

## Closing the circle

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**Abstract:** This paper describes a personal journey beginning at the Department of Design Research (DDR), Royal College of Art in 1967 under the leadership of Bruce Archer and culminating in the newly formed Design Innovation Research Centre (DIRC) at the University of Technology Sydney under the guidance of Kees Dorst in 2015. The paper compares the processes and outcomes of the two centres in shaping design research with a particular focus on design in the public sector. The paper concludes with some reflections on the influence the different approaches have had on the way designers design.

**Keywords:** history; public sector; theory, design thinking

### Introduction

The 50<sup>TH</sup> anniversary of the Design Research Society has prompted a personal reflection on a life linked with design research from a time close to its beginnings extending to where we are today. My role in this journey has been part guinea pig, as designer testing new methodologies under the scrutiny of researchers, part teacher of design methods and part practitioner. I am not, however a practicing design researcher and offer this contribution more as an outsider observing a period important to the history and the development of design research.

In retrospect the influence of the public sector in furthering the interest of design research was somewhat unexpected. The possible reason for this is briefly explored at the outset of this paper. The remainder is a chronological account of design research through personal experience and does not profess to recount all that occurred during this period. The Victoria and Albert Museum archive holds extensive records of research activities at the Royal College of Art from the early 60's to the 80's. Those records were indispensable in forming this account, as were meetings with colleagues of the period. During this time one of the pioneers of design research L. Bruce Archer established the Department of Design Research



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(DDR), the first of its kind in the UK. Trained as an engineering designer L. Bruce Archer joined the Royal College of Art in 1962 following a one-year guest professor role at the Hochschule fur Gestaltung, Ulm. While in Ulm he was tasked with bringing together two factions. One faction viewed design from a science perspective and the other from an artistic viewpoint. This experience proved to be influential in forming his understanding of design and in establishing the structure of DDR. Crucially there was a symbiotic relationship in the Department between design consultancy projects, mostly with government departments, and academic research.

## **Design in the public sector**

### *Tendering public sector projects*

The public sector is a major purchaser of manufactured goods, yet unlike consumer products where the designer works closely with the client, designers rarely form professional relationships with public servants. The tendering system of purchase, aimed at reducing corruption, discourages such collaboration. Designing for the public sector nearly always entails responding to a detailed brief in the tender document with no opportunity for the design consultant to question underlying assumptions. However where circumstances allow for academic institutions to form relationships with government departments it is possible to explore more fundamental issues and conduct research rarely possible in the private sector. In the case studies below both Universities undertook design related problems in the public sector and utilized the projects to simultaneously conduct design research.

### *Design research as a discipline*

While the marriage of research and design into a distinct discipline in the 1950's was dominated by engineering systems it was in the 60's that British academics began the design methods movement with a focus on user needs (Cross 1984). User needs figured prominently in Bruce Archer's Systematic Method for Designers in 1965 (Archer 1965). Archer spent the next 20 years practicing what he preached, overseeing more than 100 projects employing his approach to design (Parkinson 2012). With one or two notable exceptions these projects were in partnership with the public sector. One such exception was a two-day workshop with Lloyds Assurance where Bruce utilized a design thinking approach (his words) to a problem not related to industrial design (Archer 1973).

### *Change in design research direction*

Fast-forward 45 years and the relationship between design research and the public sector holds good. The chance to explore new ways of approaching design and evaluating the results in the real world remains the cornerstone in legitimizing the discipline and it is the public sector that can offer this opportunity (Dorst, Kaldor, Klippan, Watson 2015). The major difference between the 1970's and now is the adoption of design methods outside the design profession. This change in context has provided new directions to design research

particularly in the public sector where complex, seemingly insolvable problems desperately seek a fresh approach (Pritchett, Woolcock 2004).

