Qualitative Data Analysis Methods of Understanding and Use of Design Research

최정민

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Abstract

Analyzing qualitative data needs a careful approach and the expertise of researchers. Unlike pre-structured and formalized quantitative research, the resulting data of qualitative research is unstructured and jumbled by its nature. Therefore, it is necessary for qualitative researchers to explore analytical methods for analyzing qualitative data. In this study, existing qualitative interview data on the understanding and use of design research in practice were analyzed as a case study. Four interview questions were selected from the initial fifteen items for in-depth analysis and interpretation, focusing more on the interrelationship between answers and the analysis methods. Several existing analysis methods were initially investigated to form a theoretical base, including grounded theoretical methods and case-oriented comparative methods. Based on those methods, this research seeks to examine various analytical techniques in order to understand the use of design research in practice. The result of the analyses presented several findings of practitioners' characterization of their own research work, their understanding of design research and research archiving patterns. First, many interviewees understood design research along the same line with, but in a more broad sense than, their own research work. Second, the characteristics of their real work seem to have an influence on the characterization of their research as well as the relationship between this characterization and their understanding of design research. Third, interviewees who understood design research as a very comprehensive activity rather than just evaluative or method-oriented activity tended to give more positive answers in archiving their studies. Finally, the limitations of this study and the recommendations for a future study were presented.

Keyword
Design research, Qualitative data analysis, Analytical techniques

1. Introduction

Analyzing qualitative data needs a careful approach and the expertise of researchers. Unlike pre-structured and formalized quantitative research, the resulting data of qualitative research is unstructured and jumbled by its nature. Whether the researchers can derive useful insights from the messy data or not depends on the use of appropriate analytical methods and their proficiency (Creswell, 2003). Therefore, it is necessary for qualitative researchers to explore analytical methods for analyzing qualitative data.

The phrase of qualitative research started to be used in the 1970s in the field of anthropology and sociology. From that, the qualitative research has been broaden to other disciplines including design. IDEO, one of famous design consultants in the United States, adopted qualitative research methods commercially and has made many successful and innovative stories (Kelley, et al., 2005). Recently, many design researchers try to use qualitative data collecting methods such as shadowing and observation for designers' insights. IDEO introduced Method Cards including fifty one methods with brief description of why and how to utilize each methods, and a simple example. However, qualitative data analysis methods in design are not well established in terms of deep interpretation of participants' latent thoughts which will be used as important resources for further development.

The goal of this research is to introduce qualitative data analysis using a case study of "perspectives on design research in design practice." The case study was conducted to understand the needs of design research users for reducing a gap between design researchers and designers in design practice. The suggested qualitative data analysis s explains basic principles and frames, so these can be applied to diverse qualitative design research projects.

2. Scope & Methods

The case study were conducted by following from a previous research that tried to "broaden the perspective on design research users' needs in practice (Poggenpohl, 2004))." To complement the previous research, data were collected from qualitative interviews and s for qualitative analyses from other disciplines were reviewed to suggest a qualitative analysis methods.

2.1 Research Scope

The telephone interviewees whose responses were analyzed included eight corporate and eleven consultancy workers at interactive product and visual design fields in the United States. The interviews consisted of several parts: design research characterization (question 1 and 2), research use (question 3 to 6), research archives (question 7 to 10), and use and characterization of scholarly papers (question 11 to 15). All answers had been analyzed once through the preliminary study. For this research, four items (question 1, 2, 7, and 8) were selected from the initial questions for in-depth analysis and interpretation, focusing more on the interrelationship between answers and the analysis s as shown in Table 1.

