Cowboy, Cataloguer, Methodist, Magician, and Master: Gestalts of Analysis and Design

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Certificate of Originality

I certify that I have not previously submitted the work in this thesis neither for a degree nor as part of the requirements for a degree.

I certify that I have written this thesis. I have acknowledged any help that I have received in my research work and the preparation of the thesis itself. In addition, I certify that I have indicated all information sources and literature used in the thesis.

I certify that I have received ethics clearance from the UTS Ethics committee in accordance with the UTS policies and human and animal research.

Signature of Student

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Abstract

Business information systems (BIS) projects succeed or fail because of people. A better understanding of the people who analyse/design BIS could lead to more successes. This study of the qualitatively different ways that analyst/designers' conceive of and approach their work improves our understanding. Twenty interviews with analyst/designers with varying expertise and years of experience were analysed, interpreted, and described using a research method that evolved from orthodox phenomenography.

This evolved method itself contributes to phenomenography. The significant contributions are: 1) GIFTed data analysis, a data analysis technique incorporating Gestalt theory, types of intentionality, and Gurwitsch's field theory of consciousness; 2) a generic conception-of analytical framework; 3) a generic approach-to analytical framework.

The categories resulting from the phenomenographic analysis, and which describe analyst/designers' awareness of analysis/design, are treated as Gestalts. The categories form two sets: conceptions and approaches. The five conception categories are: 1) Differentiate analysis/design as something other than programming; 2) Catalogue separate analysis/design tasks into a sequential and orderly activity; 3) Idealise analysis/design as how to deliver what the client wants; 4) Contrast actual and ideal analysis—what and design—how; 5) Integrate exploring the organisation and problem with creating an abstract solution. The four approach categories are: 1) An ad hoc process that as quickly as possible delivers something to the client and solves the problem; 2) An atomistic process that produces artefacts to show that some analysis and design took place; 3) A circumscribed process that produces the best artefacts and solution; 4) An adjustable process that shares an understanding of the problem and a vision of the solution to satisfice stakeholders. Ten relationships between conception and approach categories were deemed rational. Five relationships, which are the relationships between the highest approach category to which a conception category is related, were selected for closer examination. These five Gestalts of analysis/design, the cowboy, the cataloguer, the methodist, the magician, and the master are described as

parallel Gestalts at the field or theme level of the categories and as development life cycles.

All these results reveal at a collective level a number of different ways analyst/designers experience analysis/design, thus contributing to a people-centred foundation for research aimed at increasing BIS project successes.

The history of humanity has slowly been increasing the boundaries of knowledge and knowing more and more and more, and feels comfortable inside there, but at the edges, it’s always going to be a challenge.

Neil Armstrong (1930–2012), Commander, Apollo 11 —

Malley, A. (Host), Stoykov, V. (Introducer) & evotv (Creator & Producer) 2012, 1 May, *An audience with Neil Armstrong: Part 1 Space Race*, Video, *A special edition of evotv's the bottom line*, CPA Australia, <cpaaustralia.com.au/thebottomline>.

1 Introduction

In the late 1960s, *Scientific American* magazine engaged a software house to develop a subscription system. The system resulted in increased costs, higher employee turnover, an increase in the number of clerical people required, a decrease in the reliability and quality of service and a decrease in employee morale (Boehm 1981).

On the 12th of October 2005, Australian Customs replaced a cargo system with the Integrated Cargo System (Australian Customs and Border Protection Service 2005). As a direct result, the Customs Brokers & Forwarders Council of Australia sought tens of millions of dollars in compensation due to a backlog of uncleared imports (Rossi 2005).

These cases happened four decades apart and are but two in a long list of project failures; a list that includes 10% (Glass 2005) to 90% (Jones 2004) of software development projects, depending on how failure is defined.

When I taught business information systems (BIS) analysis/design, students asked me why what they were learning was not used in industry and people in industry would ask me why their graduate recruits did not know how to do analysis/design. Both questions were often prompted by news stories of project failure. I was unable to give an answer, based on research, to either question. Motivated by the questions from students and people in industry, and by my own interest in improving analysis/design, I asked a more tractable question: what are analyst/designers thinking and doing when they are working? The answer to that question could contribute to answering the larger question: why do software development projects have such high failure rates?

Two events influenced my decision on what form my study should take. The first was a discussion about phenomenography with Professor Shirley Booth at the Australasian Computing Education Conference in 2003. Phenomenography is an approach used to study the different ways that people are aware of a phenomenon.