## **Department of Design Research (DDR) at the Royal College of Art (RCA) 1960's – 80's**

### *Key design and research projects*

Design research at the RCA will for some time to come be associated with Bruce Archer's ground-breaking design methodology exemplified in the development of a new standard for hospital beds for the National Health Service in 1967 (Swann, D. 2012). The project culminated in a product that ultimately changed the face of nursing in the UK. The radically new design was firmly focused on users, both staff and patients, with many of the features eliminating backbreaking manoeuvres. Over 500,000 beds were built to the specification around the world and many are still in use. The development of the specification and prototype bed design was lead by Kenneth Agnew. The project exemplified a new methodology for designers developed by Archer. A great deal has been written about this project; the design, the methodology and the man. Probably the most comprehensive account is by Ghislaine Mary Lawrence in her 2001 thesis "Hospital bed by design: a socio-historical account of the King's Fund bed, 1960 -1975" (Lawrence 2001 a). Lawrence recounts the complex journey of the King's Fund bed and the significance of Archer's design method within the project and beyond to the wider design community. It makes for fascinating reading but only tells part of the story of what went on in DDR. During its 20 years of existence DDR contributed a great deal more than the bed project. This included the design of many socially oriented products, the first interactive computer aided design (CAD) programs, and an ambitious and ultimately successful project to introduce design into secondary schools. All these projects were underpinned by the Archer design method and with the benefit of hindsight reveal much about the successes and failures of one of the first and most influential design method movements anywhere in the world. As in any new creative movement the leader, Bruce Archer played a pivotal role. Until his retirement in 1988 his focus was firmly on developing design as a knowledge based discipline comparable with those of science but with its own unique framework. He was ably supported by a team of researchers and designers contributing to the understanding of design, the role of design in society and the meaning of design research. (Archer, B. 1981)



Figure 1 Bruce Archer (on the right) examining a hospital bed with the Kings Fund bed designer Kenneth Agnew (on the left) circa 1965

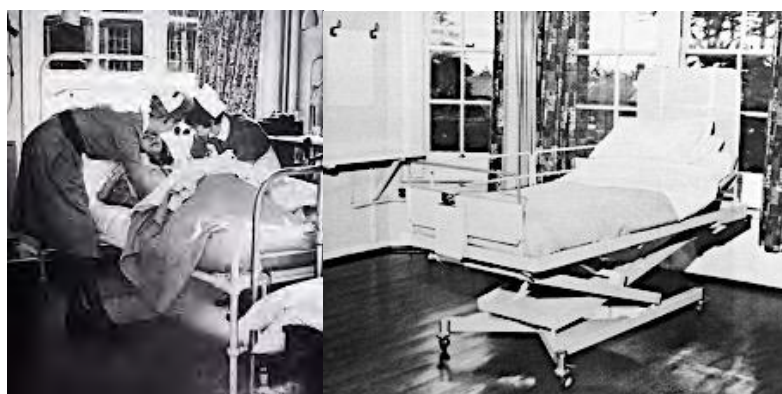


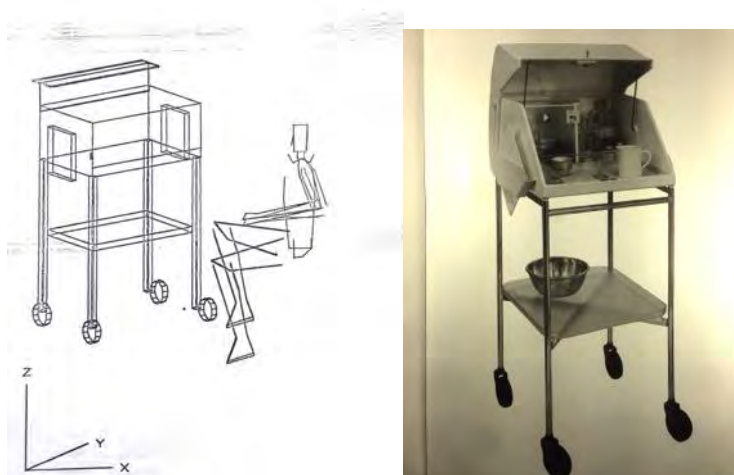
Figure 2 Pre-existing hospital bed and prototype Kings Fund Bed