Overall Structure	Research Questions	Related Item of Initial Questionnaire
Understanding & Comparison	Characterization of own research work	1. How would you characterize the research you do or use?
	Understanding of design research	2. What is your understanding of design research?
	Archiving of design research	7. Do you archive your own research and its result? 8. Are these studies ever returned to for use or expanded by additional data or analysis?
Relationship between answers	Characterization of own research work vs. Understanding of design research	1 vs. 2
	Understanding of design research vs. Archiving of design research	2 vs. 7, 8

[Table 1] Research Questions

2.2 Research Methods

Several existing analysis s were initially investigated to form a theoretical base, including grounded theoretical s (Strauss, et al., 1987; Strauss, et al., 1990) and case-oriented comparative s (Ragin, 1987). Based on those s, this research seeks to examine various analytical techniques in order to understand the use of design research in practice. The research questions of this study were organized in an expansive way: from single to combined issues. First of all, each analysis of four question items was conducted to generally understand the overall responses. Then, the differences were compared, mainly focused on the differences between corporations and consultancies. Finally, higher-level comparisons between the previously-compared results were executed, that is, relationships between several pairs of questions were examined. Table 1 shows the detailed research questions used in this research. In the sequence of research questions, interview data from nineteen participants were analyzed.

3. Qualitative Analysis Methods

As mentioned previously, the following existing methods were investigated to address qualitative research. First, grounded theory provided the basic framework of analysis in decomposing and reorganizing the interview data. It has been extensively used in various social science fields. Strauss and Corbin define "the grounded theory approach is a qualitative research method that uses a systematic set of procedures to develop an inductively derived theory about a phenomenon(Strauss, et al., 1987)." Especially, Strauss provides detailed procedures and guidelines for applying the theory to data collection, analysis and theory generation in real analytical practice (Strauss, et al., 1990). The essential procedures of grounded theoretical data analysis include coding data with focus on key elements and generating categories by relating those elements. Data coding techniques include three overlapping processes in his proposed methods: open coding, axial coding,

and selective coding. The aim of open coding is to break data and produce totally tentative concepts and their dimensions from the data. Axial coding consists of intensive analysis to revolve around one category at a time, refining and developing categories. During selective coding, researchers limit the coding to core codes-related codes. These data coding and categorization techniques were partially applied throughout this study to decompose and reconfigure the interview data. The coding terms of grounded theory were also used, including "in-vivo code," terms used by the people who are being studied, and "provisional name." In the detailed process, after 1) in-vivo codes were drawn, then 2) a provisional name was given, and 3) the category name related to multiple provisional names was created.

Second, case-oriented comparative research methods were used as a more broad strategy rather than as a detailed technique. Ragin defines that the term of comparative method is used usually to indicate the comparison of large macrosocial units (Ragin, 1987). Among its two different approaches, case-oriented and variable-oriented approach, researchers who use the former strategy "compare cases with each other as wholes to arrive at modest generalizations."
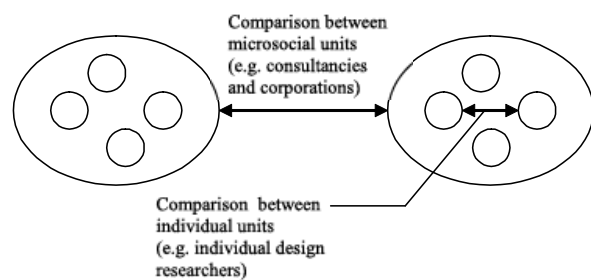
[Figure 1] Comparative Work in Two Different Levels

The general processes of case-oriented comparative method include identifying comparable instances of a phenomenon of interest and analyzing the important similarities and differences among them. Then typically, several possible explanations can be supported in a given set of cases, in which the investigator must support his/her chosen explanation by citing surrounding circumstances and by interpreting cases (Ragin,

