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IMPROVING ASSISTIVE TECHNOLOGY THROUGH PHENOMENOLOGY:
A COMPARATIVE ANALYSIS OF RESEARCH METHODS

by

Rafael M. Ramos IV

A Thesis Submitted in Partial Fulfillment
of the Requirements for a Degree with Honors
(Psychology)

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University of Maine

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Abstract

The work discussed in this thesis contrasts traditional interviewing perspectives with those of phenomenological methods for conducting research for use in the development of assistive technology. Assistive technology helps to provide greater independence by enabling people to perform tasks that they were formerly unable to accomplish, or had great difficulty accomplishing, by providing enhancements to, or changing methods of interacting with, the technology needed to accomplish such tasks. However, users of certain technologies from the field, such as visually impaired users of navigational devices, often report dissatisfaction based on features of the device that are necessarily linked with their experiences with it. The goal of this comparative analysis is to examine whether incorporating methodology from the field of phenomenology (the discipline of philosophy that studies human experience) would yield a different end result of product/object and development and usability than that obtained from traditional third-person and focus group methodologies, currently employed by designers of assistive technology. Further, this thesis will argue that the kind of data that is gathered from phenomenological interviewing and experimentation, allows for a more complete report of the potential users needs and expectations than traditional focus group reports, consequently providing answers that designers can use to make more informed decisions about the design of their products. Finally, the thesis concludes by providing suggestions regarding the implementation of new directions for phenomenologically informed research for the design of assistive technology.

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I owe a great deal of debt and gratitude for those who have helped me with this project. Anyone who knows me will attest to the fact that I can have the tendency to take on too much at once and yet still strive to finish the projects. Thankfully, I was able to collaborate with individuals whose work in respective fields of interest I truly respect. I wish to give recognition to those who were involved with the writing of this thesis, either directly through advisement and drafting or indirectly, through enduring patience and encouragement.

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Secondly, I owe much of my understanding of phenomenology and skills in philosophical writing to professors Kirsten Jacobson and James Page. Through classes with them and personal conversations outside of the class, I feel that I have acquired lasting knowledge that I intend to keep with me throughout my future career.

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I. Introduction

“A major programme for 21st century science will be to discover how an experience can be translated into a report, thus enabling our experiences to be shared.” (Frith, 2002 p. 374)

“There is an increasing recognition that controversy can be employed to challenge and change attitudes. Within industry, design is increasingly valued not necessarily for solving problems but rather for making issues visible and tangible, thereby facilitating discussion and decision making.” (Pullin, 2009 p. 113)

Assistive technology is used by individuals with disabilities in order to perform functions that might otherwise be difficult or impossible. Assistive technology can include mobility devices such as walkers and wheelchairs, as well as hardware, software, and peripherals that assist people with disabilities in accessing computers or other information technologies. Failure in developing successfully accepted or truly useful aids in the field of assistive technology can be attributed to several factors. Not least among these reasons are that developers are either still attempting to solve problems that already have reasonable solutions, or are using inadequate means of study to solicit first-hand user reports (Jacobson et al. 2011; Loomis et al, in press). It is my belief that addressing the latter problem can actually help to solve the first. The ability to get real and meaningful user concerns and perspectives towards the technology that is being developed for any specific user group should take primacy over the often naïve intuitions and “generic” user mentality which is so frequently the driving force for designers, researchers, and engineers making the products. Further, the importance of methods that acquire information about first-person subjective experiences of these technologies should be given as much importance in the research and development process as the principles that guide research of third-person computational methods and quantitative

data analysis. Although fields such as human-computer interaction and usability engineering have taken initiative on these errors by placing increased importance on user-centered design, many of these methodologies still stem from a third-person, experimenter driven perspective. Adherence to these methodologies, which exclude first-person, experiential data, can and has lead to technology designed solely around the wants and intentions of the engineer, or a set of formulaic engineering principles, rather than being based on the more substantive and meaningful input from the actual end-user.

I believe that the field of assistive technology has a particular need for techniques and methods that truly reflect the perspective and experiences of the user in a way that is both true to the those giving the information, and useful to the designer or engineer. Those who are reliant on these technologies require them to be in tune with their being and needs of everyday life. To name one example, those who are blind not only require information about their environment that is useful, but also wish to have this information conveyed by a product that they can easily engage with and readily integrate into their greater life. The experience of the way a navigational device conveys information is so much more than measuring reaction times in behavioral experiments, or having users complete narrowly focused surveys or questionnaires, especially when done simply for the sake of experimental ease which allows the researcher to stick to a single theoretical approach in all of their studies. Critical factors, oft ignored, also include the way a device feels, looks, what kind of information it provides and how it provides it, all of which have a first-person element that deserves, and I argue, is necessary for the successful development of assistive technology. This thesis proposes phenomenological research methods as a desirable model in studying users experience for design in assistive

technology as opposed to those guided by an experimenter's (third-person) agenda. In the following pages, I will first seek to illuminate research methods from the field of phenomenology (the philosophically grounded study of first-person experience), both in practice and theory; highlight a commonly called upon qualitative tool (focus groups) as a comparison of existing methodology; give evidence of compatibility between the two, and finally draw on a specific example of how a change in methodology would result in a different, and better informed field of assistive technology.

