4. Design as research that makes a difference Gillian Crampton Smith

The starting point of Gillian Crampton Smith's presentation was the thorny question, is design itself a form of research? After rigorously considering all the arguments for and against, and concluding that some (but not all) design is indeed research, Crampton Smith went on to describe in detail some cases where this is most definitely the case. Her examples, all culled from her time heading the groundbreaking Interaction Design Institute Ivrea, ranged from Victor Vina's interactive boxes (which functioned as a kind of instant experiment kit for his fellow designers) to Michel Kieslinger's intriguing Fluid Time bus update service, which proves that technology can indeed be all things to all people, and is also an example of "design as a hypothesis that is then tested in the real world."

At the start of her presentation, Gillian Crampton Smith promised that her approach, rather than addressing research for design like Brenda Laurel's, would instead focus on design as research —in other words, how design itself can be research. To the group of (mainly) students assembled in the auditorium, she told a story from her own student days at Cambridge in the 1960s, when one of her lecturers confidently predicted that designers and architects would be replaced by computers in the coming 20 years. At age 21, just setting out on her design career, this was not what Crampton Smith wanted to hear – although,

of course, she needn't have worried. The last 40 years have proved Crampton Smith's lecturer completely wrong; yet, as she quickly pointed out, our attempts to make programmes which can design have given us (although not designing programmes) insight into what it means to design. In particular, attempts to subject the design process to methodical analysis and procedures have suggested that designing itself might be seen as a form of research.

Crampton Smith went on to cite three arguments relating to this hypothesis. The first view she examined was the contrary one, that design is not research ('research' here

being the scientific method of proposing hypotheses and experimenting to see if they hold water). This, she argued, is a category error, quoting from George Steiner (Real Presences), writing about the arts, especially literature, but making a point equally applicable to design:

"There are in art and poetics no crucial experiments, no litmus-paper tests. There can be no verifiable or falsifiable deductions entailing predictable consequences in the very concrete sense in which a scientific theory carries predictive force. One must be crystal clear on this. The analytic paradigm of tragedy in Aristotle's Poetics is patterned on, it is not verified by, Sophocles's Oedipus Rex."

She followed this up with Kandinsky's assertion (in On the Spiritual in Art) that, "In real art, theory does not precede practice but follows her." It is a mistake, Crampton Smith stated, to impose on art and design the paradigms of the natural sciences.

Limited repertoire

She then turned her attention to the second argument, that all design is research: each problem is unique, and design culture progresses through exemplars. Donald Schön argued in his Reflective Practitioner (1983) that, "Designers work by developing a repertoire of solutions that they've seen or they've done themselves and in the preconscious mind they match the characteristics of these solutions that they have in the back of their mind with the requirements they have at hand." Every new design project adds to the personal repertoire of the designer or the general repertoire of all designers.

This is particularly important for interaction design, Crampton Smith said. People have been theorizing about architecture at least since Vitruvius over two millennia ago, so architects have a vast body of discussion and exemplars to draw upon. But in the young art of interaction design (and especially because its technology changes so fast), the number of currently significant exemplars is relatively small.

As a pioneer of interaction design, few people can be as acutely aware of this as Crampton Smith herself, and she recalled how, in 1990, when she started teaching at the Royal College of Art, she had very few instances of good interaction design to show her students beyond the Macintosh interface. It all had to be invented, from scratch. There are now thousands of interaction projects, yet only a small proportion of these could honestly be defined as exemplary or significant for the discipline, she argued (and surely any

user of modern technology would agree) – indicating, in the end, that all design is not research.

The third view (and the one our presenter favours herself) turned out to be a kind of middle way: some, but not all, design is research. Crampton Smith pointed out that the Higher Education Funding Council for England tries to quantify the research output of each university department to decide its entitlement to funding, and that, "Design departments had to work very hard to persuade the assessors, typically from the sciences or the humanities, that our activity, making things, could be classed as research at all." However, more recently the Council (Guidance on Submissions, 1995) has defined 'research' more broadly as:
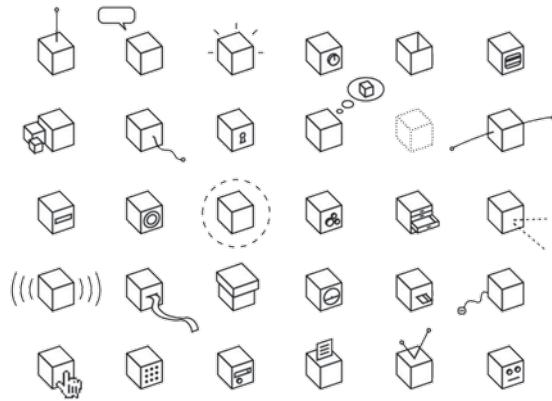
"Original investigation undertaken in order to gain knowledge and understanding [including] the invention and generation of ideas, images, performances and artefacts including design, where these lead to new or substantially improved insights; and the use of existing knowledge in experimental development to produce new or substantially improved materials, devices, products and processes, including design and construction."

