

EXPLORING THE CONTESTED BORDERLAND BETWEEN DATA AND MEANING: USING HERMENEUTIC PHENOMENOLOGY AND EXPERIENCE-BASED DESIGN FOR INSIGHTFUL ENGINEERING

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Abstract

At an engineering research centre in Denmark covering a broad spectrum of engineering specialties, we have employed a hermeneutic phenomenological approach to a wide range of educational and industry projects to help us to better understand everyday human experience for the people for whom we intend to design. Through this work, we have experimented with and explored creative ways to 'enter into' the lives of various individuals and groups within the health, pharmaceuticals, education, manufacturing and local government sectors. Some of our ideas have been a little unorthodox; applying ready-to-hand technologies in very different ways, but we have discovered that they work and can provide powerful insights into the everyday 'natural' worlds of ordinary people. Finding new ways to capture lived experiences (as best we can), understanding 'hidden meaning structures' contained within them at the most primordial level, and communicating these insights *experientially* are the goals that have driven this work. In this paper we will share some examples of how we have infused design thinking with hermeneutic phenomenology across the four stages of each project (Exploring, Sharing, Understanding and Showing How). We have developed this approach by constantly referring back to philosophical first principles to inspire new techniques and 'ways into' the life-worlds of real people that we are striving to help. We hope that designers and engineers will find these examples helpful in their attempts to find new perspectives on old problems and to challenge old perspectives on new problems.

Introduction

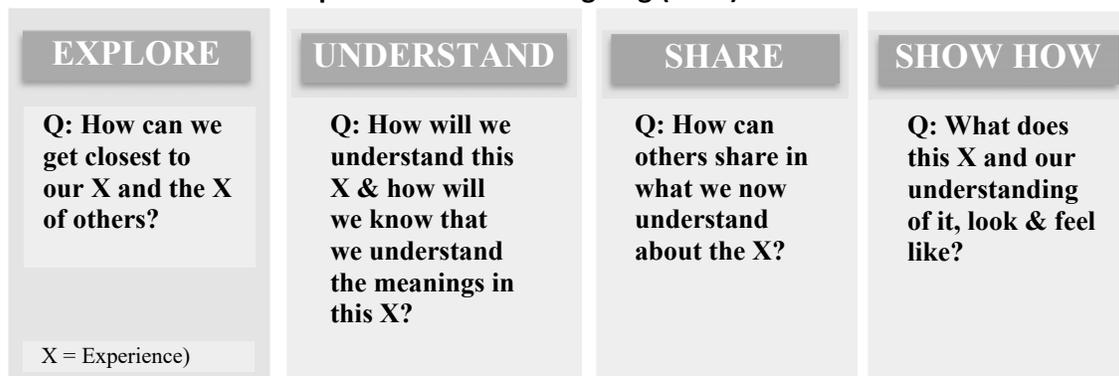
Within this paper are presented some of the more creative ways that a human science inspired methodology (from phenomenology), has been incorporated into the research and teaching practices within an engineering faculty in Denmark presenting a broad spectrum of specialties including robotics, electrical, mechanical and biological engineering. The work described in this paper was conducted mostly within a 'Master of Science' program, over five years as part of classroom activities as well as within external industry collaborations on specific commercial and government projects. The central goal in presenting this material is to show how we have conscientiously applied phenomenological thinking within projects aimed at understanding everyday human experience for design and engineering purposes. A central theme within our work and within this paper are the ways in which we have experimented with various techniques and methods to more deeply understand the 'meaning' contained in others experiences. We have combined these methods and techniques into a research framework what we call the four pillars of experience-based designing. In furthering our search for meaning in everyday experiences, we have become quite creative with our approach to *embodiment* exercises; we have developed some new twists on *hermeneutic analysis*; and have explored new technologies that enable us to 'find a way into' the life practices of other people. In summary, what follows are some of the ways we have 'captured' lived experiences (as best we can); how we have made sense of or understood the hidden 'meaning structures' contained within experiences at a primordial level (Anolli, 2005); and how we have designed ways to communicate our insights in experiential 'performances'.

