

HORSES, ELEPHANTS AND CAMELS CHALLENGES AND BARRIERS TO INTERDISCIPLINARY USER-CENTRED DESIGN RESEARCH

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1. Abstract

User centred design research methodologies are usually adopted to inform design practice. Here, this paper proposes a case for the potentially key role of design practice, and the value of artefacts, as a fundamental methodological approach to user-centred research. This paper reflects on the evolution of design research and the growing recognition of the value of interdisciplinary user-centred research methodologies in product development. The paper will describe three practice based design research case studies, directed by the author, that highlight the challenges and limitations of more traditional user-centred research methodologies. The paper will demonstrate and help define the role of design as research (critical design), and the key role of artefacts as tools to access tacit knowledge and as an aid to communication in the context of research. There is a wide spectrum of ways in which users are involved in user-centred design activity. Generally users are consulted about their needs and involved at specific times during the design process typically in the early stages to establish requirements and later for usability testing. There currently exists few case studies that challenge and clearly define the value of user engagement in design research and articulates designing as research. This paper presents a case for a user-centred design research method where ‘users’ and other stakeholders are involved as concurrent partners with the designers throughout the design process.

2. Design Research? – background

Formal research practice has only impacted industrial design relatively recently having typically taken an intuitive rather than a methodology based approach. It is only in the past few decades that industrial design literature articulated the role and value research. The design community, reluctant at first, has now begun to recognise the value of research and research methods in design, and it is now common place to adopt appropriate research methodologies to inform design activity. There is however considerably less evidence and acknowledgement of the value and role of '*design*' in research or as research.

There has been, and still often, a lack of distinction between research and the ‘gathering of information’ and the distinction between ‘research’ and ‘advanced practice’ within Art & Design. Sir Christopher Frayling [Frayling 2003], Rector of the Royal College of Art presented some clarity as he described the distinction between; ‘research for design’, ‘research about design’ and ‘research through design’. He makes the point that ‘research’ need not mean ‘academic research’ or ‘scientific research’. It simply means ‘an enquiry whose goal is new and communicable knowledge’.

The definition of research can have different meaning and purpose to different communities. To designers, research is often most helpful when it inspires something new or validates a direction of

enquiry, but to scientific researchers their methods have often been viewed as crude and lacking rigour.

'Research' activity is evident in the work of Henry Dreyfus [Dreyfus 1955] one of the early pioneers of industrial design. In describing his work he said,

"I have washed clothes, cooked, driven a tractor, run a diesel locomotive, spread manure, vacuumed rugs, and ridden in an armored tank. I have operated a sewing machine, a telephone switchboard, a corn picker, a lift truck, a turret lathe, and a linotype machine. When designing the rooms in a Statler Hotel, I stayed in accommodations of all prices. I wore a hearing aid for a day and almost went deaf. I stood beside a big new gun at Aberdeen Proving Grounds when it was fired, and was catapulted off my feet. Members of our office have spent days and nights in airport control towers and weeks on a destroyer during maneuvers. We ride in submarines and jet planes. All this in the name of research!"

This approach allows the designer to develop empathy with the user through direct contact with context and activities. This first hand experience approach 'the task in hand' has been widely adopted by designers but still tends to lack academic recognition. Evidence of activity that integrates research methods from the sciences with design processes outcomes and case studies have begun to establish credibility and validate the field of 'design' research, When a design team includes those with expertise in scientific research methods there can be a heightened level of sophistication attached to the design process.

3. Methods of engagement

3.1 User -centred

'User-centred' design methods have been widely discussed, within product design discourse, and also in the disciplines of human computer interaction (HCI), human factors engineering and ergonomics. McDonagh-Philp suggests the following definition of user-centred design [McDonagh-Philp 1998]: *"User-centred design is a design methodology that utilises the target product users as a designing resource to increase the understanding of the design practitioner."*

The term user-centred design is widely attributed to Donald Norman in the 1980's and became widely used after the publication of his co-authored book 'User centred systems design'. He developed the concept further in his seminal book 'The psychology of everyday things' [Norman 1988]. Norman stressed the need to fully explore the needs and desires of the users. The need to involve users, often in the environment in which they would ultimately use the product being designed, was a natural evolution in the field of user-centred design. Users became a central part of the development process.