New definitions

Research, that is, includes 'the invention ... of images ... and artifacts including design' but only if it aims 'to gain knowledge and understanding'. This definition, however, was framed for the academic context, not that of commercial practice. Therefore Crampton Smith offered a new definition of a research project in design (academic or commercial), as, "One which, whether or not this was its aim, discovers and demonstrates knowledge or understanding in a form which can be generalized and applied to a wider range of design situations."

Crampton Smith then turned her attention to practical illustrations of her theory, showing some design projects from her students at Interaction Design Institute Ivrea (usually known as Interaction-Ivrea). She divided projects into three types: theoretical, undertaken for designers to understand either how to design better or what can be done in the medium; experimental, building future scenario prototypes into real contexts and trying out theories in the real world; and applied, or taking the results of the research and using them in real-world projects (more as the application of research, than pure research).

In addition to these three types of project, we seek three types of insight, according to Crampton Smith. The first
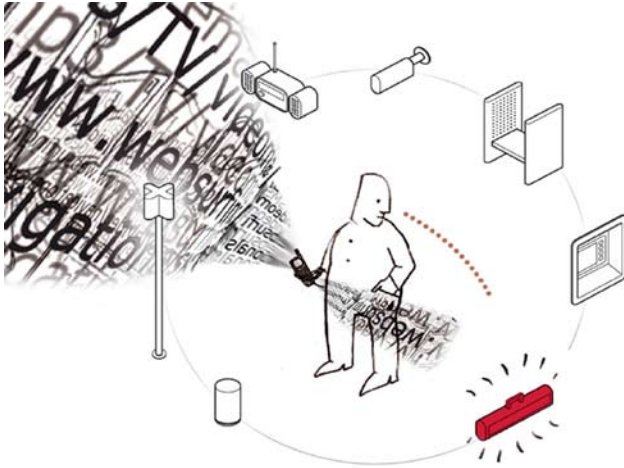
BOX BY VICTOR VINA, EXPERIMENTS WITH A NETWORK OF OBJECTS

is about people, about how technology might better support their needs, their values, and their desires. The second type of insight is into the medium: what is possible with the technology, what are the constraints. And the third type of insight is into process: how can we improve how systems, products and services are designed and implemented?

Box by Victor Vina was the first project Crampton Smith introduced. Vina's starting point could be summarised as: what are the basic ways in which you could think about networked objects? Or, in other words, if networked objects could speak to each other, what would they say? Vina's Box system was developed to allow designers to experiment with networked objects in an intuitive and simple way. For the project, Vina produced a large range of boxes, each one made out of cardboard and looking exactly like the others: the visual appearance of the boxes, after all, is not the point here. Each box was enabled to do a simple thing (an input or output behaviour). His boxes could speak, bounce, print, or make sounds, and so on. All the boxes in the same space (in the Interaction-Ivrea HQ) were linked via a local wireless network, and other boxes in other locations were linked through the World Wide Web.

To allow his fellow designers to experiment with them, Vina made a visual programming language. Wherever they were in the world, all the boxes could be represented as icons on a screen. By drawing an arrow between any output box icon and any input box icon, the designer could the flow of information between the real boxes, allowing interactive systems to be designed and tested in a clear and simple way.