The second event was encountering the following from Couger (1996):

> *Our paradigms act as physiological filters – we see the world through our paradigms. This means that any data that exist in the real world that do not fit our paradigm will have a difficult time getting through our*

filters…what may be perfectly visible, perfectly obvious, to persons with one paradigm, may be quite literally invisible to persons with a different paradigm. (pp. 62–4)

The importance of this quote, that is, our perceptions, knowledge, skills, beliefs, preferences, and paradigms act as filters through which we experience the world and guide our actions, was reinforced by others as the study progressed (Adolph & Kruchten 2011; Bostrom & Heinen 1977a, 1977b; Brooks 1975; Glass 2002; Isomäki 2002; Land, Lincoln, Mumford & Supper 1980; Marton & Booth 1997). Whatever analyst/designers were thinking was acting as a filter for what they were doing.

I saw that phenomenography could provide a research approach to describe the analysis/design paradigms that were acting as filters for the analyst/designers. In the terms used in phenomenography, my initial research question was:

What is the variation in awareness that analyst/designers have of analysis/design?

Analyst/designers analyse/design a great variety of systems. This study focuses on BIS as they are the type of systems with the highest occurrence in and greatest commonality across organisations (Jones 2008). All businesses have some form of BIS. The BIS of interest here incorporate computer software and support the processes and information management of an organisation. The software in BIS are not for operating machinery or devices, such as looms for the weaving of cloth, the microprocessors that control a car, the operating systems of a computer, or the systems in the space shuttle. BIS are about the operational, tactical, and strategic functions common to most organisations, for example, financial planning, accounting, management decision making, human resource management, payroll, marketing, procurement of materials, and supply of goods and services.

1.1 What is Analysis/Design

The development of BIS, in the broadest sense, is the analysis, design, construction, and deployment of BIS (Hirschheim, Klein & Lyytinen 1996). Business information system development (BISD) is a type of problem-solving originating from the problem-solving disciplines of mathematics, economics, psychology, and organisation and methods (Bingham & Davies 1972). Analysis and design are part of the “intelligent effort”

(Polanyi 1962, p. 121) of problem solving; in this case, the development of a BIS to solve a problem.

Analysis and design has various names. For example, for analysis, some names are system definition, system investigation, system requirements, requirements analysis, requirements gathering, requirements planning, requirement specification, envisioning, initial study, detailed study, logical design, and software requirements. For design, some names are systems design, technical design, program design, physical design, preliminary design, detailed design, and design specification. For analysis and design, some names are modelling, user design, and systems analysis. Many of the names for analysis/design come from system development methods and are sometimes open to different interpretations. In the context of this study, I use the following terms and define those terms as:

- *analysis/design*
  - — the activity that occurs before construction and deployment. (I have concatenated analysis and design to *analysis/design* to identify the phenomenon of interest.)
- *method*[1]
  - — a procedure to be followed (whether it be a BISD method or a research method)
- *process*
  - — the realisation of a method
- *methodology*
  - — the study of methods
- *project*
  - — any type and size of BIS being developed, either in part or whole
- *task*
  - — something done that is smaller than and part of a project

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[1] A recipe metaphor may be useful to explain the difference between method, process, and methodology as used in this thesis. A method is a recipe. There may be many recipes available for the same dish, for example, there are many recipes to make falafel. A process is the making of falafel by following one of the recipes. Even though the cook may follow the same recipe (i.e., method) each time to make falafel, the process may vary each time due to variations in the quality or measuring of the ingredients, cooking temperatures, the mood of the cook, etc. A methodology would be a study of the many falafel recipes, perhaps to find the best falafel, or the recipe that best tolerates variations in the quality of ingredients and the mood of the cook.

- *product*
  — all or part of a BIS that is released for use in the organisation

Analysis/design as a part of system development methods evolved as computing hardware and software developed. At first, analysis/design "and programming were virtually 'black arts' without formalised methods or a disciplined approach" (Land et al. 1980 p. xii). During these early days, analysis/design was considered a technical activity closely associated with programming and the hardware used to run the systems (Lucas 1975). In the late 1950s, analysis/design began to be identified as a separate discipline (Sherwood 1972). Since then analysis/design has followed the development of programming. Structured analysis and structured design followed structured programming. Around 1980, structured analysis and structured design yielded process-oriented methods based on data flow diagramming (e.g., DeMarco 1979; Gane & Sarson 1979; Yourdon & Constantine 1979). Also around 1980, in a move to counter the technical focus and better incorporate people with IS, socio-technical methods were developed (e.g., Bostrom & Heinen 1977a, 1977b; Mumford 1973; Mumford 1996). Object-oriented programming followed structured programming and object-oriented analysis and design followed object-oriented programming. In the early 1990s, a number of object-oriented system development methods emerged (e.g., Booch 1994; Coad & Yourdon 1991a, 1991b; Rumbaugh, Blaha, Premerlani, Eddy & Lorenzen 1991). Object-oriented methods were based on objects that contain data and processes that manipulate that data. Just before the turn of the century, Extreme Programming (Beck 1999) emerged as the first of what was to be called agile software development methods (Williams 2012). Extreme Programming (despite its name) and other agile software development methods incorporate analysis/design, construction, and implementation into "lightweight" (p. 71) methods. Rather than the longer cycles of structured methods, which could be years from starting analysis to releasing any product, and object-oriented methods, which could be months before product is released, agile methods have shorter (e.g., four-week) cycles aimed at product release at the end of each cycle (Ambler 2011).