It is often difficult to precisely identify who is the 'user' of a product or system is. There is often more than one user and the user is not necessarily the person who will purchase the product. There are generally accepted three types of users, primary secondary and tertiary. Primary users are those who actually use the artefacts, secondary users are those who will occasionally use the artefact or those who use it through an intermediary, and tertiary users are persons who will be affected by the use of the artefact or make decisions about its purchase. Human-centered design is a broader concept, an holistic approach that explores the relationships between the designer, the various end-users, and the other 'stakeholders' within the system of production and consumption. This may include those who manufacture, transport, sell, carry out maintenance, or dispose of the product or system at the end of its useful working life. The successful design of a product or system must take into account the range of potential stakeholders.

User engagement in the design process has often operated in the form of usability testing. This generally involves potential users in real testing of products and systems where they can be observed and questioned. Engagement can take place with prototypes in the early stages of development and more resolved design solutions at the latter stages of development informed through analysing data obtained. With the users involvement this can inevitably improve usability, functionality and ergonomics but often does not allow users to inform early stages of fundamental research.

However 'usability' has limitations as participant numbers are often small, it does not always cover all the 'operational' features and it is hard to ascertain how the product is going to perform over a long

period of time in the real environment. The problem often arising from a designer's perspective is that early concept ideas are difficult to 'test' with users and can easily be dismissed if misunderstood.

3.2 Questionnaires and observation

The use of questionnaires is an embedded and widely tested method in engaging and understanding users, or stakeholders, for research. The questionnaire is essentially a structured technique for collecting primary data, a series of written questions for which the respondents have to provide answers. If a questionnaire is well designed it can give accurate and useful information and should provide reliable and relevant data. A questionnaire can be used as an 'inductive' method with the aim to formulate new theory, where open-ended questions are used to explore a substantive area. Alternatively questionnaires can be used as a means of collecting reliable data in a 'deductive' approach in order to test existing theory. Questionnaires can be a useful tool if the questions asked are carefully considered and importantly the responses are critically analysed. There is a danger, questionnaires can confirm past prejudices and breed mediocrity and dullness. If Henry Ford had asked his 'users' prior to the invention of the internal combustion engine what they wanted they might have responded with a need for faster horses (figure 1). It takes a creative leap of imagination to interpret user needs and meet these through products and services that 'may not exist with users naive to the fact that they will want them. Would the Wright brothers have invented the aeroplane based on a questionnaire, or Edison the light bulb?