### *Ethics and project diversity*

Ethical considerations were ever present in the Department, encouraged by a new student awareness and active participation in the policies of the RCA. This was a time when many students in the UK and elsewhere felt empowered to question all aspects of life that impacted on them. Distrust of authority led to many conflicts between students and police in the late 1960's. Despite funding pressure (all research fellows were responsible for their project funding) no work was undertaken unless it was seen to have value to society. One project, the design of command and control rooms for the Glasgow Police Force, narrowly escaped rejection (Wood 1975). However when completed the project did show evidence of social contribution. The new control room resulted in a significant reduction in emergency response time, saving lives (Wood 1976). New ergonomic specification for control room staff was also developed as part of the project, with wider application for computer operators (Wood 1975). Ergonomics is a design element well suited to measurement, test results can be quantified, and as such it was a valued tool in DDR. This was particularly evident in early CAD work. In collaboration with Nottingham University a computer-based avatar was created to "virtually" test proposed hospital equipment designs. The stick figure avatar was

used to assess nurse bed making and lifting under a variety of situations. (Archer, Mallen 1973) In hindsight it does seem incredible that with extremely limited computing power researchers developed interactive software that enabled users with a light pen to perform a bed-making task and be alerted when an action was ergonomically inappropriate. The software was ultimately commercialised with the acronym SAMMIE (Das & Sengupta 1995). These examples like all DDR projects were centred on the user. Understanding the user viewpoint was seen as a key to successful outcomes whatever the problem.

With design beginning to be seen as a legitimate university activity, if not a science, the value of the discipline in other spheres was not lost to Archer and a number of his colleagues. They fervently believed that design offered a way of approaching problems in every aspect of life. To this end Archer established a spin off department with the aim of introducing design at all levels of education (Langdon 1969). Design, he believed should rank alongside numeracy and literacy as the three pillars of education (Archer 1979). It could be argued that design education research at the RCA provided the groundwork for the eventual introduction of Design and Technology as a secondary school subject.



*Figure 2 Print out from interactive computer aided design program with “nurse” and hospital medicine trolley 1973 and resulting prototype*

### *Lloyds Life Assurance design project December 1972*

This project deserves special attention from the perspective of design research history. Firstly I am not aware of any previous use of design method to solve problems outside of design and architecture. Secondly it was the only DDR project to be condensed into a very short period. Preparation and running the project spanned two months including three intensive workshop days (Wood interview 2015). This contraction of the timescale and the requirement for non-designers to engage with the process brings the Archer method into sharp focus and allows comparison with design thinking methods in use today. Underlying the project was Archer’s view that a properly structured methodology related to the manipulation of information by sets of problem solving rules and was therefore independent of the actual content of the information itself (Archer 1965). This project provided a unique

opportunity to demonstrate that a method developed for designing artifacts was equally appropriate to problem solving elsewhere. The problem, defined by Lloyds, was the need to gain the competitive edge over rivals in the emerging pension policy market (Tester 1974). The information providing the context for a solution was a complex mix of legal, brokerage, shareholder and end user data. This was, in today's terminology, a co-design exercise. Following four preliminary meetings a mixed discipline group of 14 individuals were isolated from any distraction to resolve this issue. While a hierarchy was specified in the planning documents (with both a chairman and project leader overseeing workshops) the structure was kept informal. Participants were required to dress casually and care was taken to prevent "extreme embarrassment" should anyone feel they were not contributing. Concern that personality clashes might affect the quality of the outcome was documented. However there was no evidence that this did occur. The process involved ten distinct steps (Tester 1974) In keeping with the Archer method a list of carefully prepared elements (nine in all) viewed as essential for success were tabled followed by the generation of a stakeholder list (ten in all). The workshop produced 30 attributes a new policy should have and developed a matrix of attributes and stakeholders. New policy ideas were generated referring to the element list and the matrix. The concepts were then ranked with respect to the matrix, revealing the preferred options. Lloyds declared the process a success with three new pension schemes outlined. Perhaps of greater significance (from the client perspective) was the realisation that staff that had never met as a group and who were schooled in a "conservative meticulous attention to formal procedure" could operate successfully in such a novel environment. A full account of the exercise can be found in the School of Design student publication North Carolina State University volume 23 1974. How this knowledge changed company structure, if at all, is not recorded. The Lloyds exercise was deemed newsworthy. The Times ran a story entitled "Heads down in the Lloyds think-tank" while the workshop was still in progress (Speigelberg 1972).