What analysis/design is, and how it is done, could be defined by the BISD methods mentioned above except that there are a large number of these methods and their use is not universal. In 1982, Longworth had identified 82 development methods, while speculating there were many more. By 1985, Longworth (cited in Glasson 1989, p. 351) estimated there were 300 different published methods. In 1994, Jayaratna estimated the number of brand-named ISD methods to be over 1,000 (p. xvii). Since 1994, object-oriented and agile methods have become widely used, further increasing the number of commercial, third party, or in-house methods in use.

Each method within a class of method, such as, structured, socio-technical, object-oriented, or agile, may not differ much from another method in the same class. Therefore, the class of method could define analysis/design. However, the use of a formal method by organisations is not universal. A formal method is defined here as one that is written down and is more than a collection of BISD tools and techniques. The use of formal methods by organisations is researched and reported in different ways possibly because what is a method is not clear to the people supplying the research data nor consistent between researchers. Some studies have found 50 to 60% of organisations do not use a formal method (Chatzoglou & Macaulay 1996; Fitzgerald 1998; Glass 1999), and yet other studies have found under 20% do not use a formal method (Hardy, Thompson & Edwards 1995; Huisman & Iivari 2003; Kalanjee 2006). For this study, the value of describing analysis/design as it appears in classes of formal methods is nullified because many BIS are developed without use of a method. (Research that describes analysis/design as it appears in formal methods is outside the scope of this study, though researching and comparing results from such a study would be interesting.) Also, analysis/design as it appears in a method reflects the method creator's awareness of analysis/design rather than the analyst/designer's awareness of analysis/design, which is the purpose of this study.

Analysis/design always takes place before construction and deployment. It is not possible to begin construction without having some idea of what is to be constructed and the forming of that idea is analysis/design. The purpose of this study is to describe analyst/designers' ways of experiencing the forming of that idea.

1.2 Who are Analyst/Designers

For the purposes of this study, anyone doing analysis/design as part of a BISD project is an analyst/designer. Analyst/designers have a variety of job titles, such as systems analyst, business analyst, system designer, software designer, software developer, software engineer, application software engineer, technical architect, solutions architect, [programming-language-of-choice] consultant, applications developer, developer, analyst/programmer, or analyst/designer. Despite the vagaries of job title, these people do analysis/design as part of their work. Analyst/designers may also take part in the construction and deployment of a BISD project. However, my interest is in only what they do before construction.

Analyst/designers' perspectives of organizations, BIS, and the people involved are considered by some as being embedded in the BISD method they use (Bostrom & Heinen 1977a, p. 17). This implies that analyst/designers' perspectives of analysis/design are embedded in the BISD method. As discussed in the previous section, a BISD method cannot define analysis/design when projects are developed without a method. What an analyst/designer thinks analysis/design is and what she does when doing analysis/design may be embedded in the BISD method she uses. Equally, her awareness of analysis/design may not be embedded in a BISD method, whether she uses one or not.

This study is about analyst/designers and their relationship with analysis/design. It is about how analyst/designers do analysis/design and it is about what analyst/designers think analysis/design is. It is about analyst/designers' awareness of analysis/design.

1.3 What is Phenomenography[2]

I could have used a number of research techniques to conduct this study to better understand analyst/designers' awareness of analysis/design, such as those shown in the right-hand column of Figure 1.1. Many researchers of information system development

[2] The phenomenography used for this study began in the early 1970s, within the research group at the Department of Education and Educational Research, University of Göteborg, Sweden (Dall'Alba 1996; Marton 1994c; Svensson 1994). In the following, where "phenomenography" appears in quotation marks, it refers to the use of the term other than in the Göteborg phenomenographic style, without quotation marks, it refers to the Göteborg phenomenography. I found three uses of "phenomenography" that are not connected with the Göteborg phenomenography. Two uses are philosophical in nature, one is by Bachelard (Bachelard 1931–32/1970; Rheinberger 2005) and the other is by Wang (Resnik 1989; Wang 1986). The third use, in psychology rather than philosophy, is by Sonnemann describing Jaspers' work (Sonnemann 1954).