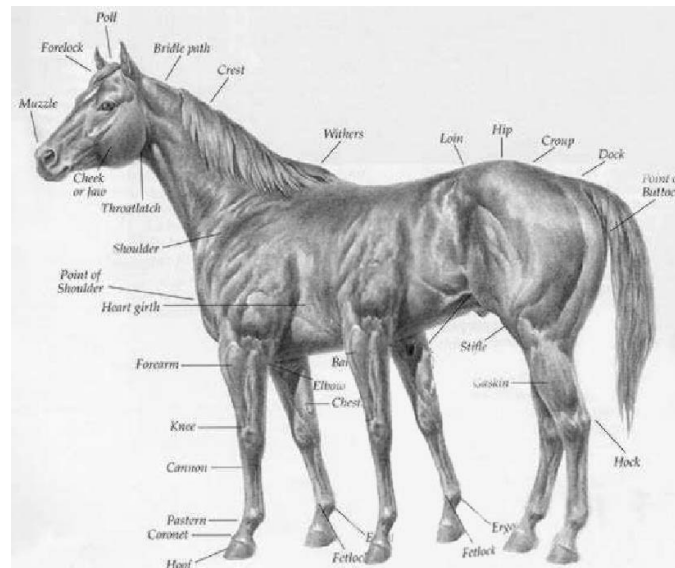


Figure 1. How Henry Ford may have responded to his users

As reported by [Light 2002] business consultant Martyn Perks controversially presented a case highlighting the 'limitations of user centered design' with a view that business is now emphasising the user at the expense of creativity and innovation. He states a case that 'user research' often treats the user with disdain. 'There is a 'them and us' mentality in working with users where users are treated not as subjects but as objects. If you ask users, they will not tell you the whole story, they will tell you the banal, because users often act subconsciously. User research is about today, not the future, while innovation is a leap of imagination. Asking someone what they want is different from observing what a person might need and there are different tools for doing so'.

Observation has a long tradition as a methodology in the social sciences and participant observation is a central method for data collection in ethnography. Observation includes listening as well as looking and everyday face to face interaction depends heavily on both verbal and visual behavior. Therefore alongside observation, ethnomethodologists have directed much of their attention to conversation analysis, since they see language as the fundamental base of communication and social order. Using audio and videotaping they gather data that can be analysed extensively. Qualitative approaches to observation are much more unstructured, the logic that categories and concepts for describing and

analysing the observational data will emerge later in the research during the analysis rather than being brought to the research or imposed on the data from the start.

Limitations of observational techniques are findings may only reflect a unique population and therefore cannot be generalised. There are also problems with researcher bias. Often it is assumed that the researcher may 'see' what they want to see. There are generally two approaches to observational methods. Direct observations where people know you are watching them. The danger here is that they could react to the observer and change their behavior. Unobtrusive observation involves methods for studying behavior where individuals do not know they are being observed. Inevitably the major challenge to this approach is addressing the ethical issues.

3.3 Tacit knowledge

Polanyi has been widely cited in the context of tacit knowledge [Polanyi 1958]. He speaks on the role of language of communicating knowledge While suggesting that language is a vital tool we can use to share knowledge, he also emphasizes that we can often know how to do things without either knowing or being able to articulate to why what we do works. *'We can know more than we can tell.'* He goes on to suggest that some types of knowledge have limited capacity for transfer. Making which cannot be specified in detail cannot be transferred by prescription, since no prescription for it exists, it can be passed on only by example from master to apprentice. The 'things we don't know we know' can be described as our 'tacit' knowledge and as Polanyi says we often find intuitive tasks difficult to articulate. It is a design researchers challenge to access this tacit knowledge and adopt accordingly appropriate research methodologies. Sveiby's simple test provides a useful example to demonstrate tacit knowledge. To test your tacit knowledge he constructs a simple challenge to touch your nose with your index finger with your eyes closed. Most people have no problem achieving the task within a few seconds however the majority have great difficulty when asked to describe how they did it in detail. Articulating how you held your index finger, every movement your arm was doing, all different angles, all the way up to your nose.

4. Interdisciplinary research

We use our analytical skills to divide the world into smaller and smaller units hoping that in understanding the parts we will eventually understand the whole. Our schools, colleges and universities teach us that knowledge is divided into academic disciplines. The more schooling we have the more entrenched our disciplinarity can become. Discipline becomes the rationale for our institutional structure.

The story of the six Blind Men and the Elephant, as a parable regarding the fact that people tend to understand only a tiny portion of reality and then extrapolate all manner of dogmas from that, each claiming only *his* one is the correct version, has re-appeared a number of times in both Western and Oriental thought. Popularized by the nineteenth century American poet John Godfrey Saxe, the poem describes how the blind men stumble across an elephant for the first time. The first man approaches and feeling the elephant says, 'It is very much like a wall', the second feeling its tusks, 'it is like a spear', the third it's trunk, 'like a snake', the fourth its tail, 'like a rope', the fifth its ear, 'like a fan' and finally the sixth blind man feeling its leg, describes it 'like a tree'. All present a logical interpretation but their perceptions are misguided as they are unable to establish an holistic understanding of what they have encountered. This can be similar to our limitations in research when we are only able to establish a partial understanding.