Scientists value our grasp on and of objectivity. It is the basis of how we validate experiments and how we justify the knowledge that we have obtained. Experts in the fields of statistics and quantitative research methods have devised ways to analyze data gathered by objective means so that margins of error are miniscule and reports are mathematically clean. However, numbers and graphs generated by programs cannot necessarily give the designer, even one who might be trained in statistical analysis, a view of the experience that a person might have of a given product or event (i.e., the first-hand experience from which the dataset has been extracted). Krueger, in his book, *Focus Groups: A Practical Guide for Applied Research* (1988), acknowledges this reality for those who rely on reports based solely on quantitative data:

“Social scientists have aided and abetted the communication obstacles due to the methodological, technical, and statistical “jargon that litters their prose.” As a result, Krueger (1988) relates, the decision maker “has to accept or reject the researcher’s interpretation of the data on faith.” It may well be that discomfort and lack of faith of quantitative data explain why decision makers find qualitative data to be more useful than other research.” (p. 39)

Statistics, while they might be examples of “fact” in the eyes of many, still need to be interpreted to obtain meaningful use within the design process of a technological product, or the evaluation of a medical treatment.

One such area of research where use of qualitative data is considered highly important is that of assistive technology. Designers in the field of assistive technology have a particular need for data that accurately reflects the user's experience of the device or tool that they are developing. Computer modeling, or sole use of theory regarding what people might do, can be useful supplements for development, but cannot be substitutes for the first-hand results gathered from real people. Advances in usability engineering, primarily a practice/field of computer engineering and research, have emphasized the necessity of human subject testing and participation in almost all stages of the design process in attempts to get at user experience. However, these models of testing are often structured by traditional empirical research perspectives and can often lead to the development and design of products that do not lend themselves to be very usable in nature, or are themselves unpleasant in design (Giudice & Legge, 2008; Pullin, 2009).

Although the methods employed by researchers in these fields claim to take the subjective report of human participants into account, it can be argued that they still utilize completely objective/non-personal techniques to gather information from their potential users about their experiences of the product. For example, methods often take the form of simple questionnaires and surveys, which leave the potential user or human subject (in the case of an experiment) a limited range of space to note or elaborate their point of experience. By consequence of this restriction, valuable information that the user might be able to contribute is left without mention, and therefore without inclusion in the process of technology design.

Qualitative methodology is often used to fill these gaps in report of users experience within assistive technology. The advantage of this technique is that it can

yield results that can bring out facets of user experience and be presented without specialized jargon, allowing understanding and use by a wider range of people. This is not to say that qualitative methods should supersede quantitative methods. Their application is certainly complementary as they are able to get at different information and different results. They may be used to inform quantitative methods at all stages of research (pre, during, and post-analysis), or simply used on their own when quantitative procedures are not necessary (Krueger, 1988). Qualitative methods facilitate the study of experiences in greater depth. It is the case for qualitative methods, as well as research methods in general that different approaches to qualitative inquiry are suitable for different research objectives. As some examples: ethnographic research aims to study the behaviors of a culture-sharing group and describe their culture (Creswell 2007; Gubrium and Holstein 1997). Critical approaches aim to question ideology, expose power relations, and take action for change (Crotty 1998). And deconstructionist or postmodern research aims to show that things (e.g., texts, beliefs) do not have definable, determinable, or bounded meanings (Derrida 1997). Implementation of dual method approaches have laid claim to many discoveries and advances in fields such as marketing/advertising, social, and hard sciences. Such examples can be found in the design of the modern digital camera (experiential prototyping and behavioral experiments) (Pullin, 2009), decisions made on how to spend millions of dollars in advertising drugs for pharmaceutical companies (surveys and focus groups) (Krueger, 1988), as well as the development of hundreds of medical tools and operating procedures (focus groups, standardized interviewing and content analysis) (Krueger, 2004). Assistive technology has a particular need for information gathered from both qualitative and

quantitative research, since both elements, first person reports and third person engineering knowledge, are critical in the successful design of products that can be effectively used while also being technologically sound. This combination is particularly challenging for the design of assistive technology, as the user groups often have specific needs which vary from the “generic user,” and the technology often relies on specialized equipment or implementation of different modalities than standard interfaces (e.g., auditory, haptic, or multimodal displays).

Despite these challenges, modern examples of qualitative research, whether for assistive technology or more generally, such as focus groups still follow traditional models that fit in the structure of pure empiricism. That means to say that, results, though the data may be qualitative in nature (reports from a focus group), it is still the result of a method that is subservient to an empirical way of thinking and experimenter driven in nature. In his essay, “What is it like to be a bat?”, Thomas Nagel (1974) notes that these traditional perspectives that rely on a reductionist model of thought will never be able to access an account of first-person experience. Therefore, it is not only the methodology that is used in experiments that must change, but the guiding theoretical focus that underlies these studies.

This is not to say however that third person studies should then become secondary to another method. Quantitative, third-person approaches will always retain their relevance in accurately gauging third person, observable data, such as reporting *How* people behave in a given situation. However, as previously discussed, this approach is not best suited for accessing data that is exclusively intended to be first-person oriented. It is the work of this thesis to show that current qualitative methods (most of which are still

based on third person, experimenter driven motivations) could significantly benefit from the addition of phenomenological research methods.

The goal of phenomenological research is to be able to describe the lived experience of various phenomena (Moustakas, 1994; Pollio, 1997) through rigorous method and adherence to philosophically grounded theoretical consistency. Additionally, this approach provides an exceptional fit in the role of guiding design in the field of assistive technology. By incorporating phenomenology into the practice of design, it can be argued that several problems within the field that are frequently cited as user difficulties or complaints such as an awkward user-interface or too much information that is irrelevant or unwanted, can be given better information to help find solutions that are useful to both the designer and end user.

II. Phenomenology as a Research Method

Phenomenology (as a discipline) is a field in philosophy that studies human experience. It is demarcated from other fields such as ontology (the study of what exists) and epistemology (the study of knowledge), because it deals with experiences by first person, or subjective analysis (<http://plato.stanford.edu/entries/phenomenology/>, 2011). Its use in a field not only implies changed methodology, but also a new theoretical approach and foundations of thought regarding the nature of human experience. The history of phenomenology, while young compared to other philosophical traditions, is still expansive and intellectually developed. Therefore, in the interest of clarity and conciseness, the detailing of phenomenology's history will be restricted to what is necessary to understand the terminology and methods described in this thesis.