Gaston Bachelard, who was on the conceptualist rather than subjectivist side of Husserl's phenomenology (Hyder 2003), used "phenomenography" to refer to rational research and scientific empiricism (Bachelard 1931–32/1970). Wang, a mathematical logician and philosopher of mathematics (Hodges 2005) who first posed what became known as Wang tiles (Berger 1966), chose "phenomenography" to label his alternative approach to philosophy (Resnik 1989; Wang 1986). "Phenomenography" is distinguished from phenomenology by Sonnemann (1954) while explaining the application of existential phenomenology in psychology. He coined the term "phenomenography" to label Jaspers' "*descriptive* phenomenology of subjective experience [emphasis in original]" (p. 149).

(ISD) professionals have conducted survey research (Figure 1.1, grey shaded area) using the research techniques of sampling, statistical analysis, measurement and scaling, and questionnaire (Niederman, Moore & Yager 1999).

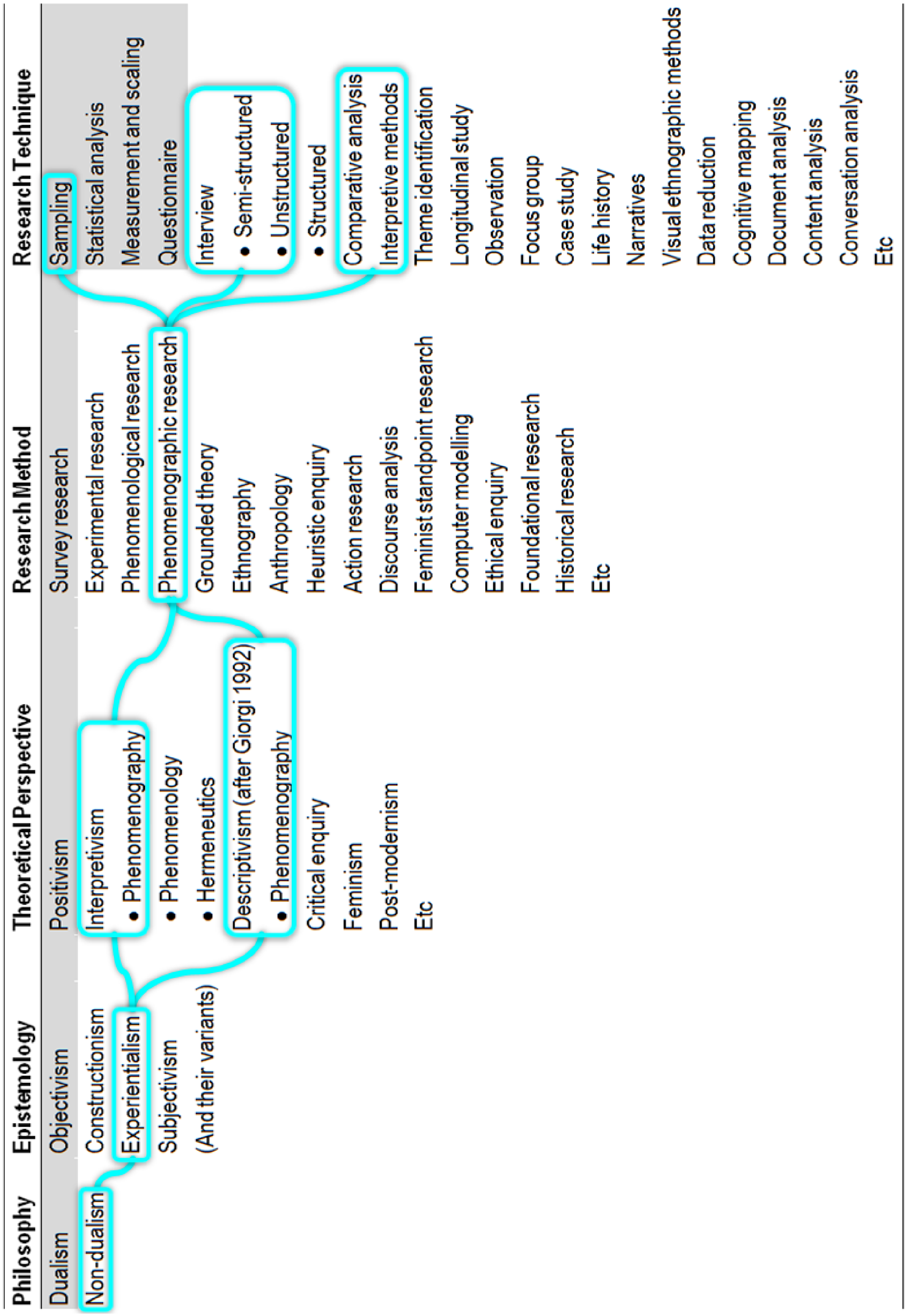


Figure 1.1: Elements of a research process with examples (Adapted from Crotty 1998, p. 5)

Note: The grey shading refers to survey research and the aqua lines refer to phenomenographic research, which are discussed in the text.

As indicated from right to left in the grey shaded area of Figure 1.1, a survey research method is often conducted from the theoretical perspective of positivism. In the case of this study, a positivistic theoretical perspective would regard analysis/design as having a meaning independent of the analyst/designer's consciousness (awareness) of analysis/design. How we know what we know is referred to as our epistemology (*epistemology* 2009; Crotty 1998, p. 8). The epistemology underpinning positivism is objectivism. If an objectivist epistemology is applied in the study of analysis/design, then the way in which an analyst/designer is aware of analysis/design does not change what analysis/design is. The philosophy of objectivism is dualism. A dualistic philosophy holds that the object is separate from the subject. For example, a dualistic philosophy sees analysis/design as being separate from analyst/designers.

These dualistic–objectivist–positivistic theoretical underpinnings of research dominated my prior education. As mentioned, it was because of the discussion I had with Prof. S. Booth that I made the connection between the form this study should take and phenomenography. I have come to understand that I was challenging the dualistic–objectivist–positivistic theoretical underpinnings that dominated my previous education (and much of BIS and BISD research). I was not going to find out or discover the truth that was out there waiting to be found as something independent of the analyst/designers, analysis/design, and the analyst/designers' relationships with analysis/design. I needed to position myself for this study as non-dualist, experientialist, and interpretivist/descriptivist (see Figure 1.1).