Collaboration through interdisciplinary working can lead to a more holistic understanding. As Newell [Newell 1998] points out, we need the depth and focus of disciplinary ways of knowing, but we also need interdisciplinarity to broaden the context and establish links to other ways of constructing knowledge. Multi disciplinary must not be confused with interdisciplinary ways of working, Interdisciplinary work should be a more integrated seamless approach to collaboration with unified common goals achieving a higher level of disciplinary integration. As opposed to a patchwork approach where disciplinary groups work 'together' but within their own specific disciplinary boundaries.

Despite increasing interdisciplinary activity our organisational frameworks often define our experience and understanding of information. To combat this researchers within the Art & Design Research Centre and the Centre for Health & Social Care research within Sheffield Hallam University have created a cross faculty research community Lab4Living. (Lab4Living.org.uk). Its aim is to propose creative strategies for the development of future living environments in which people of all ages and abilities 'not merely survive' but are empowered to live with dignity, independence and fulfillment. We adopt a holistic, human centred approach engaging stakeholders as concurrent partners in our research.

Engaging users in design research and product development has more recently been referred to as 'Participatory design' or 'Co design'. The terms can be contentious especially amongst the design community and there is minimal literature to date that clearly defines these methodologies and their value. Participatory design is credited to have emerged in Scandinavia born out of the labour unions push to have more democratic control in their work environment [Ehn and Kyng 1989]. This approach can develop a deeper understanding of the psychological, organisational, social and ergonomic factors that affect the use of the product. The involvement of users provides a platform where the product is more likely to be suitable for its intended purpose and can lead to products that will be more effective, efficient and safe. However while this approach helps identify needs, can inform product ideas and test them, design and designing as an activity is much more and involves sophisticated technical and visual understanding, issues related to production and manufacture, and an appreciation of commerce and business. 'Users' ability to constructively participate or collaborate, if at all, in these latter aspects of design, to date is less clearly defined, however there is potential benefit in engaging other stakeholders (not necessarily users). Of course this does not advocate designing by committee, a term referring to a style of design and its resultant output when a group of entities comes together to produce something, particularly in the presence of poor and incompetent leadership. The defining characteristics of "design by committee" are needless complexity, internal inconsistency, logical flaws, banality, and the lack of a unifying vision. One maxim is that *a camel is a horse designed by committee*; attributed to, among others, Sir Alec Issigonis in the context of industrial design

5. Case studies

Barriers to adopting user-centred approaches to product development are that it can be costly and time consuming. It requires diverse skills and there can be challenges to understanding cultural and language issues.

The following case studies describe design practice as research that has emerged from the Lab4living research team that build on a research methodology at the Art & Design Research centre at SHU where making is central to research enquiry and applied knowledge. The case studies highlight the challenges in implementing some of the research methods mentioned and highlight the role of prototypes and artefacts in overcoming some of these challenges. .

5.1 TAC-TILE sounds

Chamberlain [Chamberlain and Roddis 2003] describes the development of vibro-acoustic furniture to be used therapeutically, by children who are profoundly deaf, or both deaf and blind. The flexible modular furniture (Figure 2) allows people with sensory impairments to experience sounds and music, through the vibration of loudspeakers enclosed within furniture.

Early on in the project, the designers were able to discuss ideas with therapists and special needs teachers who had expertise in working with children with sensory impairments, and also with loudspeaker technologists, musicians and potential manufacturers (the stakeholders). However, because of their disabilities, the end users (i.e. the children) could not actively participate in the research. Traditional methods for engagement such as questionnaires, interviews, as discussed, were unsuitable. It was hard to establish empathy with the user by engaging in 'the activity' as Dreyfuss had done and ideas, concepts were difficult if not impossible to communicate and discuss in the traditional sense with the end user.