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Design as research that makes
a difference

Gillian Crampton Smith

Design and the growth of knowledge

MOBILE EMBODIMENTS TO EXTEND THE MOBILE PHONE OUT INTO THE WORLD

TURIN BUS MONITORING SYSTEM
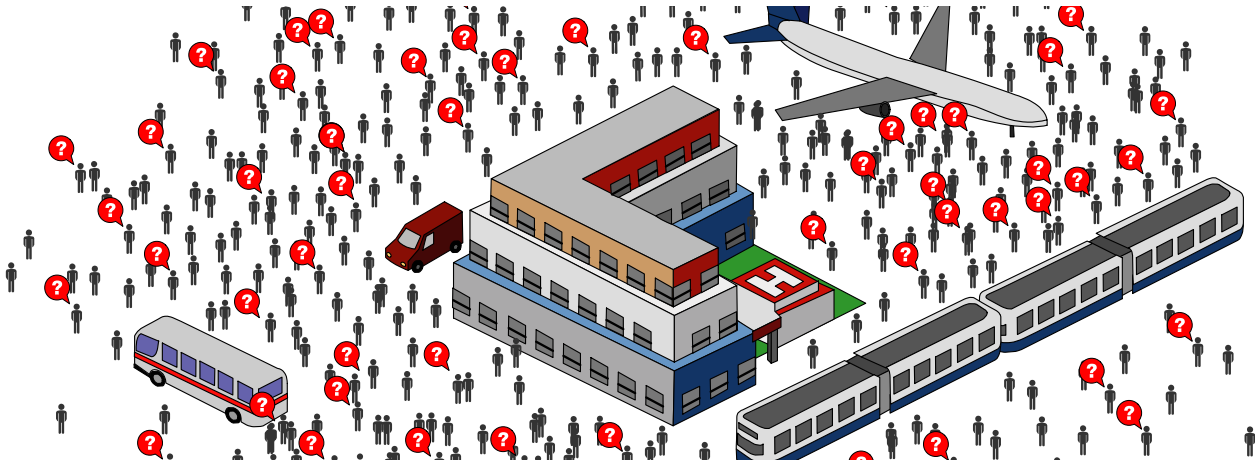
Thinking outside the box

Crampton Smith went on to use this basic infrastructure in Ivrea's physical-computing classes. Each student had to design a pair of boxes, an input box and an output box, resulting in some behaviour. In one pair, for instance, moving one box caused the other one to draw a pattern. The box kits were used for over five years at Interaction-Ivrea, and were continuously developed. "Interactive systems are awkward to program from scratch," said Crampton Smith. "Therefore, we aimed that students should be able to work directly with the material without having to do too much programming."

The box project, she continued, was not about people but about a medium – and about allowing experimentation within that medium. It was one in a series of Interaction-Ivrea projects designed as platforms to allow easy experimentation with design aspects of the medium, without the difficulty of building prototypes. Other such projects were Processing, a graphic programming language developed by Ben Fry and Casey Reas at the Media lab and continued at Interaction-Ivrea; Wiring, a board using the Processing programming environment; and Arduino, a new

board developed to make low-cost physical computing accessible to designers.

Crampton Smith then introduced what she called "another key project" from Ivrea. Mobile Embodiments, by Analia Cervini, Giulio Ceppi and Juan Kayser, asks how we might 'extend' the mobile phone out into the world. They invented displays, situated in the domestic or urban environment, for which the mobile phone could be the trigger. A park bench, for example, delivers surround sound; an ATM prints out messages from your mobile device; a public ticker-tape screen displays your SMSs as you pass. This again was research into the medium of interaction design: given existing technologies, what different approaches could designers take to make them more usable, useful and enjoyable?

She then introduced a third key project, called Fluid Time. This began as a theoretical design project, about identifying a general change in human behaviour as the result of new technology and seeing how to design for it. It then developed into an experimental project in the real world: "We can think of the designs as embodiments of a hypothesis which is then tested in the world," said Crampton Smith.