The activities described in this paper might be interpreted as containing the intent if not the pure principles of Hermeneutical Phenomenology. The philosophy and methodology of Phenomenology has a long and convoluted history which cannot adequately be presented here and is not considered essential to understanding the argument presented in this paper. However, it is important to acknowledge that this way of thinking does underpin what is described in what follows and we wish to acknowledge the foundational thinkers in the field such as Martin Heidegger (1962) and Maurice Merleau Ponty (1962). Of particular help has been Herbert Dreyfus's very thorough analytic of *Being and Time* as well as the interpretations of Existential Phenomenology that Shaun Gallagher brings to his writings. Other important contemporary authors that we have relied upon include Max van Manen (1997; 2017), and Peter Willis (1998; 2001). These authors are a good place to start if readers are interested in exploring a foundational understanding of phenomenology further.

INTRODUCING THE FOUR PILLARS OF EXPERIENCE-BASED DESIGNING (XBDⁱⁱ)

The Four Pillars refers to four stages in the process which we call Experience-based designing (XbD), a process that is strongly focused on the explication and subsequent application of *meaning* within a defined experience. These four pillars are a distillation, taken from many research models and approaches developed across diverse fields of engineering and design that contain similar and common components (CUB, 2019). In developing our research and teaching program we distilled these many interpretations into a platform with four stages. The four stages are comprised of an exploring (or discovery) and data gathering stage (*Explore*); an analysis, synthesis and understanding stage (*Understand*); a validation, collaboration and communication stage (*Share*) and a concept, prototyping, design development stage (*Show How*). These stages may sound as if they are discrete processes but are in fact all non-linear, iterative and even *organic* meaning development processes. In each of these stages we have developed and are refining techniques and methods with the one goal of maximizing the richness contained in the information that guides our designing - that is, to better understand the experience of those for whom we wish to engineer possible interventions. Fundamentally this means that we are always searching for new ways to get back to the fundamental phenomenological question – what is it like? At each stage of our process we are evaluating how the questions shown in the diagram below contribute to this quest.

***The Four Pillars** of Experience-based Designing (XbD)**



**The Pillars represent four aspects of experience research (field research; analysis & synthesis; communication and designing)*

What we have learned from applying the Four Pillars ...so far

In the following passages we will share some of the lessons we have learned from our many attempts to find better ways to explore, understand, share and show how human experience might be useful to designers and engineers. They are of course examples only and there are many that have been left out in the interests of brevity however the range of activities that could have been included within this framework are many and diverse. We hope the following descriptions help to stimulate the readers own ideas for how the framework might be applied.

1.0 EXPLORING

Exploring is essentially a discovery stage where researchers begin to understand the 'research field' and to gather appropriate field data. The *Explore* stage really starts with 'finding a way in' but even before that, as Van Manen (1997) has suggested, we need to clearly designate what experience we really want to understand, 'What is the experience of [...] like?' For example, some of the projects we have worked on include the experience of rehabilitation after stroke; visual impairment in the home; disability and sexuality; gaining a university education with severe physical disability; and others. Defining the scope of the experience is important in that its 'unity' as an experience needs to be understood by the researcher otherwise it can become an unclear mixture of different experiences. Any singularity in experience is already highly complex by its very nature so that restricting its beginning and end to an understandable scale is vital. Later in the analysis stages we will also be asking questions like, how is this fragment of data important to the experience? Without a clear idea of what the experiential focus is, then we are not able to answer this kind of question nor the substantive question i.e. what is *it* [the experience] like?

The second key aspect of our way of 'finding a way in' involves the researcher undertaking an embodiment exercise. In many fields of research, this is not a new conceptⁱⁱⁱ we realise but perhaps the way we utilise it is. We start by making it as productive and authentic as we can manage. Firstly, the researcher has an initial conversation with a *lead user* (an 'experiencer') who represents a group of people whose experiences in a particular setting we wish to understand (i.e. the experience of [...]). They glean from this initial contact a rudimentary understanding of the key factors (times of day, events, situations, relationships etc.) that most powerfully influence the nature of the experience being studied. The researcher uses this to information to structure (design) their embodiment so that they can begin to experience for themselves the experiential world they wish to research.

Figure 1 below shows images from a number of researcher embodiments.



Figure 1: Embodiment exercises L-R: Visual impairment; Disability and sexuality; Cervical radiculopathy

Some researchers are able to undertake their embodiment for a few hours, sometimes days however,

it inevitably leaves an indelible impression^{iv} on their subjective view of the experience which they can then use in a number of ways.