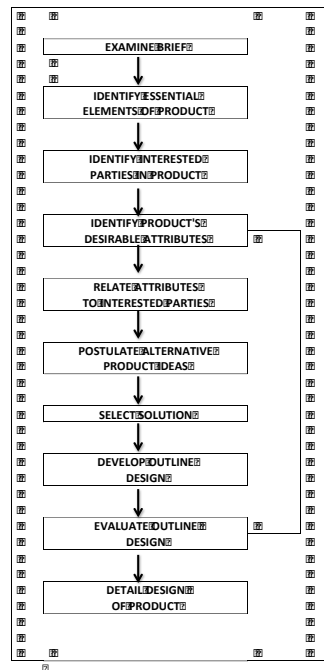


Figure 3 Lloyds workshop list of steps



Figure 4 Lloyds workshop in progress. Bruce Archer is top left. 1972

### Reactions to the DDR methodology

The DDR method had its critics in the 60's and 70's. G. Broadbent said the methods neglected humanness, values and emotion or judgement (Broadbent 1979). It was also thought that the concentration on detailed information research would never deliver all there was to know about a problem. Therefore the idea that a full and exact exposition of a problem would contain the solution was a fallacy (Broadbent 1979). Some departments in

the RCA were hostile to Archer's methods, Fashion and Textiles particularly so. There was a view that a rigid formulaic approach to design led to a stunting of creativity. It was true that the design profession, as distinct from design academics, showed little interest in systematic design method (Lawrence 2002 b). These opinions are understandable especially when based on text alone and not through participating in the process. I could find no direct response to the Broadbent criticism, but my view and the view of other DDR design staff was that the Archer method provided a unique and invaluable scaffold for approaching design problems. Systematic method for designers was not widely adopted outside of DDR. However the process did enable a cluster of successful social sector products and the development of early CAD software. More importantly systematic method helped facilitate a positive change in attitude towards the role design could play in commerce and in improving government services. Design was taken seriously.

5 Synthesis				
5.0	Receive instructions	74-76	76	commission received to execute P1:5
5.0.1	send acknowledgment	76-77	77	acknowledgment despatched
5.0.2	bring files and progress machinery up to date	75/76/77-78	78	files and progress machinery up to date
5.1	Resolve remaining problems about ends (note that, in general, solutions to problems about ends will pose problems about means)			
5.1.1	reappraise the performance specification prepared under 4.3.8 and the list of intractable problems about ends prepared under 4.3.9 and prepare a new list of unresolved problems about ends	64/65/69/76-79	79	revised list of unresolved problems about ends ready
5.1.2	for each problem in the list prepared under 5.1.1, list the factors in the problem	79-80	80	list of factors in sub-problem ready
5.1.3	identify the goals to be achieved and the constraints or conditions to be satisfied	79-81	81	goals and constraints or conditions sub-problems identified
5.1.4	establish the connections between the factors (or the goals and constraints or conditions)	80/81-82	82	connections between factors established
5.1.5	identify similar or analogous problems in prior experience	82-83	83	analogous problems in prior experience identified
5.1.6	identify similar or analogous problems handled elsewhere	82-84	84	analogous problems handled elsewhere identified
5.1.7	catalogue the properties of the analogous problems and re-express each within a common format	83/84-85	85	analysis of analogous problems complete
5.1.8	re-express present sub-problem within the format developed under 5.1.7	82/85-86	86	re-expression of sub-problem within common format complete
5.1.9	identify those factors in the sub-problem for which the data values may be voluntarily fixed by the designer	86-87	87	factors where data values are voluntarily assignable identified
5.1.10	identify those factors in the sub-problem for which the data values are fixed by external influences	86-88	88	factors where data values are externally fixed identified

Figure 5 Section of the Archer systematic method showing the detail steps and cross-referencing

## Intervening years

Much of the time between 1980's and 2000 might well be considered the dark age of design research, over shadowed by postmodern reasoning with its emphasis on cultural relativism and lack of objective reasoning. Exceptions were Nigel Cross and others who delivered new insights thus keeping the debate on design research alive (Cross 1994). At the end of the 90's the economic success of well designed hi tech products alerted businesses to the importance of design and the benefits of participating in creative processes. During the same period universities virtually mandated that design staff reach doctoral level to teach design;



as a result design methods were explored in depth by this new wave of design academics. Both design and design method became hot topics resulting in a rush of publications, new courses and new vocabulary. Design thinking and innovation reached a status in business, academia and even government not dreamed of in the 60's.