A. Phenomenological Interviewing

In the *Phenomenology of Everyday Life*, Pollio (1997) discusses at length the ways in which phenomenological research methods can be applied. The following is an abstracted framework from that text, as well as *Phenomenological Research Methods* (Moustakas, 1994) which can be used for any research that seeks to investigate and make known in a more effective way, the subjective data of its target user/population.

The interview method of phenomenology differs fundamentally from other types of interviewing techniques used in empirical contexts in a few crucial ways. Typically, traditional methods of interview discussion are one sided, with the researcher taking lead on the questioning process and guiding the dialogue to stay on track to the task at hand, common examples are clinical interviewing for psychologists or medical practitioners, as well as researchers in focus groups. Although there may be variants of interview formality, the structure in traditional methods is normally crafted around a specific agenda, with tailored questions aimed at keeping the conversation from wandering from the topic that the researcher is trying to investigate. Additionally, the researcher is often bound to an overtly professional code of communication, involving the adoption of a mechanistic and unnatural demeanor towards the participant (Laing, 1960). The intent or results of these methods are meant to reflect the subjective attitudes of the user/participant for a given subject or project. The purpose and goals of the interview are highly defined by the researcher and stated explicitly a priori to guide the interview process. In some kinds of user ‘interviews’ the actual interaction between the researcher and participant is limited to the completion of a survey or questionnaire, which is given prior to participation in a behavioral experiment. After the completion of the prescribed

behavioral tasks, the participant might be asked additional directed (i.e. closed-ended) questions about his/her experience while performing the task. Here again, this approach generally adopts questions that fit the narrow spectrum of what the researcher expects to hear or needs to quantify rather than utilizing open-ended questions geared at elucidating the users actual experiences.

By contrast, the goal of the interviewing process in phenomenological research is to attain a first person description of some specified domain of experience that can be analyzed to produce the best representation of that persons experience as possible. Unlike the more traditional approaches typically used by engineers or developers, which may seek opinions from the user(s) structured by narrow questioning which conforms to a pre-specified understanding of the phenomenon, the outcome of data collection in phenomenology is meant to reflect the actual subjective content of the user/participant directed at some area of interest and guided by true dialogic discussion.

Generally, a few pre-specified questions concerning the topic start the discussion. All questions flow from the dialogue as it unfolds rather than having predetermined questions that may lead the interviewee to feel like they are being towed along a certain path of thought, as is done in focus groups and surveys. An implicit assumption with the phenomenological approach is that central or personally relevant issues will emerge repeatedly throughout the dialogue (Pollio, 1997).

Everything about the interview process is designed to evoke descriptions, not to confirm theoretical hypotheses. The most useful questions focus on the experiences described in the most full and detailed manner. Questions that are avoided are those that ask, “why” as they often shift away from the detailing of the experience to a description

of the abstract, theoretical, and personal beliefs of the individual. Rather than seeking higher level concerns from participants or users while being guided along a predetermined track, as ‘why’ questions can do, the phenomenologist seeks detailed reports of what it is like for that person given the experience being highlighted. ‘What specifically about x?’ might represent a question regarding a response in a phenomenological interview rather than “why do you feel that way?”. The data that is gathered from the phenomenological interview process is meant to be dialogic in the truest sense of the word. We only divulge what we are truly thinking in the purest most detailed form when we are guided by natural conversation and not pressured or forced to give it (Pollio, 1997)

The phenomenological interview process itself actually breaks into three separate interviews. “The first interview establishes the context of the participant’s experience” (Moustakas, 1994). The second allows participants to reconstruct the details of their experience within the context in which it occurs. And the third encourages the participants to reflect on the meaning their experience holds for them” (Seidman 2006, p. 17). To enable rapport and deep reflection, 90 minutes is considered an appropriate length for each of these in-depth phenomenological interviews (Seidman, 2006). To elicit participants’ experiences with a phenomenon, and their reflection on the meaning of their experiences, participants are considered co-researchers (Moustakas, 1994). As co-researchers, they are asked to describe their experiences in their own terms and to give constant feedback on the researcher’s interpretations. Reflection and feedback on the part of the participants is an important function of phenomenological interviewing generally and is the main purpose of the third interview specifically. To bracket (maintain epoché)

his/her subjectivity in the study, the researcher should aim to clarify any interpretations with the participants in the study (Cileciz, 2009).

B. Analysis of Data Gathered in Phenomenological Research

Although phenomenological interviewing takes an atheoretical stance, post-interview analysis is a rigorous and thorough process. By nature of the information collected, it takes a markedly different approach than those used for traditional empirical methods, as it is not seeking to fit a predetermined set of categories or an a priori theory, but rather to describe experiential patterns emerging within a given context” (Pollio, 1997)

Data analysis in phenomenological research begins with composing a full, verbatim transcript of the interview, and then merging all of the recorded data from the interview prior to analysis in chronological order. For the purposes of this project, analysis methods outlined by Moustakas (1994) in *Phenomenal Analysis* will serve as a guide for the steps involved in the interpretation of phenomenological data.

1) Phenomenological Reduction

Analysis after transcription begins by horizontalizing the data. This means reading the transcripts several times, while treating statements related to the phenomena being studied as equal in importance. All statements regarding the phenomena are recorded, while those not being related, are eliminated. For example as relates to assistive technology, statements such as, “I consider the form and weight of the device to be important in my selection of it” would be considered as relating to the phenomena of study (from the user’s perspective) as opposed to introductory statements of the interviewee detailing their day so far (which are neither relevant to the subject of study

from the perspective of the interviewee nor the researcher). At this point, a peer review could be arranged to check the reliability of the researchers reduction process (Cileciz, 2009).

