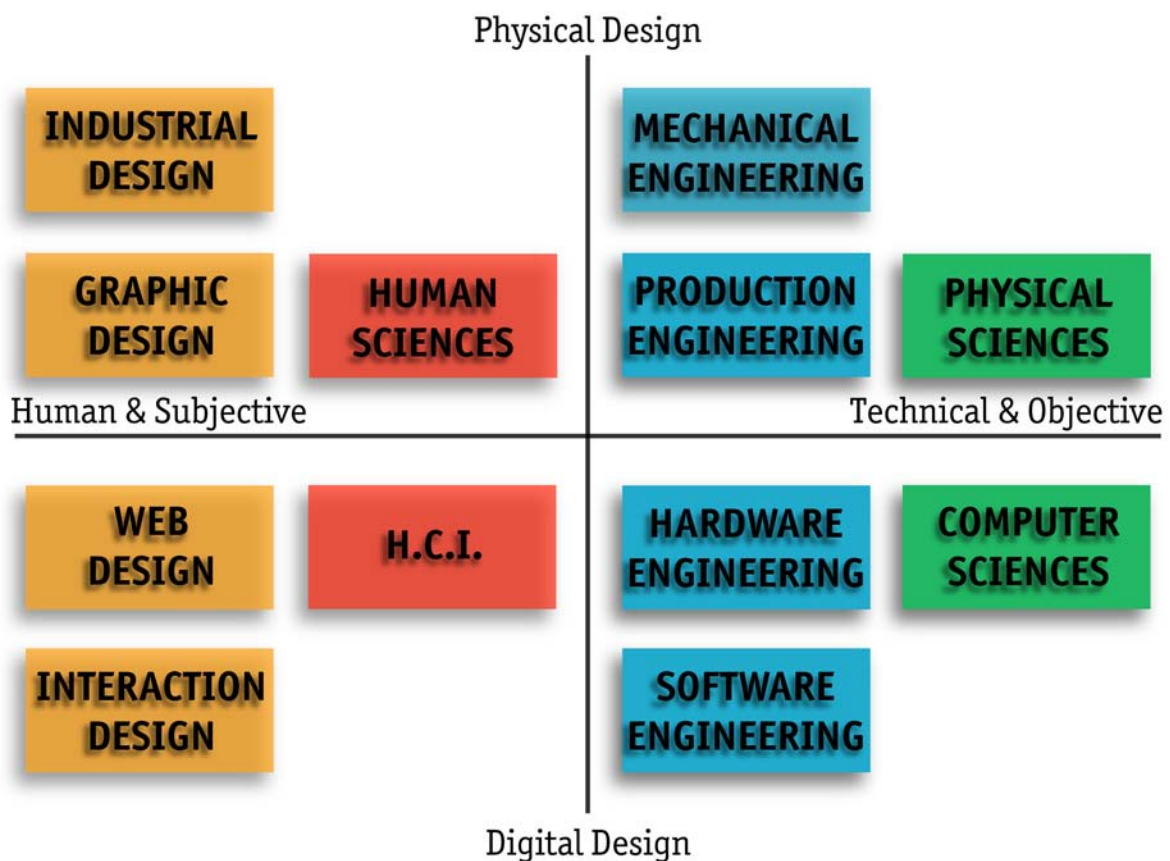
Giant Suede Coasting Bicycle with full accessories

Returning to the example of the Shimano Coasting Platform, the specialist design skills within Shimano were needed to develop the components once the strategic brief was in place. Each of the bicycle manufacturers also had their own specialist design teams, using their expertise to create designs that reflected the qualities of their brands and appealing to their group of customers. In the examples above,

Trek⁵ is the most modern design, building on their mountain bike roots, Raleigh⁶ has a traditional appearance to fit with their heritage of cruising bikes, and Giant⁷ attempts to form a differentiated identity by offering accessories. The designers within these companies rely on the general design awareness that people have about their brands to attract the right customers.

Interdisciplinary Design Thinking

Interdisciplinary design thinking is especially valuable for deciding what to do in the first place, so that the power of intuitive creative processes can be harnessed to stimulate innovation, solve any type of problem, and develop new opportunities. Design thinking can help with the messy and challenging problems posed by the complexity of design contexts in the world of digital technology and global connectivity. Complex design problems, such as systems or services, will be better tackled by a team of people from varied backgrounds, harnessing intuitive processes, but collaborating so that the output from the *shared mind* is more productive than the sum of individual contributions.



This diagram shows the range of design disciplines from which an interdisciplinary team is formed for an *Innovation Through Design* project at IDEO. People from non-design disciplines also contribute to the projects, typically those with business and brand backgrounds, as well as writers, story tellers and prototype developers, for physical digital and video prototypes. In the case of the project with Shimano, the initial team was focussed more on the physical design disciplines, with web designers joining later when the opportunity was identified.