## **Design Innovation University of Technology Sydney (UTS) 2009 - 2015**

### *Design innovation and design research*

In 2009 the University of Technology Sydney teamed with the Justice Department NSW to form a research centre aimed at reducing crime by design intervention, the Designing Out Crime Research Centre (DOC). Predominately working in the public sector the concept centred on bringing design method to complex issues that often results in criminal or anti social behaviour (Watson 2013). While new physical, tangible products were seen as valuable outcomes to the Centre's work the wider brief was to bring in design thinking to create new systems, structures, indeed any innovations likely to keep the community safe from criminals. This was not the first time crime and design had been connected academically (Wortley, Mazerolle 2013). However DOC did provide the first opportunity to study, develop and publish design method as practiced on live and pressing problems in the Australian public sector. The mastermind of the Centre's approach was Kees Dorst. Kees arrived in Australia in 2007 having practiced, taught and researched design in his homeland Holland where he engaged with industry leaders and government agencies on strategy and coping with technical change. A new way of thinking on how design might interact outside the discipline was evident in his first book, *Understanding Design* (Dorst 2003). Perched on the three-legged stool of research, consultancy and education DOC has completed an impressive number of projects, many involving students, and staff papers in two disciplines: design and criminology. Over a period of five years a problem solving process emerged, a combination of a method articulated by Kees and refined through practical application. The resulting "Frame creation", a nine-step process is now the subject of two books, learned articles and workshops (Dorst 2015). The method provides a platform for innovation well beyond crime prevention. The success of DOC and the Kees Dorst method did not go unnoticed in the wider university community outside of design. The new VC (appointed 2014) placed innovation as a top priority for UTS and as a consequence the "Design Innovation Research Centre" was formed in 2015, bringing together many of the University's creative thinkers in a partnership which included the DOC team (DIRC 2015). The largely open plan office houses 20 plus staff, overseas guests and PhD students. Whiteboards, butcher paper notes, table tennis and generous refreshment facilities dominate the space. An informal drinks and music session starting 4 pm every Friday replaces brain storming around the printer. An atmosphere of collegiality, exchange of views and a sense of purpose is pervasive. While it is too early to predict if this hub of activity will contribute to design research similar to DDR the signs are positive. The Centre is forming new relationships; some

with international bodies such as UNESCO, others with local and federal government departments in addition to key Universities in Europe and the US. It is the design-based methodologies that underlie these relationships.



*Figure 6 Kees Dorst presenting his “frame creation” approach to solving complex problems. UTS 2015*

### *The DIRC research approach*

There is no single approach to problem solving in DIRC. The coming together of such an eclectic group means there are many paths practiced in reaching new solutions. However two tend to dominate. The aforementioned frame creation and the second “design led innovation” developed by Sam Bucolo (Bucolo & Matthews 2011). The context of the former is local government, international issues, social problems and higher education. The design led innovation approach is focused on industry, building government links and initiatives to facilitate change in medium size Australian companies. Common to all methods in use in DIRC are three elements - user focus, co-design and a set of design tools that aims to extract key understanding and insight throughout the journey. 30 design tools have been identified (Watson 2013).

Symbolic of design method and research in DIRC are end-to-end workshops, seminars, focus groups and presentations. Active participation in process with clients, stakeholders and DIRC staff blurs the distinction of roles and responsibilities. The objective is to transfer problem-solving skills rather than seek repeat business.