The second process is to convert statement data into *meaning units* (Moustakas, 1994). This means to break apart statements/words that have more than one meaning to eliminate overlap and possibilities of ambiguity. After this is completed all meaning units from all participants are analyzed and noted in terms of those which are present among all the participant's reports.

The third step in reduction involves the creation of individual textural descriptions, or narratives meant to represent the individual's description of the phenomenal experience, consisting of the particular appearances or textures showing in the *eidetic* (or essential) features of the experience. As described in Cileciz (2009), the process and purpose of this step is detailed as:

“Individual textural descriptions are constituted by the participant's verbatim statements representing meaning units rearranged in narrative form, with any necessary supplementary statements by the researcher inserted within brackets. Each statement by an individual expressing a meaning unit—either shared with other participants or unique to that individual—is included in his/her individual textural description” (p. 500)

2) Imaginative Variation

In this stage of analysis, the researcher is encouraged to read the individual textural descriptions several times with “free play of fancy” or creative and unrestricted interpretive readings of the descriptions (Moustakas, 1994). This is done in an attempt to get at the content of experience from as many different view points as possible, so that an account of what makes the experience(s) for that person what it is. Varying the interpretation, combined with multiple readings of the description from different

perspectives and continued input from the participant or co-researcher, is meant to show the essences and meanings of that experience through stripping of data that are contradicted to the report at large (Moustakas, 1994; Pollio, 1997). A tangible example might be that of running unclean rice under water and through a strainer several times, removing it from the strainer each time it is cleaned. What will remain, assumedly, are the meaningful parts of the experience for all participants. From the process of imaginative variation, an individual structural description of the experience is made from the reading and re-presentation by the researcher of the individual's textural descriptions.

3) Synthesis

The final step of analysis is the synthesis of all participant data to form a description of experience for the group. Meaning units that are present in all participants' data are considered now as *shared meaning units*. As a result, the individual textural descriptions can now be combined into a single narrative, or the composite textural description. The same process is performed on the data from the imaginative variation, which was meant to produce individual structural descriptions, in order to create a composite structural description. The last step of synthesis, and therefore for the analysis is to combine both the textural and structural descriptions to form the *textural-structural synthesis*. This final report in a narrative structure is meant to give an account of the experience that includes only the most essential features of that experience across all participants. (All terms from Moustakas, 1994)

C. Validity in Phenomenological Research

To measure validity in qualitative research, and in turn, phenomenology generally refers to a study's rigor to ensure that the findings are a result of the appropriate implementation

of methods and that the research produces valuable information based on its epistemology (Glesne 2006; Guba and Lincoln 1982; Lincoln 1995; Merriam 1995). The design of phenomenological research in assistive technology should include important considerations of validity. This requires incorporating a range of validation techniques and procedures, some of which are general to qualitative research while others are specific to phenomenology.

An essential factor for validity in phenomenological research is commitment of the methods to the discipline's key assumptions and theoretical underpinnings (Giorgi, 1997). Specifically, producing worthy knowledge in phenomenological investigation is contingent upon the researcher's abilities in the bracketing process, referring to the researcher's continuous engagement in disciplined, systematic efforts to suspend their personal standpoints and set aside prejudgments regarding the phenomenon being investigated (Moustakas, 1994). Bracketing does not mean an absolute absence of presuppositions (as depersonalizing is meant to give in empirically focused studies), but rather an awareness and critical analysis of one's own presuppositions.

Formulating a subjectivity statement at the beginning of a phenomenological study is a useful starting point to deliberately search for and explicate one's prejudgments and facilitate the bracketing process throughout the investigation (Ashworth, 1999). Even though a researcher is supposed to engage in bracketing throughout the entire study, it is most important to bracket one's subjectivity during data analysis. Therefore, before starting data analysis, the researcher should revisit his/her subjectivity statement and reflect on all his/her prior experiences related to the phenomenon, in order to more consciously keep them in brackets and minimize their impact on the findings.

Measures such as peer reviews can reduce the impact of the researcher's subjective biases on the findings, which is a very important issue in phenomenology. In these types of peer review, an independent peer checks that every statement made by participants is treated as having equal value and that only and all of the statements relevant to the phenomenon are selected, thereby ensuring that the researcher's biases do not influence their perception of the relevant statements, and subsequently, the findings of the study or product design.

In addition to these recommendations, researchers should use other validity practices in qualitative research as applicable to their particular research situation or design domain. Applying these various techniques to ensure validity would result in rigorous phenomenological studies and would make phenomenology a valuable addition to the repertoire of robust frameworks as well as to the methodological diversity used in assistive technology development (Robyler & Knezek 2003; Savenye & Robinson 2004). Successful implementation of these techniques in the design process would address many important, yet currently unmet, needs in the field as were discussed in the introduction.

III. Focus Groups As a Research Method

While many other types of qualitative research approaches can be employed in conjunction with empirical methodologies, focus groups are arguably one of the most utilized techniques (Krueger, 1988). This application can be attributed to several factors. Most notably focus groups are inexpensive, versatile, and can be organized and analyzed in short order should the need occur for quick results (groups can be organized, data collected and analyzed in less than two weeks [Krueger, 1988]). The following section

will outline the characteristics that focus groups share between themselves, to give a framework of their operation and use.

A. Characteristics of Focus Groups (from Krueger, 1988)

Generally, focus group designs tend to share five common characteristics. First, they necessarily involve “real” people. While this may sound trivial when made explicit, the emphasis that people who are participating in the focus group are not specialized in the field being studied is important to note. In addition, the number of people in the group needs to be carefully considered. Too big, and inside groups and splitting off into cliques can occur, too small, and there might not be enough opinions to count as being a representative sample. If you are attempting to get at understanding why people think the way they do, the greatest number of people you can get without the side effect of distractions that happen in a big group is always the aim when choosing the optimal size of a focus group.