PEOPE WERE ENCOURAGED TO LIVE WIH THE DEVICES

'I HATE TEMPO MORTI'; I TEND TO FILL THEM ALL THE
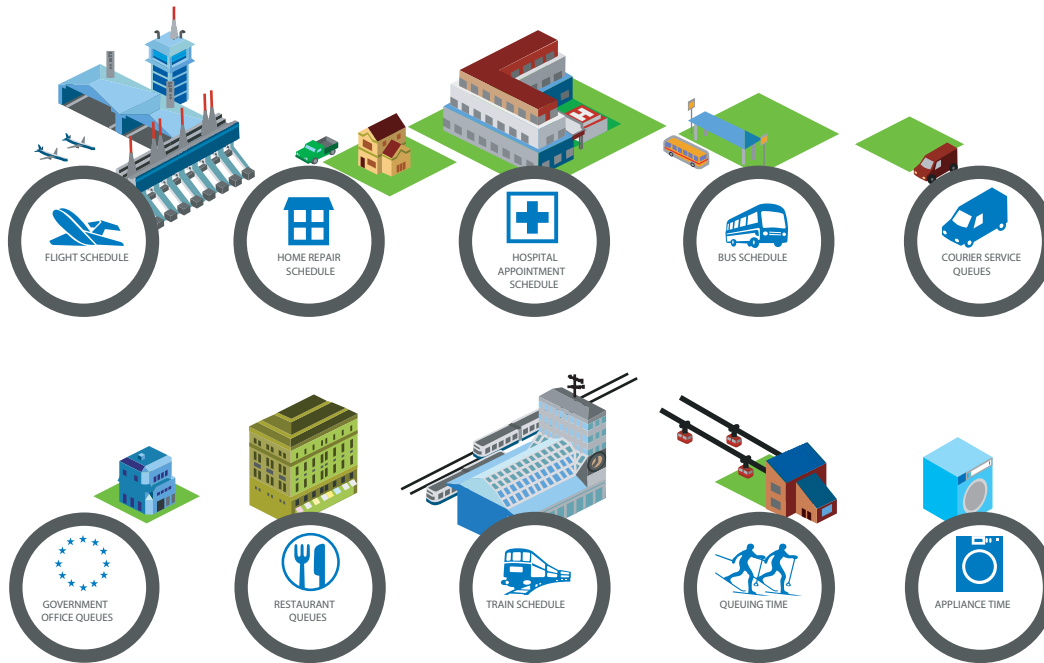TIME. FLUIDTIME IS A GOOD SUPPORT FOR THIS"

The importance of being fluid

The hypothesis behind Fluid Time is that our lives are
unnecessarily restricted by traditional timetables. Fixed
appointments and timetables are always subject to changes,
and these changes can be tracked using mobile technology.
So, while doing his Masters project at the Royal College of
Art, Michael Kieslinger designed devices that would tell
you how things were proceeding, so you could check if your
doctor's appointments were on time, delayed — or maybe
ahead of time, so that she could see you earlier than booked.
Or you could see if your flight from Vienna was still expected
on schedule.

In the second, experimental, phase, at Interaction-
Ivrea, Kieslinger and his team of designers and engineers
designed two fully working prototypes and tested them in
real situations. The first was the Interaction-Ivrea communal
laundry service: they asked students what kind of device
would help them book, control and monitor the washing
machine in the basement. The second prototype, a bus-
monitoring system for Turin, was handled in another way:
they designed devices from their imagination and then
encouraged people to live with them in the real world to test
them.

In Turin, luckily, the current location of all buses is
openly available on the Web. So the team designed interfaces
which allowed users to glance at their mobile phone or
perhaps their watch, to discover when the next buses would
arrive at their stop. The user feedback was interesting.
One subject found that she could adjust her walking speed
to arrive just on time for the bus; another found she no

FLIGHT SCHEDULE

HOME REPAIR
SCHEDULE

HOSPITAL
APPOINTMENT
SCHEDULE

BUS SCHEDULE

COURIER SERVICE
QUEUES

GOVERNMENT
OFFICE QUEUES

RESTAURANT
QUEUES

TRAIN SCHEDULE

QUEUING TIME

APPLIANCE TIME

FLUID TIME COULD BE USEFUL IN A WIDE RANGE OF ACTIVITIES

longer had to endure the 'dead time' when she wasn't doing anything; a third appreciated the fact that he could save time by slotting in more activities; and one simply liked playing with his device and watching the bus icons as they moved across its screen. "This experiment taught us that people are very different in their reaction to technology," said Crampton Smith. "We must design devices that give them the freedom to use them in the way that suits them best."

Wrapping up her presentation, she stated, "I want to end on the need to make a difference." She quoted Philip Johnson-Laird, who said that "Research isn't research until it's communicated", adding that she would take this further and say that research isn't research until it makes a difference. "Maybe I don't really believe that," confessed Crampton Smith, "but I remain frustrated that, after 20 years

of interaction-design research and many excellent ideas about improving human-computer interaction, we are still spending our lives hunched in front of a tiny screen staring at Microsoft Office!"

So just how do we make all that research make a difference? Crampton Smith argued that communication is certainly necessary, but with careful thinking about to whom, and why, and, "how can they digest and retain it." Designers should think more about bringing new products into the world, she added: "Are they culturally desirable? Technologically feasible? Economically and politically sustainable?" This is necessary because, as she concluded, "design must add to the richness and strange beauty of existence. That seems to me a duty that all designers, including interaction designers, owe to the world."