Category	Provisional Name	In-vivo Code	Interviewee	
User research	User research	user research...how people accomplish tasks in the work environment.	1	*Co.
	Customer research to understand them	···going out to customers to gather information on their tasks and pain points··· end user model and understanding the context··· the alpha part is to understand customers···	2	Co.
	Qualitative user research	···documenting user requirements... qualitative in nature··· not sophisticated	3	Co.
	User research	user research related to how our target users... utilize our applications	6	Co.
	Exploratory user research	One is exploratory research···ethnographic···	9	Co.
	Ethnographic primary research	primary research which is most ethnographic···ethnographic interviewing and observation.	10	**Con.
	User centered research	an emphasis on the user than on business or market··· understanding user patterns of behavior, needs, emotions, etc.	12	Con.
	Consumer research	I call it design research··· a form of consumer research, but with design as an end application.	13	Con.
	User research, rather than testing	user research···more about research / concept testing and usability testing···.just testing tools	14	Con.
	Identity research (similar with user research)	identity research···identity development is one activity of the research···how places are organized and how people find way through them··· preliminary research···	15	Con.
	Ethnographic primary research	We also did fundamental research··· ethnographic kind···	16	Con.
	Generative user research	···generative (distinguished from evaluative and experimental) ···upfront in the product development process···research with potential end users to generate the ideas···	17	Con.
	Design-oriented user research	It's mostly user research...design research...not marketing···	18	Con.
	Qualitative user research	qualitative research into consumers....their values, attitudes and behavior··· around the product or service.	19	Con.
Evaluative research	Usability testing	···we evaluate what we've come up with···in front of customers going out to ask specific questions···	2	Co.
	Qualitative testing	···testing for the final project... disaster checking... highly qualitative.	3	Co.
	Evaluative research	···the other is evaluative research···focus group oriented, getting reaction to the specific thing.	9	Co.
Market research	Market research	We engage Gallup and Harris···	3	Co.
	Market research	I use primarily market research···qualitative or quantitative. ···focus group responses or online or telephone surveys.	5	Co.
	Market trend research	···to judge where the market is headed···	8	Co.
Ad hoc research	Ad hoc research	We don't have formalized system···sort of ad hoc as needed.	4	Co.
Etc. (broad level)	Quan. & Qual. research as a strategic guide	···central to a lot of the business decisions and company strategies. ···it's a combination of qualitative and quantitative research.	7	Co.
	Creative research, not just design research	I call it creative research. We brainstorm what is creative design... We don't think of it as something we tack into design.	11	Con.

[Table 2] Characterization of Own Research Work

*Co.: Corporate   **Con.: Consultancy

1987). In addition, according to Przeworski and Teune, "comparative work proceeds at two levels simultaneously: at the system level (or macrosocial level) and at the within-system level (Przeworski, et al., 1970)." In this research, consultancies and corporations were chosen as comparable instances in the system level and the individual practitioners' data were also compared at the within-system level as shown in Figure 1.

4. Analysis Results

Based on the research questions, the analysis consists of two parts: 1) understanding and comparison and 2) relationship between answers. First of all, each interviewee's responses for each

| Interviewee | | Provisional Name | | |
		Characterization of Own Research	Comparison	Understanding of Design Research
6	Co.	User research	=	User research
11	Con.	Creative research, not just design research	=	Research for creating something
12	Con.	User centered research	=	User centered research
19	Con.	Qualitative user research	=	Qualitative user research
1	Co.	User research	<	Any research for better design
2	Co.	Customer research to understand them & Post-usability testing	< =	Inclusive practical activity in design process
7	Co.	Quan. & Qual. research as a strategic guide	<	Any process creating design insight
9	Co.	Exploratory user research & Evaluative research	< =	Guide of the direction of design
14	Con.	User research, rather than testing	<	Any research to support design work
17	Con.	Generative user research	<	Applicable and practical research
18	Con.	Design-oriented user research	<	Research of user and design process
16	Con.	Ethnographic primary research and secondary research	>	Research of design metaphor and appearance
3	Co.	Design and market research, including qualitative user research & testing	=/=	Design as an art rather than a science (depending on individual designers)
4	Co.	Ad hoc research (not formalized)	=/=	User centered research
10	Con.	Ethnographic primary research (and secondary research)	=/=	[Unanswered]
13	Con.	Consumer research	=/=	An assemblage of research methods
15	Con.	Identity research (similar with user research)	=/=	[Unanswered] It's not a term that in my lexicon…
5	Co.	Market research	=/=	Testing
8	Co.	Market trend research	=/=	Informative evaluation for getting feedback