Second, it is strongly suggested that the participants be as unacquainted with each other if possible. This is done to minimize effects of past experiences that group members might have had on each other, which could possibly affect the outcome and direction of the discussion. The concern is well noted by Krueger (1988), “The concern about familiarity of participants is really an issue of analysis. The analyst is unable to isolate what influenced the participants. Were the findings related to the issue being discussed or could the comments have been influenced by past, present, or future interaction with other group members?” (p. 29).

Third, the procedure that focus groups follow is meant to gather data in a specific way about perceptions, feelings, and thoughts on a given subject matter or issue of those

involved. They are not meant to make a specific decision, guide people to agreement, or make a plan.

Fourth, focus groups make use of the qualitative data they collect based on the discussion that occurs within the group. The data consisting of the participant's feelings and perceptions is brought out by open ended, nondirected questioning, as opposed to a yes/no survey instrument or directed interviewing method. The dynamic of the group is meant to mimic the nature of natural group discussion, with the moderator of the group's job being to give the questions, listen, record, and later analyze the data from the meeting. The analysis occurs in a manner that is not meant to fit any preconceived theory or structure, but based on the content of the discussion itself.

Fifth, the discussion that takes place is "focused" on a given topic, using a predetermined set of carefully selected questions. From Krueger (1988), "This analysis includes an in-depth study of the event, experience, or topic in order to describe the context and content of experience and the ingredients or components of the experience." The questions chosen, although predetermined, are presented, or are attempted to be presented, in a way that appears natural, mimicking the process of normal conversation. The questions are also tailored to present themselves logically and understandably to the group. The emphasis of importance when conducting the discussion, as mentioned in the third characteristic of focus groups, is not to have agreement. The attention of the moderator is instead given fully to following the discussion that takes place, trying to get at what the group's feelings towards the issue or subject really are.

As relates to this thesis, in usability engineering and research in assistive technology, focus groups are used as both a marketing tool and as a method of gathering

views, motivations, and opinions on the devices or products being focused on. Problems with collecting data through the methods mentioned above for use in developing assistive technology (such as an engineer's principled agenda, or the harming effects of attempting to objectify the interview setting) are addressed in the forthcoming section, "Problems With Traditional (third-person driven) Interviewing Procedures".

B. Analysis of Focus Group Data

Contrasting with the section on analysis of phenomenological interviews, the procedure for analysis of data collected from focus groups is given below. Key differences that lie in the analysis and outcomes of the data collected from both procedures are as follows: the theory behind how human experiences are viewed and their ability to be accessed (Cileciz, 2009) (first-person vs. third-person), the time given to examine as many reinterpretation possibilities as is plausible (focus groups look at statement/word invariants for purposes of statement accuracy, but do so without the input of the user from which they were obtained to check accuracy of interpretation, phenomenological methods incorporate the user at all stages), and lastly, phenomenology starts at the individual level, strips, reconstitutes, and finally synthesizes the invariant structures of that individual with the rest of the group all while consulting with the participants as fellow researchers. By contrast, focus groups examine group level activity, and pick out data that is shared on that level of the group without consultation from any group members after the interview stage.

Analysis of data collected in a focus group can be thought of in a timeline of: Collecting raw data, processing descriptive statements, and interpretation of those statements into a final opinion of the group. From the verbatim descriptions given by the

group, the researcher(s), typically a moderator and an assistant, begin by writing a summary of the discussion and making initial comparisons in the responses given by the participants. The comparison looks at factors such as the context of the comments, and the different meanings that could be taken from the responses. Other factors that are considered are consistency, “Did the respondent change their opinion later in the discussion after input from another group member?” (Krueger, 1988, p. 109). The presence and work of an assistant moderator in the analysis is important at all stages to check the work being done by the head moderator for accuracy of interpretation.

From both the summary, raw recorded data, and transcriptions, the researcher seeks to identify common themes, words, contexts and consistency of each respondent’s comments. After which then the concepts of the ‘big idea’ of the group and the researcher’s goals of the group’s discussions are compared to inform whatever subject is being studied.

IV. Comparative Analysis of Focus Groups and Phenomenological Methods

There are several differences in the greater project, scope, and process between phenomenological methodology and traditional focus group methodology, although they might at first seem functionally identical. The following section will highlight those differences as well as higher-level problems with the idea of ‘objective’ interviewing. Focus groups employed in usability design research have been shown to yield useful information to designers because of their more open format of discussion, as opposed to a survey method that might be used as procedure in a lab experiment. Yet, focus groups still follow cues from empirical style interviewing procedures and can present barriers to effective communication such as inducing a judgmental atmosphere created by being in a

group that doesn't allow a dialogue to evolve naturally. Additionally, although direct "why" questions are avoided, the questions in a focus group are always predetermined. 'Why', is always the end goal of the interview in a focus group. The transcripts of the reports, dynamics of the group, and guided questions are meant to build a picture of the group's feelings and experiences towards the chosen subject matter of discussion.

Focus groups do not allow the researcher or moderator to engage fully in the interview or discussion, keeping an air of formality and rank above those participating. Phenomenological research does not draw such a harsh distinction, instead treating the participants as a fellow researcher or co-researcher. The experiences, phenomenology assumes, is highly sensitive to issues such as distancing or force to talk, therefore to get at the true experience of the individual, one must not consider themselves removed from any aspect that normal conversation might take. Indeed, it is the only way the creation of a 'natural' environment will occur.