Only when the designers produced working physical prototypes could the research team interact with the user and develop any meaningful sense of understanding. The prototypes allowed the children to

control their own sensory experiences and establish a means of communication. The designers found that the working prototypes acted as a bridge between themselves, the therapists and the children, revealing new knowledge about the needs of the end user, and also as a catalyst for further research and investigation. A structured programme of development utilising the prototypes with special needs centres in the UK and Finland provided qualitative data that informed an iterative evolution of prototypes that ultimately was realised in a final solution supported by a programme for use.



Figure 2. Tac-tile sounds system

Traditionally new theory informs product development but in this case new theory emerged from the product (or artefact) itself, the products enabled research. In a sense we were designing back to front starting with physical things and concluded with new theory. The vibro-acoustic furniture emerging from the project is manufactured and distributed in the UK by Rompa Limited. In 2000 the “Tactile Sounds System” received two Millennium Product Awards from the UK Government Design Council. More than twenty further products have been developed by the design researchers engaging with stakeholders adopting this methodological approach and have impacted on Rompa’s approach to the development of new products, methods and programmes for teaching and therapy and most importantly improved quality of life for the sensory impaired users.

5.2 Medical Connector system.

This project aimed to minimise medical misconnection errors through the design of a non interchangeable medical connector system [Chamberlain et al. 2008]

The increasing complexity of medical interventions and the associated medical devices means that users are required to connect a multiplicity of external tubes to various types of diagnostic and therapeutic devices. A typical patient in a coronary care unit may have as many as 40 connectors. It is not surprising then that errors arise and recent incidents that have led to patient fatalities where drugs were administered intrathecally (via the spine) that should have been delivered intravenously (into the vein) has raised concern about the application of a single connector design to a number of incompatible applications. Our research brought together a multidisciplinary team to design and test a new system of medical connectors adopting a design led human factors approach not normally associated with medical devices. There is now significant pressure for research and development into a system of medical connectors that will distinguish between the different routes of delivery, so that

misconnections of this kind become physically impossible. The design of a non-interchangeable connector system can eliminate the possibility of misconnection, which has the potential for catastrophic results. An easily identifiable system should eliminate the common practice of customised labeling and reduce the time for clinical checking procedures. Clinical practice will benefit in terms of a safer, time saving system and should contribute to a less stressful working environment.

The research brought together expertise in general and regional anaesthesia, critical care medicine (Bradford Royal Infirmary), psychology and human factors (University of Leeds) and industrial design (Sheffield Hallam University) to develop an engineered design solution supported by a *novel* means of enhancing the discriminability of a new system of connectors through visual and tactile (haptic) cues. B.Braun Medical, a major international manufacturer and supplier to the health industry, provided technical expertise and market insight.



Figure 3. Haptic discrimination tests of connector shapes

A key research challenge was to devise methods to evaluate visual and haptic discriminations and affordances. According to Norman an affordance is the design aspect of an object which suggests how the object should be used; a visual clue to its function and use [Norman 1988]. How could the connectors' shape and texture aid identification and afford their use and method of connection? A varied set of connectors was designed and presented to users who were given timed tasks to identify their affordances (push or twist). CAD simulations were used to test visual affordances and physical prototypes were used to test and compare haptic affordances. The testing procedure involved 25 participants who were health care professionals working in the intensive care unit at the Anesthetic Department at Bradford Royal Infirmary. Participants were required to carry out matching tasks under controlled conditions using seven prototype connector shapes, with vision and with their hands and the prototype components hidden from sight behind a screen (Figure 3). The time taken to carry out the matching task was recorded, using a millisecond stopwatch. Tests were carried out with both gloved and ungloved hands, using standard latex-free surgical gloves and any identification errors were recorded. A statistical analysis of four conditions 1.blind/gloved, 2.blind/ungloved, 3.vision/gloved 4. vision/ungloved were recorded. These artefacts therefore simulated new user experiences for study. The research team realised “conducting user-based research in the setting of an intensive care ward was going to be an ethical and practical minefield”, using simulated experiences allowed such problems to be avoided. Physical artifacts were fundamental in conducting and evaluating the role of touch (haptics) in the discrimination and identification of small shapes appropriate for connector designs.