Firstly, when the researcher approaches subsequent interview's they report that interviewees seem to more readily accept them as 'semi-equals' – in Gadamerian terms they have begun to 'learn the language' of the experience (Gadamer, 1975)- and participants are very appreciative of the extra effort that this has demanded of them. It helps to more quickly establish rapport and empathy within interview and observations with participants seeing the researcher now as a collaborator who wants to understand them and not simply observe them from a distance. After completing an embodiment, the researcher 'writes-up' their experience in a rich phenomenological description (Walcott, 1994) which includes aspects of senses, affect, cognition and context (Coxon, 2013a). The subsequent auto-ethnographic 'story' of their experience is then treated as data and included with participant's narratives, transcripts and other *textualisations* of the field research. All of these transcripts and written forms of contextual material naturally generate a significant volume of data and emphasises the importance of the embodiment exercise as a source of 'embodied knowledge' in the analysis process (Varela, 1996; Gallagher, 2005). Embodiment is a way of 'priming' the researchers intersubjective understanding to provide a strong foundation for the interpretive decisions that are an essential part of the hermeneutic analysis process that follows as well as within the remaining stages of the XbD process. The process of preparing (priming) our subjectivity, mirrors Gallagher's suggestions for achieving intersubjectivity [sic] (Ibid).

"Prior to the possibility of knowing another person's mind in either a theoretical or simulation mode, one already requires ...an understanding of what it means to be an experiencing subject" (Gallagher, 2005, p224)

Embodiment exercises as a key aspect of the research process can be quite poignant for some researchers particularly when applying it for the first time.

"Because I had tried it myself, I was able to use my emotional intelligence or intuition if you will, to "feel" what it meant ... Sometimes feelings do not even make sense, they are irrational but nevertheless very real. Keeping this in mind as a designer or engineer provides a valuable insight and a powerful professional tool" (Male researcher - MB, 2014)

"I will apply the technique in future projects because I have discovered that there are product related aspects that I, and we, in the group, never would have gotten to know, had we not done the embodiment (Male researcher - SM, 2014)

Once the embodiment is completed and the researcher is ready to further explore the life-world of his participants, there are many ways this can be done and most of the techniques used are very familiar to ethnographic researchers. We are particularly interested in seeing how close we can get to understanding the *natural* experience through the eyes of the participants. Of course, this will never actually happen (only in the Matrix), however our credo in doing Experience-based Designing is, 'how close can we get?'

Keeping this goal in mind, we have been experimenting with various devices that enable participants to record aspects of their own world view without us being present. Reducing the mediation of an experience due to the presence of a researcher is always an aim that is difficult to achieve. In some projects we have asked participants to record a section of their day that is of particular interest to us – say the morning routine of bathing and getting dressed (this can be a difficult process for people with many different physical impairments). Because this is a quite private event, people are reluctant to discuss it or share with researcher. By

wearing and simply turning on the recording glasses (Fig 2) they can capture the everydayness of the event as it happens. Recording data of this kind has a number of benefits. Participants are very often reluctant to discuss private matters and tend to gloss over them in interviews as being mundane or not important. When participants view a video of their previous experiential event it helps them recall details more clearly and to a certain extent, re-live the event and not simply reflect back on their mediated memory of it. The information gained in the embodiment exercise also allows the researcher to participate in a conversation about the event to tease out more depth in the re-viewing than would have otherwise been possible.

In situations where a participant is reluctant to share the video with a researcher or there are additional privacy issues (such as toileting, sexual activities) we can employ video playback glasses (Figure 2). These glasses allow the participant to view and describe the event but do not allow the researcher to participate and probe deeper. It is an interesting tool that allows us to access deeper layers of socially taboo fields of research that might otherwise be inaccessible.



Figure 2: L-R: Video recording glasses and video playback glasses

The techniques described above are examples of how we have strived to get 'inside' the experience of others so that we (as researchers) can better understand and act on participants behalf.

"Before using this approach, I was very focused on the physical impairment of stroke survivors, but it really opened my eyes to all the meta-physical issues that follow such a terrible experience. As product designers we often have neglected the meta-physical importance and this might be because of our lacking empathy to truly understand the issues" (Male student - JD, 2014)

2.0 UNDERSTANDING

The Understanding stage includes the analysis, synthesis and the development of understanding out of the field data that has been gathered. After the field work is completed, data in the form of text and in most cases, large quantities of it, need to be analysed and there are many methods of qualitative analysis that might be considered (Creswell. 2007). The essence of the task i.e. to 'make sense' of the material and more importantly to question *what does it mean?* are often overlooked in a desire to reduce the amount of material and start designing. We have adapted our approach based on Ricoeur and others foundational notion of

multiplicity in the meaning of words (Ricoeur, 1978; Geanellos, 2000; Gadamer, 1975). After gathering field data and turning it into text we then set about exploring the meaning that is contained in the words that have been set down or transcribed. To do this, we employ a nine-step process of analysis called the *SEEing*^v process (Coxon, 2013b) and we begin the understanding stage at step 4 of that process. Steps 1-3 are effectively included within the Explore stage described above and comprise, 1. finding a way in and the embodiment; 2. gathering field material; 3. preparing field material (turning it into text) for analysis.