[Table 4] Relationship between Characterization of Own Research and Understanding of Design Research

question were examined to understand overall their thoughts and use patterns of design research, by categorizing their individual answers and seeking to figure out the differences between two macrosocial units: consultancies and corporations. Then, the relationships between two different questions were investigated to interpret the results from expansive points of view. All interviewees were numbered from 1 to 19 in order to compare each person's answers between two different question items in the relationship phase.

4.1 Understanding and Comparison

The raw data were first analyzed according to grounded theoretical techniques, comparing individuals' answers, and then differences between consultancies and corporations were compared.

4.1.1 Characterization of Own Research Work

When an interviewee answered with totally different ideas for question 1 (characterization of own research work) in a parallel level, each idea was separately filled in the analysis table. As a result, the answers from interviewee 2, 3, and 9 were double addressed. Table 2 presents the analytical methods and results. Fourteen responses showed that they thought of their research as user research, and many of them mentioned qualitative or ethnographic approaches as their research methods. Also, three interviewees characterized their research as a kind of evaluative research to get feedback for specific design outputs. In addition, three other interviewees characterized it as market research, which may be concerned with their particular work: one works for a global brand business, another works for a broadcast company, and the other works for a marketing company. "Design territory" may not be their only concern.

After analyzing the overall responses of characterization, the differences between those

Category	Provisional Name	In-vivo Code	Interviewee	
User research	User centered research	user centered research... All (of interface design issues) based on your audience···	4	Co.
	User research	···to understand how target users would utilize a service or a product. ···to identify opportunities for improvements or needs	6	Co.
	User centered research	design fields tends to be more user centered than business focused.	12	Con.
	Research of user and design process	understanding of the user and the process of design···	18	Con.
	Qualitative user research	qualitative research ···how the consumer feels about the product, does it connect with their values, their attitudes and behavior···	19	Con.
Evaluative research	Testing	Test, e.g. concepts and templates in advertising	5	Co.
	Evaluation for getting feedback	···getting customer feedback as to what design says to them··· projective techniques and more subtle ways of asking questions···	8	Co.
Comprehensive research for design	Any research for better design	any research that helps relate to better design a product	1	Co.
	Any process creating design insight	any process of trying to gain insight (of) products and representative forms···	7	Co.
	Guide the direction of design	research that guides the direction of design	9	Con.
	Research for creating something	It's really ingrained into what we do··· clients ask us for design research···always to be used toward creating something.	11	Con.
	Any research to support design work	any kind of research that···support the design···	14	Con.
	Inclusive practical activity in design process	Highly inclusive activity: the A-Z of moving from an idea to implementing, refining, specifying, creating, or developing it.	2	Co.
	Applicable and practical approach	applied approach··· definitely more applied and practical···	17	Con.
Etc.	Design as an art rather than a science	Design as an art rather than a science...rely highly on ···professional designers.	3	Co.
	Assemblage of research methods	an assemblage of research methods···include sociological field work, observation, interview··· include human factors, ergonomics, information architecture, etc.	13	Co.
	Research of design metaphor and appearance	(in terms of) design research···we could be researching metaphors, design appearance···	16	Con.
[Unanswered]	[Unanswered]	[Unanswered]	10	Con.
	[Unanswered]	It's not a term that in my lexicon···	15	Con.