A. Problems with Traditional Interviewing Procedure

The laboratory/traditional clinical setting for interviewing is the idealized model for conducting an interview in the most objective scenario. The goal of the researcher is the ability to control all the biasing factors, so that the interview may be formalized and structured in all ways possible. This is aimed at minimizing interview variability, thereby facilitating the emergence of factors that the interview is meant to study.

However, these attempts to get at honest, relevant, and true responses from participants can actually create barriers to communication. Borrowing from Hagan

(1986), these are some of the issues that may impede rapport and accurate descriptions of the client's condition due to attempts to objectify the interview setting.

First, the assumption that value-free, objective questioning means the same thing to all people (Hagan, 1986). Even a common phrase like discomfort can mean completely different things to a person that has encountered situations like true poverty and homelessness. Likewise, those terms may mean nothing to a researcher who might have lived in a middle-class comfort zone. It is not within the bounds of the interview to stray from the on point questioning, so therefore a disconnect between the researcher and participant can bud here and develop as an unmentioned divide throughout the interview.

Second is the assumption that there can be non-threatening, impersonal, questions. This is a common tactic in interviewing procedure for several standardized tests in psychology as well as focus groups. Questions in focus groups for example, are carefully deliberated and selected based on their neutrality and ability to be delivered as such. Not only does this tactic feel unnatural to utilize, but can appear as insensitive, and intrusive (Hagan, 1986). In normal dialogue, e.g. as would be employed with phenomenological research methods, this use and selection of language occurs naturally, and does not have the same pressure on the interviewee that adherence to a script can foster.

Third, is the importance placed on the non-judgmental, blunted affect response. The offer of a neutral response to any answer that the client may give is meant to both keep the interview moving and to maintain professional character. The danger in this approach, however, is the reality of a cold, mechanistic interviewer, not allowed to show human empathy, or even understanding. In addition, this can create an atmosphere where

it appears that the client is being studied like an object, rather than a person whose content of response is beneficial for both the researcher and themselves. Such an impersonal demeanor during an interview can be easily off-putting and disruptive in attaining true responses from the participant. (Hagan, 1986).

Additional problems with the effectiveness of focus groups have been brought to light by Rushkoff (2005) who argues that the participants of focus groups can be coerced by the insincere affect of moderators. This can lead participants to respond in a manner geared at pleasing the researcher rather than offering their own opinions or evaluations, with data after the interview often cherry picked to support a foregone conclusion.

B. Further Similarities and Differences Between Focus Groups and Phenomenological Interviewing

Where the previous section highlighted differences in interviewing methods and theory driving those methods, this section seeks to highlight the similarities that do exist between the goals of both methods. The data gathered from focus groups as well as that gathered from phenomenological interviews seeks to get at the user's perspective of a chosen issue or experience. Where the contrast is clear is how these methodologies believe this data is best accessed and both can be considered as different designs of the same tool. Although the data is considered qualitative, focus groups employ methods (in methods and procedure) that are influenced by a third-person engineering perspective. Participants in focus group research are still seen through an objective lens (i.e. they are separated from the researcher as an 'other' like an object to be analyzed). The interview process is artificial and narrowed to follow a specific agenda with an a priori understanding of the experience. What is gathered is considered the subjective

perspective of the group, but answering predetermined questions in a group from a researcher with an agenda, can leave out much richness from the details of those perspectives that could end up being invaluable to designers later on.

Therefore it can be argued that while both research perspectives attempt to attain the same goal, due to different methods and theories of how human experience can be shared, one approach can be imagined to generate very different results than the other. One approach (focus groups) seeks to scan the user for opinions that are set in the agenda of the researcher by asking only questions that the researcher has deemed important and the other (phenomenology) allows an open dialogue, where issues and concerns that are important to the user are allowed to surface in a way that pre-determined questions do not allow. Assistive technology development in particular can be seen as a key benefactor from this kind of sharing of information, not just from the user's perspective, but also from that of the designer. For example, a technology that has been shown to have some promising features but lacking in acceptance from users is sonar based navigational devices (Giudice & Legge, 2008). However, such devices could potentially greatly benefit in their redesign given richer data about user's experiences of how they use the technology and what information they desired it to provide. Here again, motivating the design from the standpoint of direct user input about needs and preferences is likely to lead to the most useful and successful product, rather than basing the design on the designer's naïve intuitions, as is all too often the norm.

C. Bridging the Gap

Given the discussion of the differences and similarities in the methodology between phenomenology and focus groups, I turn now to contemplating ways that these methodologies might be reconciled.

The key differences, as discussed in the previous section, lie in the additional rigor of interview techniques that are employed by phenomenological research, the understanding of the nature of experience that makes those techniques necessary, as well as the process of analysis.

In order to successfully incorporate the methods used by phenomenology, this work proposes the following steps:

- Educate the researchers on the philosophy of phenomenological research
 - What advantages does discussion in this way give to designers?
- Incorporate the style of phenomenological interviewing in place of traditional methods, which necessarily distance the interviewer from the interviewed.
- Evaluate the reports of the interviews according to the needs of the task at hand, and the process informed by knowledge given by phenomenological theory.

Product teams, designers, engineers, and other investors have likely put in many resources on prototyping equipment and testing in purely functional ways. Although, it has been demonstrated that these purely mechanical methods of designing simply an “object to be used” are not sufficient to please the consumer, disabled or not (Giudice, 2008; Pullin, 2009). Early prototypes for digital cameras, given as an example in *Design Meets Disability* (Pullin, 2009), show how emphasis placed on experiencing of the item

to be used can mean the difference between a truly successful product, and millions of dollars wasted (Pullin, 2009). It is therefore in the best interests of the design team to make sure that the qualitative aspects of the data procedure are as valid in doing what they intend to do as those obtained from quantitative, third person analysis' (Pollio, 1997).