The project has produced generalisable knowledge about haptic affordances and a methodology for evaluating them, which may inform the design of other safety critical control systems and three patents have been filed relating to the innovative features of the connector design.

5.3 Future Bathroom

This project, funded by the EPSRC and facilitated by Chamberlain (P.I) Mountain (Co.I), Wright (Co.I.), Read (RA) and Burton (RA) as part of the Lab4Living team, is in progress and is about

improving the quality and design of bathroom products for older people. The challenge is to design quality products that all bathroom users would find acceptable as well as meeting the specific needs of older and disabled people.

The study adopts creative strategies in the design of bathroom furniture that can create space with the flexibility to evolve and grow to reflect and meets the changing needs of individuals and their families as they age. The aim of the project is to develop a robust methodology for fostering co-design dialogue between designers, researchers and older people (aged 50+), with chronic age related health conditions which lead to disability and frailty. Examples include arthritis, osteoporosis, stroke and macular degeneration.

The project is informing the design of a range of innovative and desirable bathroom prototypes (both bathroom furniture/products and assistive technologies for bathroom use) that are sensitive to the problems of living with disability, which do not stigmatise, are capable of manufacture and will demonstrate the principles we have developed. These cannot be disclosed currently due to IP issues. The project engages Ideal Standard as an industrial partner and experts within the field of disability and assistive technologies.



Figure 4. Community researchers collecting data and ‘personal bathroom stories’

A key challenge of the project is in engaging users in a familiar but what is generally considered ‘taboo’ subject matter. The bathroom is a space of private and intimate ritual and the research methods for developing an understanding of behavior has to be carefully considered. Questionnaires are unlikely to reveal detailed insight and observational techniques are restrictive. An extensive number of older users are engaged in the project (approx 80) through a series of structured ongoing workshops and represent independent, dependant, carers and professional carers. The workshops are recorded and transcripts created from the discussions for evaluation. To enable the project team to develop more user insight, community researchers (older users with disabilities) have been recruited to the project and trained accordingly. They have been visiting users in their homes (Figure 4) within the community interviewing them and recording their bathroom facilities. Because the community researchers are likely to have more empathy with the older users more intimate stories are emerging than are likely to have emerged through more traditional research methods conducted by the academic research team.

Initial discussions quickly informed design concepts in response as ‘what if’ scenarios. These sketch concepts were used to suggest design solutions and prompts to provoke further discussion and insight. Early abstract concepts are now informing tangible artifacts once again as prompts to further the research teams understanding rather than simply as pragmatic solutions. Artefacts, prototypes are key to the research and can aid in accessing users tacit knowledge by demonstrating the things they do through ‘doing’ rather than trying to verbalise the things they do intuitively. For example getting in and out of a bath, sequence of activities, psychological an emotional responses.

Key to the project is that the community researchers have been recruited to the project from the outset and are engaged in every stage of the research and product development. The approach is that we are researching and designing ‘with’ these users and not just ‘for’ them.

The topics of enquiry raises other interesting challenges and furthers the debate on defining the user? The user group while having the potential to inform the research on age related physical issues have very different experiences to that of younger users. Many have lived and experienced homes with a tin bath and outside toilet so their experiences and aspirations are very different to that of the future old. Therefore we have engaged as stakeholders ‘future old’ so we can meet both the physical and aspirational needs of a broad range of users. Culture and religion has a big impact on our washing and toileting rituals. In response we have extended our research with ethnic groups and academic partners in Asia to broaden our understanding of user behavior that might inform the development of our research methods and design solutions within the context of the future bathroom. Our industrial partner is a key stakeholder who brings a sense of commercial and technical reality to the project but our work is impacting on their approach to user-engagement and how it might inform their future product provision. In the final evaluation of key importance will be the value of and to the older people in the community who have been empowered through this process.