Step 4:

Step 4 is essentially about explicating meaning, exploring the denoted, the effect beyond the cause, what was meant from what was said. Exploring this level of meaning is one of the key moments when the embodiment exercise finds its greatest value. Each line of text, each encapsulated thought or idea is repeatedly asked what does and could this mean? We are not forcing or looking for meaning that is not there but rather the meaning that is hidden or buried within the metaphors presented in the text. These layers of hidden meaning can only be explicated by someone who knows how to recognise these meanings and that must be either the researcher (who has embodied the experience) or the original author. If it is possible for both to be present and to conduct the analysis together that is optimal however this does not happen often and so the researcher is left to draw on the experiential understanding gained in their embodiment and during interviews/observations as a basis for their interpretive decisions.

Step 4 is an inductive process (developing more than one meaning from the one data fragment) and the volume of field data can often become multiplied by a factor of four or more through this process. For example, each data fragment will have at least two meanings if the researcher considers what is denoted as well as what is connoted by the words used by participants. Then additional hidden meanings that are intuited by the researcher or that are suggested by the context of the dialogue are added to the list of 'possible' meanings from each data fragment. Treating field data in this way, expands the universe of data and allows a researcher to look beyond the surface level that the text represents - a very important step within the *SEEing* process. It is where the real and deeper meanings within the experience can begin to be seen both literally in the meaning text that is generated and hermeneutically within the researcher, who in their wrestling with interpretation of the data becomes more open to the other meanings as they begin to emerge. It can be (as some researchers have reported) a quite transcendent moment, where strong insights into the nature of the experience begin to emerge.

"the SEEing method was good. Even though my first impression was that it was time consuming and repetitive. Nevertheless, I realised I gained a lot of knowledge and insight by using this tool to elaborate on feelings and statements and to find new angles and hidden messages. Messages and issues which weren't directly mentioned doing the interview but hidden subconsciously between the lines" (Researcher, female VB, 2014)

The remainder of the steps from 5 to 9 are essentially reductive processes familiar to many researchers. We will discuss these only briefly and mostly in terms of their application in the *SEEing* process and its relationship to phenomenological principles.

Step 5:

Step 5 is focussed on determining what is important or essential to keep or not to keep in the universe of data we have generated. We answer this question by adopting a

phenomenological perspective, that is, in terms of "the things themselves", a tenet of phenomenological analysis (Willis, 2001). The 'thing' in this case is the experience we wish to understand. In questioning the data, the researcher will ask, is this fragment of meaning *essential* to understanding the experience of say, visual impairment in the home? Questions of this nature elevate the stronger fragments of meaning that will ultimately constitute the 'essence' of the experience.

Step 6:

In this step we separate the meanings within the experience that were considered *essential* (in step 5) into physical (P) or meta-physical (MP) groups. A disputed philosophical separation is thus implied between the thinking of existential and hermeneutic phenomenology (Coxon, 2010), suggesting that P information is more focused on the physical world of experience while the latter (MP) is more in tune with the meta-physical or psychological (Gallagher, 2005; Merleau-Ponty, 1962). While this may be a debatable philosophical logic, whose history can be traced back to the dualism of Galileo and Descartes (Maxwell, 2000) it provides a valuable guiding principle for determining both P and MP meanings that are useful for designing.

Step 7:

Our universe of meaning statements, have so far, not been differentiated in terms of their level of intensity. Some will be much more powerful aspects of the experience than others, so we apply a Likert scale of 1 to 7 (1 is low) that qualifies each piece of essential meaning in terms of its level of intensity in the experience. The scaling for meta-physically relates to its psychological power, its emotional value, or its unexpectedness as part of the experience. The scaling for physicality relates to its helpfulness, practical value, supportiveness in form or function, ergonomics or aesthetics of use etc. Again, we tap into the researchers embodied understanding of the experience to support their subjective judgement.