[Table 3] Understanding of Design Research

interviewed in corporations and consultancies were examined. Figure 2 shows the summarized result. In order to effectively explain the result, the analyzed data were grouped by two criteria: the time to conduct research (Preliminary/Evaluative) and the specificity (Specific/General). For example, group 1 (Preliminary and Specific) included such codes as "how people accomplish particular tasks in their work environment." Some codes such as "getting reaction to the specific thing" were considered as those of group 2 (Evaluative/Specific). Group 3 (Preliminary/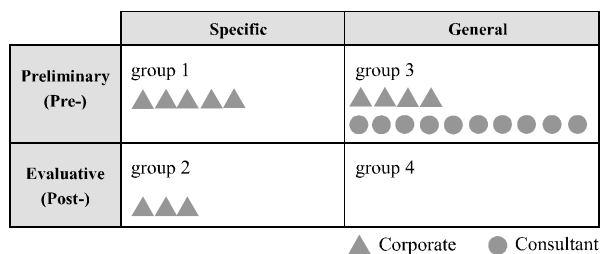General) included such codes as "generative research upfront in the product development process" and "ethnographic exploratory research."

All ten consultants answered that their research work was user research to be conducted preliminarily at a general level rather than limited to particular outputs. However, answers from those in corporations showed a wide range: from exploratory user research to testing for the final product. This might be due to the nature of their company and work. As mentioned above, the type of company seems to affect the characterization of their research activity. Also, one-third of the interviewees in a corporation gave different

Interviewee		Understanding of Design Research	Archiving of Design Research		
			Y/N	Form of Archiving & Data	Reason
1	Co.	Any research for better design	Yes		
2	Co.	Inclusive practical activity in design process	Yes		Iterative nature of research work
4	Co.	User centered research	Yes	Currently CDs / Hopefully integrated database on servers	
5	Co.	Testing	Yes		
6	Co.	User research	Yes		User research is an iterative process
7	Co.	Any process creating design insight	Yes		
9	Co.	Guide of the direction of design	Yes	Reports, video, and audio tapes in an integrated corporate database	
10	Con.	[Unanswered]	Yes		
12	Con.	User centered research	Yes	Currently, raw materials / Hopefully, queryable database	There are unchanged data
14	Con.	Any research for design work	Yes		
15	Con	[Unanswered]	Yes	digital storage and backing up files	To build on the previous results
16	Con.	Research of design metaphor and appearance	Yes	early documentation and resources and the results	
17	Con.	Applicable and practical research	Yes		To see how things have changed
19	Con.	Qualitative user research	Yes	If possible, everything	To refer back to it where appropriate
3	Co.	Design as an art rather than a science (depending on professional designers)	Yes (loosely) /No		
8	Co.	Informative evaluation for getting feedback	No/ Yes	Decentralized archiving	
13	Con.	An assemblage of research methods	No		Design research is disposable research.
18	Con.	Research of user & design process	No		

[Table 5] Relationship between Understanding of Design Research and Archiving of Design Research

answers simultaneously: both preliminary user research and evaluative user testing. They seem to more strongly consider their work as an outcome-directed activity than consultancies, not just as a research for better understanding of users.

	Specific	General
Preliminary (Pre-)	group 1 ▲▲▲▲▲	group 3 ▲▲▲▲ ●●●●●●●●●
Evaluative (Post-)	group 2 ▲▲▲	group 4

▲ Corporate ● Consultant

[Figure 2] Comparison of Characterization of Own Research Work

4.1.2 Understanding of Design Research

Because this analysis would be compared with those of the characterization of own research work in the following phase, the analysis format for question 2 (understanding of design research) was organized in the same way as question 1 (characterization of own research work). Table 3 shows the analysis result. Participants' answers ranged widely from a very inclusive understanding such as "any research" to a small scope such as "testing," and from an abstract level of understanding such as "an art" to a very practical level such as "an assemblage of research methods." Unlike the characterization of their own research work, only five participants answered that their understanding of design research was a kind of

user research. About seven answers reflected very comprehensive scope of design research. Some of them mentioned more general concepts, while the others emphasized very practical and applicable viewpoint of design research. Although the comparison between corporate and consultant responses was also attempted for this research question, however, significant difference was not found.