6. Conclusion

The case studies presented in this paper all involve complex user issues and present and highlight barriers to traditional methods of research in engaging them and developing further our understanding of their real needs. The ‘tac-tile sounds’ project involved deaf and deaf blind users where communication in the normal sense proved impossible. The ‘medical connectors’ involved a diverse group of users, clinical staff and patients, where the research was concerned with discrimination of objects through touch in a safety critical situation. And lastly the ‘Future bathroom’ project engages users in a very private topic of enquiry and concerns intimate activities that are difficult to observe.

Design and design research has evolved and progressed significantly since the early industrial design pioneers. Dreyfus’ methods are still valid and extensively used as a research tool for designers but the approach is limited. The case studies highlight the limitations of this method. It is arguably impossible to experience the world of a deaf and blind child, it is difficult to experience the impact of drug delivery in real world situations from the perspective of the diverse range of users, clinicians, and wide range of patients. We can engage and do experience bathroom related activities but ultimately the experience is limited when we need to consider, gender, age, culture, and disability issues. Current research, including that of the Lab4Living team, adopts and adapts technology that proposes simulated experiences so researcher can begin to establish empathy with a broader range of user issues. While these are welcome and developments will progress research in our understanding users it is often difficult to replicate true real world situations.

Defining the user can be challenging and in all case studies is complex. The extreme range of abilities of the deaf blind children and therapists who might use the tac-tile sounds system. The users of the medical connection system which will involve medics, nurses and patients who will range from the very young to the very old. And the Future bathroom project while considering the wide-ranging needs of the ageing population must not restrict usability for younger more able users, their future and consider the wide cultural user issues.

Adopting a more holistic approach to usability, a ‘human centered’ approach, can more readily support the needs of all the stakeholders and all case studies have facilitated their engagement in the research. Special needs teachers, therapists, deaf and blind children, musicians, acoustic specialists in the case of the tac-tile sounds system and nurses, medics, psychologists, human factors, engineers in the medical connectors project and older, disabled people, physios, occupational therapists in the Future bathroom. All projects have been design led and key stakeholder involvement in all case studies has been industry. Applied research often has to face the implications of commercial compromise. Industrial participation in research and their close engagement with users and other stakeholders might influence positive change in the products and services provided.

Case studies presented in this paper can be described as in Frayling's terms, ‘research through design’. Clearly all case studies demonstrate design practice as a core activity of the research and while this could be viewed positively as ‘advanced practice’, in isolation can not necessary be presented as research. However each design case study presented has a distinct research agenda and findings published accordingly, the tac-tile sounds system highlights the key role of artefacts as communication

and as tools to access tacit knowledge, the medical connector through controlled experiments provide us with measurable data on the role of haptics in discriminating small objects. The Future bathroom project currently in progress, while aiming to apply the research findings in the design of improved bathroom products will contribute to the more formal development of co-design methodologies in the context of research. This design approach where the objective is more than problem solving and the pursuit of 'solutions' might be described as 'critical' design through which we can define new knowledge in the process..

Design activity has traditionally been adopted once theory has been established by applying it tangibly to inform new products. Design is much more than visual embellishment and its role and contribution in fundamental research to enhance our understanding of users is gaining recognition. To date there are limited examples of case studies that demonstrate the broad value of design as an activity in research and more formal analysis of its role is needed to enhance its credibility in research activity. Interdisciplinarity, which all case studies exemplify, provides opportunities for new research methodologies and the creation of knowledge, and is encouraging design researchers to articulate their research with a heightened sense of sophistication and rigor.

Design has an important role to play in user-centred research that we must be careful to define. It should enable us to better understand the world, the time and space in which we live and respond with innovative leaps of validated imagination thus avoiding the need for 'faster horses'. Interdisciplinary research collaborations present many opportunities and challenges and demand a determined review of the value of our existing disciplinary practice. However through these interdisciplinary collaborations we must ensure we don't end up with 'camels' but develop new methods to help us establish a more holistic understanding of the 'elephant'.

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