It takes time to get good at working together in interdisciplinary teams, as people from different backgrounds are not used to understanding each other's contributions. When a team is fluent there is a magic sense of new possibilities that a group of creative people from diverse disciplines and varied viewpoints can create. At IDEO we have been working in these teams for over fifteen years and it has become the normal way to generate innovative ideas. We have learned that project rooms are an important enabler for the process. We have a slogan, saying, "Forget your discipline when you go into the project room – just work together with the rest of the team!"

We have become skilled at brainstorming, with these rules forming a frieze above the marker-board clad walls in all our conference rooms:

Defer judgement

Encourage wild ideas

Build on the ideas of others

Stay focussed on topic

Hold one conversation at a time

Be visual

Go for quantity



Brainstorm



Project Room

In the example of the Shimano Coasting Platform strategy, the team identified four factors that influence casual cyclists' interest and participation in biking:

1) *A better riding experience.* Insights from user research revealed that many adults miss the pure indulgence of what it felt like to ride a bike when they were young. They remembered it as being easy, uncluttered, and joyful.

2) *Product platform.* The desired experience requires a completely new and innovative feature set, including automatic shifting without levers and cables, and reduced visible technology to let people focus on just enjoying themselves.

3) *The purchasing experience.* This is a problem for recreational bikers. Bike stores in the USA are typically staffed by young male biking enthusiasts, who need to learn to engage with a new customer base that is more likely to include women, inexperienced bikers, and self-described biking dilettantes.

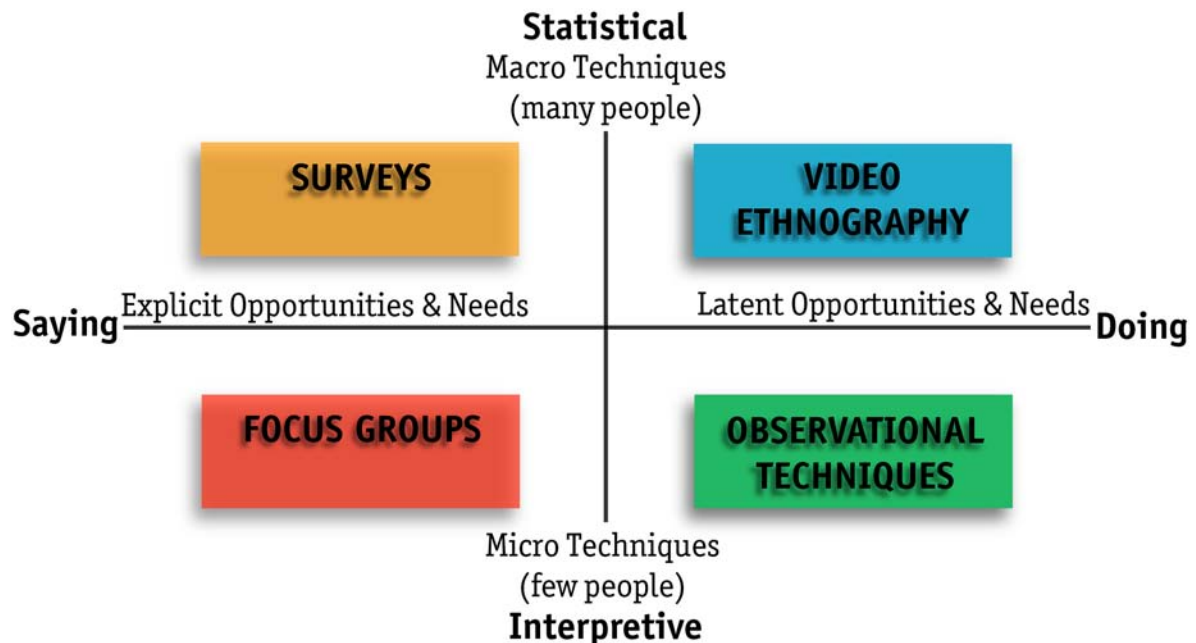
4) *Having a safe place to ride.* This led to a local and national strategy for lobbying for improved bike lanes, regulations, and bike-friendly environments.

The solution included a reference design, which would inform and inspire manufacturers to develop their own branded offerings with the right user experience. A promotional campaign called "Coasting" was instigated to raise broad awareness among casual bikers and retailers about the new offering.

Design Research

You can think about design research in two main categories; research as part of the design process and research about design. When part of the design process, research methods can be included in conjunction with *specialist design skills* as well as *interdisciplinary design thinking* and therefore should not be separated at a higher level on a hierarchy. Research about design is more definitely an enquiry about *how to know*, and deserves the location at the top of the list. Let's look at the two types separately.