### *A recent DOC project in the public sector*

Many of the projects undertaken by design innovation staff at UTS have been described and reviewed in journals and the press (DOC website). This particular project has been selected to elucidate the methodology common to most. The problem concerns the high level of recidivism in Australian prisons. One study put the figures at 52 per cent of non-Aboriginal people, and 88 per cent of Aboriginal people return to prison within five years. (Harding,

1995). Many have a history of social disadvantage and lack basic numeracy and writing skills. The early stages in the frame creation process identified education as a key way of tackling recidivism. (Other opportunities were noted but most fell outside the time inmates were incarcerated.) Educational programs in jails have had limited success, with few enrolments and high dropout numbers. The issue was how to increase certificate level education in high security correctional centres. In keeping with the reframing problem solving approach all the stakeholders were engaged in the redefining (reframing) process, including prisoners. Once the key issues were identified it became clear that a paradox stood in the way of an acceptable solution (identifying paradoxes is a key process step in reframing). Put simply an ideal learning environment is in total contrast with the typical prison environment. Prison design is essentially about managing risk; risk to staff, risk of self-harm, risk from fellow inmates, risk of escape and not least political risk. The result in design terms is what has been described as “cold conservatism” (Clear, Candora 2001). A bleak, harsh aesthetic where all furniture is steel and fixed, inmates are separated from staff by bars or glass, lighting is unforgiving and all nature is removed should it interfere with surveillance. In contrast the current wisdom is that learning works best in stress free, comfortable, flexible spaces with natural light that encourages emphatic relationships and a focus on the task. Understanding the root of this paradox, managing risk, proved to be the key in reaching a resolution. With the knowledge that an emphasis on risk control had such a strong influence on the physical space it became possible to explore other risk management approaches. It transpired that overseers (key in determining control arrangements) believed risk in all its forms was less likely when inmates were not tense or harassed and engaged in purposeful activity. The reframing of an educational place was then possible, with dramatic results both in terms of the resulting architecture, interiors and landscaping but also in the high numbers of graduates (Lulham 2015). The reframing process works well when designers join with non-designers in a co design partnership, indeed this shared responsibility is a core requirement. The full case study with reference to frame creation methodology can be found at: [www.designingoutcrime.com](http://www.designingoutcrime.com) (Intensive Learning Centre)



Figure 7 top: existing prison architecture and cell interior. bottom: reframed learning space

## Reflections

As a practitioner of Archer's systematic design and of frame creation I can vouch that they both "worked". The creators of the differing approaches have been vindicated in multiple tests of their methodologies. Clients got the results they sought and the design academic community was provided with much to occupy their minds. Public sector projects proved to be ideal for conducting design research. Both methods strive to provide the problem solver with the necessary information to arrive at the all important light bulb moment and having lit the bulb translate the breakthrough into practical, socially relevant solutions. That moment of insight, the flash of inspiration still remains much of a mystery; at least to the extent it cannot be replicated at will or by computer. The power of computing with respect to much of the design process was clearly foreseen by Archer. Systematic method with its mathematical underpinning was well suited to data processing. On the other hand frame creation relies little on computing power or for that matter on a comprehensive collection of data. The necessary information and the source of the solutions dwell rather in the minds of participants, the process merely unlocks that which resides within. The two approaches to problem solving can be seen as products of their time. In 1970, the dawn of the computer age, it was appropriate to reduce problems into small bite (or byte) size pieces. It is perhaps the degree in which computing is absent today in the development of new problem solving methods that would have been surprising to Archer. That said I feel he would be delighted to see how innovators and problem solvers outside of design have embraced processes developed within the discipline. This is proof, if proof were needed that design research is as

legitimate as any research in the sciences. The shift from an exceedingly systematic approach to a more intuitive, value weighted process could be a reflection of the changing way we view the world. Currently there is a responsive often-passionate connection with the built environment that was not present in the 60's. An "emotional design" approach has inspired some of the best of our buildings, products and communication systems (Norman 2005). Until software has emotional sensitivity it's hard to imagine computing playing a key role in design research as it did 50 years ago. Pending that game-changing breakthrough, understanding the fascinating complexity of human thought and then innovating new ways of doing things appears best tackled by creative, connected individuals. Improving process to advance this endeavour seems likely to occupy the design research community for some time to come.

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