Step 8:

Step 8 represents a classic 'open coding' *categorisation* process where each of the meaning fragments is assigned a category name or theme title (Kelle, 2005). It is a way to cluster similar meanings together and conforms with accepted qualitative data analysis theory relating to categorization and thematization (Boyatzis, 1998; van Manen, 1997). We group together the most intense, essential elements of the experience into a limited number of meta-themes which we can use to communicate to others (participants, other researchers or clients)

Step 9:

Drawing on the phenomenological tradition of writing as giving form to understanding (Van Manen, 1997), in step 9 we bring the (now clustered) essential and most intense elements of the experience from step 8 and turn them into expressive narratives - essentially, summaries or stories that we can use to communicate our understanding of the essences of the experience to others.

3.0 SHARING

The Sharing stage provides an opportunity for validation, collaboration and communication with various stakeholders. At this point in the XbD process the interpretation phase is largely over and the researcher (and others if available) has developed insights which need to be advanced into action in designing. The Share stage is a performative process that begins the reification of experiential understanding. It enables collaboration with participants in a form of sharing 'backwards' - a feedback process for validating the understandings developed. It allows for a sharing forward with clients or other stakeholders in the research. And it also

allows for a sharing 'sideways' between concurrent projects looking at experiences that come together at a point i.e. the experience of providing therapy and a patient's experience of receiving therapy.

Sharing is also performative in the sense that up until now the earlier processes of exploration and understanding have been largely internalized or phenomenal to the individuals involved, either the researchers or the participants. In this stage we move to an explicatory process where the learning from the earlier stages needs to be shared and given form. The form that this takes can be varied but may include participation in the Explore and Understanding processes themselves as described earlier as well as the Show How stage described below. In sharing backwards (with our participants – a form of validation process) we are revisiting the original question of 'what is it like?' by now asking participants 'is this what the experience is like ...for you?' Assuming we have achieved a close approximation and/or some adjustment is necessary we have the basis for moving on to sharing forward. Sharing is essentially about working with partners to move the understanding we have developed forward into a doing-something-about-it stage (if the size of the project requires it, we may also need to share sideways - as described above). Sharing the experiences of multiple parties sideways is a much more complex process than can be described here however, it has demonstrated useful results particularly within the healthcare field (Bate, 2007a; 2007b).

4.0 SHOWING HOW

The 'Showing How' stage is where the research team can begin to apply creative processes such as prototyping and other design development techniques. Essentially 'showing how' is the process of taking the findings from field research and developing ways that will allow decisions to be made about the direction the product, service or systems will take. It can involve collaboration between various stakeholders such as original research participants, fellow researchers or external collaborators in workshop and various well documented generative interactions intended to bring experiential understandings to life in new forms (Sanders, 2008). The nature and success of these interactions is always strongly influenced by the meaning structures developed in the first three stages. From an engineering standpoint we focus our Show How process on productively linking research understandings with industry, government or other 'client' needs that will enable the products, services or systems to be realised (in humanly sensitive ways) for the benefit of the people 'explored' in the very first stage of the XbD process. One of the biggest hurdles we face at this stage lies in that experiential understanding is not a directly quantifiable or transferable concept. The qualitative understandings (meanings) uncovered in the EXPLORE and UNDERSTAND stages need to be shared and acted upon with an audience of stakeholders who in many instances may not have taken part in developing the experiential understanding that the researchers (and other sharer's) now know. We have been working on ways to accomplish this in line with phenomenological (writing, poetizing) and communications (negotiated meaning) principles. For instance, in realising that we cannot transfer our (as researchers) phenomenal understanding of an experience directly to others we need to develop ways to enable our audience to experience 'something' of what we know that is powerful enough for them to 'get it'; to have a sense of verisimilitude that helps them to understand the experience in their own phenomenal way. In order to do that we firstly needed to develop our own understanding of the experience from 'the others' life-world perspective, now we need to reconstitute that understanding in the life-world of another set of *others*.

When endeavouring to communicate 'an experience' we duly understand that technically this is not possible. As in the first stage of our project we understood that we could not ever fully 'know' the experience of another - so it is that we now also acknowledge that in the last step

of our process, we cannot 'give' a prescribed experience to another. We can however, provide them with a poetization of the experience as we now understand it from which they might develop their own understanding – hopefully in harmony with ours. Showing how in this way needs to be done carefully in an inclusive, experiential manner such that the power of the findings is not lost in translating them for a non-research audience. Processes of performative collaboration and forms of communication transfer (Experiential presentation) are an emerging field of study and practice with many new and exciting development possibilities (Erwin, 2013) - one that is crucial to the practical success of the research outcomes. In our work we have experimented with new 2D, 3D and 4D communication technologies, forms and media in order to achieve the goals described above. We have the luxury of having access to a dedicated high-tech, experimental spaces (Figure 3 below) where we are able to explore different ways to communicate the ineffable; the human experience.