Research as Part of the Design Process



This diagram lays out different kinds of research methods, showing a horizontal scale that characterizes design opportunities and user needs, from explicit on the left to latent on the right. The vertical scale indicates the difference in techniques from macro above to micro below. Traditionally, market research was developed to find out what people want by asking them directly through large-scale surveys or more in-depth focus groups; these methods work very well to find out what people say they want. Once a design concept is clear, this is the information that you need to build a business case or to decide how many people will be interested in purchase.

If your goal is innovative design, your product or service has not even been thought of, so by definition it cannot be explained to research participants. This is where design research methods are needed to discover latent needs and desires that will help the members of the design team define potential opportunities. The examples on the diagram are video ethnography techniques on the macro scale, where stop frame video is set up to watch a space or task to reveal patterns of use. On the micro scale, the example is observational techniques, where members of the design team go to wherever the design context exists to see what people really do, as

opposed to what they say they do. IDEO has published a deck of *Methods Cards*⁸ describing fifty one methods for design research. These are all about discovering what people might want and need, revealing opportunities for innovation and inspiring fresh ways of thinking about new possibilities.

In the Shimano Coasting Platform example, the research initiated the project, uncovered the strategic opportunity, and determined the direction of the design development. The researchers and the other members of the design team, from both Shimano and IDEO, were immersed together throughout the process.

The questions explored included:

- ~ Would a focus on baby boomers be beneficial to the biking industry?
- ~ Why are fewer people buying bikes each year?
- ~ What are people who could be biking doing otherwise?
- ~ What are the needs of potential bikers?
- ~ What would a bike have to be like to appeal to potential bikers?
- ~ What new market might there be for the biking industry?
- ~ How to identify and create a new category of biking?

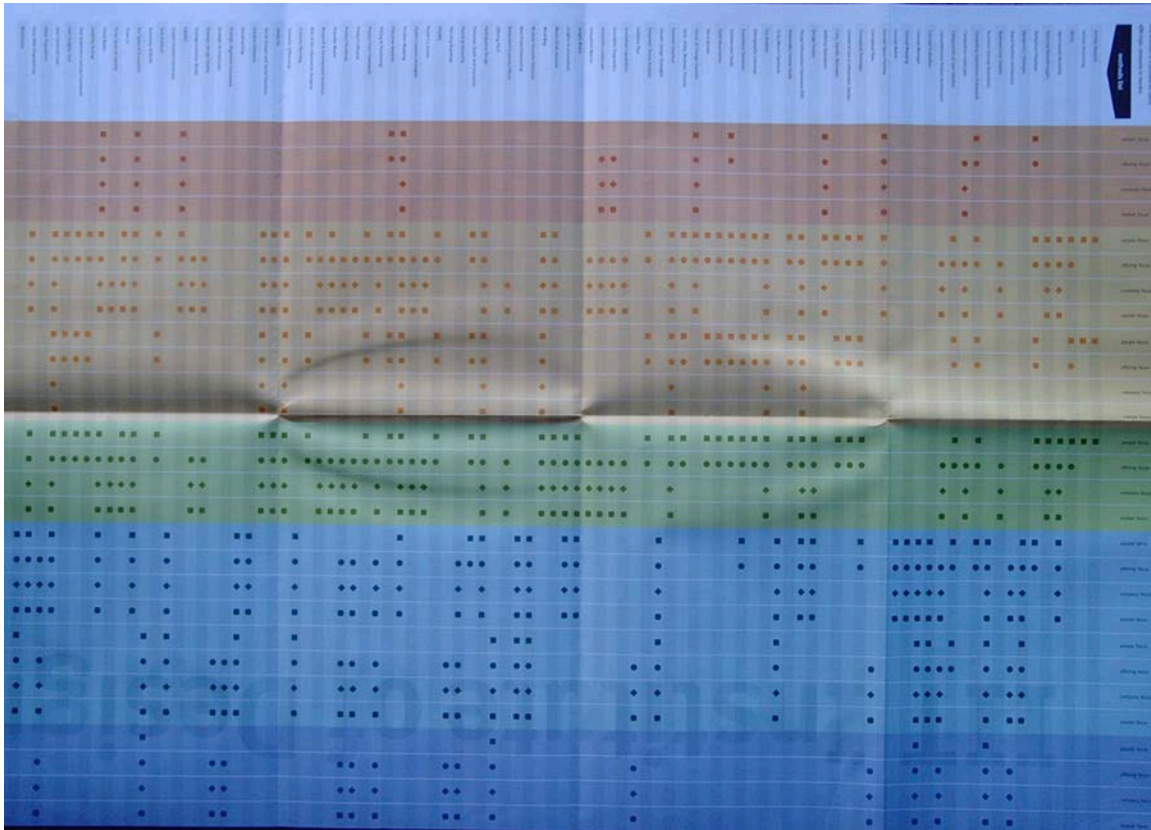
The methods included:

- ~ Interviews of potential bikers, including adults of all ages who don't bike.
- ~ Home studies of the potential bikers to understand how they spend their free time, and to see if they currently have unused bikes sitting in storage.
- ~ Parallel research efforts in four parts of the United States to account for regional differences in culture, weather, and infrastructure.
- ~ Projective techniques creating visual collage of impressions of biking: participants were presented with dozens of image stickers representing different aspects of biking to prompt conversation.
- ~ Try it yourself experiences, where the team tried analogous activities to empathize with what potential bikers experience when they attempt to bike.
- ~ Park visits to observe what outdoor activities people are enjoying.
- ~ Prototype testing where participants test-rode bike concepts and gave feedback on the experience.

The most profound discovery was that every one of the participants who didn't currently bike had fond memories of biking in their younger days. To add to that, the pleasures they received from biking - simple exercise, a feeling of freedom and of being outdoors, feeling the breeze - did not have a replacement in their current lifestyle. The key insight was that there was a whole world of people who don't bike, but would really like to. More importantly, the type of biking experiences that these people desired was not being offered by the biking industry. They fantasized about the enjoyment of riding around with friends in a flat paved, safe area, out in nature, at a leisurely pace. The team called this new category of biking *Coasting*.

The participants were repelled by the current biking industry which emphasizes competition, speed, mechanics, Lycra shorts, endurance, fitness and performance. They felt unwelcome in that world and were not motivated to be part of it.

Research about Design



Poster of Design Research Methods Published by IIT ID

Research about design is not very mature as yet. Most practicing designers *Just Do It*, to quote the Nike slogan, relying on the intuitive nature of their process to yield results. Designers don't worry about underlying principles or postulate theories about methodology. Compare design to the fine arts or poetry. There are plenty of people earning doctorates in the history and theory of fine art and poetry, but nobody expects them to be the same people as those who create excellent art or write beautiful poems.

Perhaps design is growing up, as interest in design thinking expands, and there will soon be lots of new PhD programs in design. The fact that a *Korean Design Research Institute* and a *Korean Society of Design Science* exist is exciting! The poster shown in the photo above was published by IIT ID⁹ in Chicago, where the strongest tradition of Design Research in the USA resides. It lists design research methods taught at the school, analyzing them by mode, so that one can see at a glance where each method can be used, and whether it is focussed on users, offerings, company or market. There are also mature traditions of research about design in Europe and Japan, but we don't as yet have an easily accessible body of knowledge that is convincing to academics in other disciplines.

So what research needs to be done to bring design up to the level of other disciplines? Perhaps that question in itself poses a welcome challenge that we

should try to respond to, as does the *Creativity through Convergence* Conference.

The *Changing the Change*¹⁰ conference in Torino in July of 2008, also promises to make a strong contribution. Here are the declared aims:

An international conference on the role and potential of design research in the transition towards sustainability. The conference intends to outline the state-of-the-art of design research in terms of vision, proposals and tools with which design can actively and positively take part in the wider social learning process that we refer to as *changing the change*. The conference has a double aim:

1. To consolidate a design research culture and practice orientated towards a constructive critical attitude able to reach all design disciplines. The conference intends to focus on the way in which the question of *changing the change* is present and widespread throughout the research community and in relation to all design fields - from product design to communication design - from interior design to interaction, service and strategic design - from social design to fashion design.

2. To outline the state-of-the-art of contributions that design research is today able to bring to social conversations about the future. The conference seeks to bring visibility to significant results. This with particular attention to visions of the future, to feasible solutions and to tools to help bring them into being. It will also enable us to make of the conference and its published output a tool for communication with the outside world; a tool able to demonstrate what design research can offer today to help re-orientate the transformation underway.

These are admirable goals, and perhaps will give us a new energy to move forward in discovering *How to Know* as well as *What to Do* and *How to Do It*. I hope so!

Bill Moggridge, May 5th, 2008

Notes

1. www.shimano.com
2. www.ideo.com
3. www.coasting.com
4. *Emotional Design: Why We Love (or Hate) Everyday Things*, by Donald A. Norman, published by Basic Books, 2003.
5. www.trebikes.com
6. www.raleighusa.com
7. www.giant-bicycles.com
8. IDEO Methods cards are available exclusively through William Stout Architectural Books in San Francisco, <http://www.stoutbooks.com/cgi-bin/stoutbooks.cgi/ord/basket.html?id=9Jw44pfJ>
9. www.id.iit.edu
10. <http://emma.polimi.it/emma/showEvent.do?idEvent=23>