As previously mentioned in the discussion of its procedure and motivation, focus groups that deal with designing for disability or technology assistance follow a largely empirical model of thought. The data collected are meant to be functionally similar to those gathered by phenomenological methods, however they are viewed, and examined in notably different ways. Both methods seek to get at the experiences, attitudes, and thoughts that people have on a given product or situation. But while moderators in a focus group are necessarily distanced from the conversation that is taking place, the phenomenologist actively engages with those involved, in natural dialogue. This emphasis on the roles of who is divulging their subjective point and the one who will later use it in analysis is crucial to clarify, for it is here where the phenomenological method allows access to true experience, feelings, attitudes, and directed thought (intentionality).

V. What Are Ways in Which Phenomenology Can Help Design Better Products?

In *Design Meets Disability* (2009), Graham Pullin notes that if the extent of the vision for assistive technology is to have 'real' utility (e.g. solves the problem), usability (e.g. maximum utilization by the person), and accessibility, then traditional empirical methods and testing would probably suffice as the sole approach in the design of those

technologies¹. Here highlights an important disconnect between the perspective of the engineer/designer and the user for whom they are designing. The engineers, when developing a piece of technology to assist a user, say with low vision, are coming from the perspective that there is a ‘problem’ to be solved. This is not necessarily the most helpful view to have, and certainly does not necessarily encompass the perspective of the user. The user after all does not likely see the problem as solved once they use a device. The blindness, or paralysis etc still is a fundamental part of their being and experience of the world (Schenk, 1986). The role of the assistive technology is that of incorporating an object that is foreign to the body’s unity to address a particular experience in that person’s life (Leder, 1990; 2008). Therefore the device must not only serve the goals of utility, usability and accessibility, but also the experience, enjoyment, engagement and desired effect within that users being-in-the-world. Attainment of these goals then, rests on successful and rich communication of experiential perspectives between user and developer, which needs to involve the ability to share experiences in a way that is representative of the user and understanding of the designer.

There is no doubt that it is good to have technologies that can do many things for a broad range of people. However, an important question is how to establish whether the tasks and goals supported are actually needed by the end-user? To answer this obvious, yet often ignored question, the designer needs to have the experience of the one using the product, coupled with behavioral testing to ensure maximal usability. The question then can be stated: What is the best way to get at that first-hand experience? Human subject

¹ The goals of utility, usability, and accessibility were given at an assistive technology conference, at which primarily third person research perspectives were highlighted as ways to attain those goals. (Pullin, 2009)

testing is one approach, but this only tells half of the story as results are generally based on quantifying performance on a prescribed experimental task, which does not account for, or rigorously describe, the individual's report of their experience.

Like focus groups, data gathered from phenomenological methods could be utilized during all phases of development of new products as well as aiding redesign of products that employ useful concepts, but have suffered from an engineer's biased agenda (Pullin, 2009). By gathering individual reports by way of phenomenological interviewing as well as the rigorous analysis process, we can not only fill the gaps where designers have not found a way to accurately gauge what the user needs from the product, but also give a way to guide engineers to not blindly follow traditional principles which all too often yield adoption of features that are neither wanted or useful to the end-user. However, in order for this approach to gain support and acceptance, researchers will need to take this approach seriously. Changing the design mindset in order to put the same importance on the qualitative data gathered by means of phenomenological interviewing at the same level as traditional quantitative empirical methods based on formal statistical analysis and behavioral experimentation will be necessary (Marbach, 2003). The depth and detail of user's experience that phenomenology can open up to designers once analyzed is rich and full of relevant data to inform development processes at all stages. Richer than that of pure focus group data, since it allows for natural dialogic conversation to guide it, therefore also (as the assumptions go), allowing issues that are important not only to the researcher but to the potential user, to come up as well. Specific examples of where phenomenological interview data could help fill in gaps in designs of

assistive products that have not had major acceptance, yet purport to still be useful ideas by the groups that request them are mentioned in the next section.

A. “Seeing with Sound” the vOICe

One piece of technology that I would like to highlight as possibly being able to be improved from information based on a phenomenological approach is the vOICe, a visual to auditory sensory substitution device developed to assist the blind and visually impaired in building “sound-scapes” of their environments (<http://www.seeingwithsound.com/>, 2010). The vOICe system, which works by sampling once per second the 180 degrees of the visual field in greyscale with 174 x 64 resolution, and converting it into frequencies spanning 500 to 5000 Hz. The loudness of sounds corresponds to a pixel's brightness, and the frequency of sounds corresponds to a pixel's vertical position in the picture. The visual field is scanned in columns, with the frequency distribution at any given moment in time representing a single column of visual pixels (Meijer, 1992). So, to provide an example, two parallel lines each running horizontally would sound like two sine waves of different frequencies superimposed on one another for a period of time, whereas a single dot would sound more like a "beep."

Scientific advances in "sensory substitution" technology have demonstrated that it is possible to simulate (or stimulate) one modality (sight, hearing, touch) with sensory data from another. In one such system, a camera translates optical information into weak electrical pulses, which are then applied to the tongue (which is an ideal interface for sensory substitution due to its high receptor sensitivity and large neural representation in the cortex) (<http://scienceblogs.com/developingintelligence>, 2007). Users of this

technology report the subjective experience of actually seeing with their tongue, if you can imagine that (note that Thomas Nagel would suggest you can't)².

Auditory sensory substitution systems like vOICe have several additional advantages:

1) The auditory system is exquisitely and simultaneously sensitive to multiple dimensions of sound (frequency, amplitude, harmony, rhythm, spectral, left/right onset time and to a lesser extent left/right phase differences).

(<http://scienceblogs.com/developingintelligence>, 2007)

2) Audition seems to have natural relationships with spatial processing. For example, human subjects are faster to respond to an upper location if a high-pitched sound is played simultaneously, and are conversely faster to respond to a lower location if a low-pitched sound is played, as opposed to the opposite mapping.