4.1.3 Archiving of Design Research

The responses to question 7 (archiving of design research) and 8 (reuse of the archived research) were analyzed. Although the questions were basically yes or no questions, the responses of some interviewees included the specific forms of archiving and the data as well as the reasons why they did or did not archive their studies. Since such description was thought to enrich the interpretation of the data, these supplementary mentions were analyzed together. Most participants answered yes for both questions: archiving of own studies and the reuse of archived research. The form of archiving and the archived data ranged from burned CDs of raw data to an integrated database. Several interviewees mentioned a queryable database as a desired archiving form although only raw materials were currently stored. Also, the reason for reusing the archived studies included the iterative nature of a design research process, reference to unchangeable data, and investigation of changed patterns. While most participants gave positive answers for both questions, four interviewees answered no for either one of the questions. Among the negative responses, one interviewee mentioned that design research was "disposable research." Also, another interviewee's response, who works for a global business department, provided the reason relating to the characteristic of his company: a decentralized organization in many different places. However, no significant difference between corporate and consultant answers was found.

4.2 Relationship

In this phase, the analyzed data in the previous processes are re-examined with focus on the potential relationships between two different questions: characterization of own research vs. understanding of design research and understanding of design research vs. archiving of design research.

4.2.1 Characterization of Own Research vs. Understanding of Design Research

In the following Table 4, corporate and consultant responses are compared at a provisional name level. However, when the provisional names were so comprehensive as to make each comparison difficult, in-vivo-level reviews were conducted for more detailed investigation. There were four participants who gave similar answers for questions 1 and 2, and three of them were consultants. Comparing their characterization of their research work, half the interviewees tended to think of design research in a more inclusive sense; several people mentioned "any research" for design work. On the other hand, some interviewees seemed to think of design research in totally different ways from their current research work. Some of them did not give an answer for their understanding of "design research" even if they had clear concepts of their research work, which could be a kind of design research. In addition, two participants who considered their research as market research answered that design research was for testing particular outputs. Both were corporate designers. It may be postulated that their market-oriented and relatively narrow scope of research work affects their understanding of design research as an outcome-oriented research.

4.2.2 Understanding of Design Research vs. Archiving of Design Research

Table 5 shows the result of the relationship between each interviewee's understanding of design research and their behavior and attitude toward

archiving research. Since this analysis was focused on the one to one relationships between responses for two questions, three interviewees who did not give any answer for either question were excluded for this analysis. Most interviewees who understood design research as a very comprehensive activity gave positive answers for the question of archiving. However, some interviewees who had more evaluative or method-oriented understanding of design research gave negative answers. For example, one participant who regarded research design as "an assemblage of research methods" stated that "design research was disposable research" so that archiving the results was not necessary. Besides those interviewees, another interviewee who understood design research uniquely as "an art depending on professional designers" also gave a negative answer.

5. Discussion and Conclusions

Through the analysis, the characterization of own research work, understanding of design research, and archiving of research were investigated in the practitioner community. In addition to grounded theoretical analysis, comparing each interviewee's answer between different questions revealed relationships between answers. First, many interviewees understood design research along the same line with, but in a more broad sense than, their own research work. In other words, they seem to understand their research work as a particular part of the broader design research realm. Second, the characteristics of their real work seem to have an influence on the characterization of their research as well as the relationship between this characterization and their understanding of design research. Third, interviewees who understood design research as a very comprehensive activity rather than just evaluative or method-oriented activity tended to give more positive answers in archiving their studies. The findings through these analyses will bridge the gaps between the design research and the practitioner societies in terms of understanding and use of design research.

In addition to the investigation of research questions, the purpose of this research was to examine various analytical methods for pattern finding in qualitative data. Through this case study, several analytical techniques were examined; some were modified existing theories and others were developed. As mentioned earlier, qualitative data is unstructured and mixed as a whole. Therefore, according to the applied analytical frames and the researcher's expertise, more useful insights could be achieved or not. For a further study that would expand this result to attempt generalization, triangulation and/or member validation methods that are generally recommended to enhance confidence in qualitative research could be applied.

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