Figure 3: Audience participating in an experiential presentation

Most of us will be familiar with two-dimensional presentation techniques such as posters, flip charts and software-based PowerPoint and Prezi. 3D presentation materials are also familiar in the design and engineering worlds in the form of mock-ups, prototypes (low and high fidelity), and other 3D printed materials. For us the excitement starts when we enter the 4D world – this is where the audience becomes engaged or involved in the presentation so that there is a physical embodiment^{vi} of the experience they encounter during the presentation. The audience is thus allowed to develop individual phenomenal interpretations of the research findings and simultaneously evaluate them against solutions that answer the design question, 'based on our new understanding of the experience; how can we improve this experience? '. Experiential presentation is essentially about replacing the passive non-experiential research 'findings' presentation with one that *speaks the world not of the world* as Van Manen suggests (1997, p.13).

"The human being is a person who signifies - gives and derives meaning to and from the 'things' of the world. In other words, the 'things' of the world are meaningfully experienced, and on that basis these 'things' are then approached and dealt with" (Van Manen, 197, p.14)

Just briefly, some examples of the techniques included in this kind of 4D performance are: asking an audience to stand on one leg with their eyes closed to experience the sense of uncertainty that spasmodic paralysis brings, playing a loud and intrusive beeping noise to impinge randomly on the presentation that simulates the intrusiveness of monitoring machine

noise, blurring the presentations imagery to replicate visual impairment, re-enacting the moment of a stroke using an animation sequence with the patient's own voice over. These are a few of the ways we have employed somewhat 'theatrical' methods to add power to the experience of understanding the experience of others.

All of these methods and techniques are primarily focussed on maximising the 'buy-in' from an audience, particularly those who we would like to work with to design things that will improve the experience of a new generation of experiencers.

CONCLUSION: LEARNING'S AND FUTURE DIRECTIONS

Throughout this paper we have discussed some of the lessons we have learned in applying hermeneutic phenomenological thinking in the projects we have undertaken. In the process we hope to have gone some way towards convincing the reader that a human science, phenomenologically inspired approach to engineering and designing for the benefit of people is not only possible but offers useful insights and new opportunities. The design and industrial worlds are beginning to recognise the importance of focussing more of their efforts on the people that they wish to serve. Designing for people and the role that experiences play in shaping the human world is fast becoming not only a focal point for good business but a socio-economic imperative in a technology dominated world. The work that we have done in Experience-based Designing has helped to illustrate that there are other ways in which the experiences of people can be factored into the design process early in the product development cycle; the 'fuzzy front end' as Suchman (2007) refers to it. As designers and engineers, it is the examples that we create and the experiments we undertake that help to generate renewed interest in the human sciences and especially the role that phenomenology can play in improving the human condition more broadly.

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IMAGES

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ENDNOTES

ⁱ The concept of 'hidden' meaning has been much debated by a number of authors both in terms of its semiotic and psychological value (Aniulli, 2005; Gallagher, 2005; Geanellos, 1998; Searle, 1979)

ⁱⁱ We have used the letter X to represent the word experience - a common practice in the Experience Design field. i.e. Customer Experience (CX), User Experience (UX), Employee Experience (EX) and others.

ⁱⁱⁱ Jones 2013 describes various body storming techniques that help researchers to embody an understanding.

^{iv} Reflecting Gallagher's (2005) views on the neurophysiology of inter-subjectivity including the way that neural links produced in performing an activity create embodied memory of the activity as well as the debatable effects on embodied memory that mirror neurons can produce in having observed the activity.

^v *SEEing* is a proprietary process of qualitative data analysis (Coxon, 2013b)

^{vi} Gallagher refers to this form of embodiment in regard to the effect on mirror neurons and the neurons governing shared representations "Such neural activations correspond to meaning that is intersubjective in the literal sense - it is meaning that is simultaneously shared in the modalities of observation (of others) and action capability (of my own). ... the brain areas responsible for planning my own action are the same ones activated during the observation, imaginative simulation, or imitation of the action of others" (Gallagher, 2005, p.127)