(<http://scienceblogs.com/developingintelligence>, 2007)

3) The temporal resolution of sonic information can be easily increased or decreased, which can be used to improve its correspondence with the increased resolution of human vision at the center of the field of vision. (<http://scienceblogs.com/developingintelligence>, 2007)

² Research in sensory substitution would also seem to agree with Nagel (citation [I can't remember the exact paper that you sent me that addressed this]). It is rather the case that certain spatial properties of the world can be perceived through multiple inputs. Part of research done in sensory substitution and multi-modality interactions seeks to find what these invariants are and where the strongest couplings lie.

The research by Auvray et al. (2007) demonstrates a "proof of concept" for general-purpose visual sensory substitution with audition. Even with relatively small amounts of training, subjects were able to use sound to locate and identify objects by their visual characteristics in 3-dimensions (Auvray et. al, 2007). In most cases, training had remarkable benefits, and the learning curves may be far from linear: proficiency with this system could conceivably increase exponentially with additional practice.

On the other hand, there remains substantial room for improvement: the reaction times were so long as to make this system practically useless for most applications, and there is a long way to go until vOICE is ready for object detection with distances and complexity of the real-world or with non-optimal ambient lighting conditions (Auvray et al, 2007). Further, "The sophistication of vOICE's auditory encoding needs to increase in almost every possible way before it will be ready for natural and immersive use in daily life." (Auvray et al, 2007)

There is clear appeal for the use of such a system (both as a prosthesis for the blind, as well as the potential of providing soldiers with 360 degree vision through auditory substitution), but many unanswered questions remain from users about efficacy, usability, and practicality. How intuitive is it to learn and use in a real time capacity? Does the way that the information is presented through the interface make sense? What is the learning curve? Is it convenient to use comfortably day to day? Does it solve a "real" problem—one which is not already addressed by another more parsimonious assistive tool? Will the user have concerns of its appearance?

One could postulate that the device's development could be greatly informed about such questions and the design improved based on experiential data gathered from

phenomenological methods, since the experience of using the device is so crucial to how effectively the information it provides will be used, or even if it is effective at being integrated into a person's everyday being. As the research by Auvray et al (2007) shows, the vOICe, while being effective in theory in the sensory translation rules that it employs to translate information from one sense to supplement another (sound for vision), real world application and integration to users lives has shown its limitations and concerns for issues are yet to be addressed.

In a review of assistive devices for the blind by Giudice & Legge (2008), concerns such as information overload and undue complexity are described as crucial engineering and design pitfalls to be considered (and avoided) in the development of assistive devices. It is not hard to imagine that by using real user's perspectives gathered from phenomenological methods, as opposed to the more common approach of simply relying on designer intuition, or user opinions gathered by existing methods such as focus groups, or quantitative surveys, would have positive and far reaching effects on the development of these technologies.

For example, if we were to imagine a phenomenologically informed redesign of the vOICe technology, specific changes that could be addressed might take consideration of where the processing power is directed to (priority in frame rate refresh given certain conditions). Of greater importance, more input from users on whether the chosen parameters of visual to auditory translation that are used actually make sense should be solicited by users. Is the current scheme perceived as intuitive and natural--beyond the theoretical elegance of the implemented algorithm? Rather than starting from an engineering perspective about this critical translation, the design should start by

establishing from blind users about what they actually want access too in the world and then what the best methods for conveying this information through sound would be.

There may be a better way through which information could be translated about the world through the device, though still using the general framework, but this is information that no computer program or algorithm can model completely. Aesthetic concerns, often an area that is not a primary concern of engineers (Pullin, 2009) could also be given meaningful input from phenomenological interviews. Questions like “will this device’s appearance draw undue or unwanted attention to my blindness?” or “is the device intrusive on my abilities to do other tasks normally that are not related to my low vision?”, would be given appropriate attention due to the consistent and in-depth involvement of both the researcher and user in gathering and analysis of experiential data attained through phenomenological methods.

VI. Discussion

“The disconnect between what a product does and what the user wishes it would do is compounded as there is often inadequate communication between engineers and rehabilitation professionals or potential blind users.” (Giudice & Legge, 2008)

I propose that assistive systems like the vOICe, as well as a plethora of similar sensory substitution devices, suffer from adherence to the view that there can be successful design with the minimal input from actual user first hand reports from users during the research and development stages of a product. I argue that the phenomenological methods that I have outlined as well as their foundational perspective, are the way forward if we are to address the true subjective data that has been absent in development of assistive technology. To be successfully implemented, both

understanding of its methods and theoretical foundations will need to be integrated into the engineer's mindset and design perspective.

This is not to say however, that phenomenology should take a place of higher importance or authority over existing methods, qualitative or quantitative. Rather, it should be considered as a tool which is available to be added to the arsenal of any project where it might find use. As mentioned in the beginning of this thesis, there are many methods appropriate for a given research project. Someone making small tweaks to a product's design will often not need the detail of data gathered from phenomenological interviews. Instead, a focus group might better suit the needs of such a situation. The phenomenological research procedure is both time consuming, and possibly expensive depending on the kinds of assistance one has, so a researcher on a budget or with limited resources and time may not see it as a viable option to choose. However what should be clear from this analysis of phenomenological methods as well as suggestions given concerning its application in design, is that it could very well be the best way for researchers to incorporate actual user experience into their work. To date, this input is missing from most design of assistive technology and the results are telling. Many devices that are developed are cumbersome, unintuitive, or not accepted by the target demographic. If the phenomenological approaches discussed in this thesis were introduced as a standard component of design, I argue that this trend would reverse and there would be many more devices which are natural to use and desired by these end-users.

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