1.3.1 Philosophy of Phenomenography

As shown by the aqua line in Figure 1.1, a phenomenographer takes a non-dualistic philosophical position. Non-dualism does not separate subject and object as does dualism. As is the case for this study, a non-dualistic philosophical position means analyst/designers and analysis/design are not seen as separate. Even to identify them as subject and object suggests a dualism. Rather than separating "subject" and "object", the phenomenographer prefers the term "phenomenon". The relationship between phenomena, such as the relationship between people and a thing is the focus of research for the phenomenographer. In this study, the relationship in focus is between analyst/designers and analysis/design. Phenomenographers sometimes express this relationship as the way people experience a phenomenon.

1.3.2 Epistemology of Phenomenography

As indicated in Figure 1.1, the epistemology of phenomenography is experientialism (Lakoff & Johnson 2003). The experiential epistemological position is one where we gain knowledge through experience (Lakoff & Johnson 2003). Phenomenography is about describing the variation in people's experiences of a phenomenon. Therefore, in particular for phenomenography, the experiential epistemological position is that it is through *variation* of the *experience* of the phenomenon that we come to know about a phenomenon. Hence, this study is about the variation of the experiences analyst/designers have of analysis/design.

Variation, in the phenomenographic sense, is "observable variation" (Marton & Booth 1997, p. 134). An individual must experience (see, perceive, conceive, understand) differences in a phenomenon to be aware of that phenomenon.

1.3.3 Theoretical Perspective of Phenomenography

In keeping with Crotty's approach (1998, Table 1), for the purposes of identifying the theoretical perspective of phenomenography in Figure 1.1, I have identified the theoretical perspective of phenomenography as phenomenography and the research method as phenomenographic research. However, in practice, phenomenography describes both the theoretical perspective and the research method. The theoretical perspectives of phenomenography are interpretivism and descriptivism. The interpretivist theoretical perspective of phenomenography is that people will experience, conceptualise, perceive, understand, see, or apprehend phenomena in a *limited* number of *qualitatively different* ways at a *collective level* (Marton 1981a). The researcher interprets from the data, the limited number of ways people experience a phenomenon. The researcher limits the number of ways people experience a phenomenon by interpreting the qualitatively different aspects of the phenomenon experienced by people, not as individuals, but at a collective or meta-individual level. For this study, I was able to interpret from the data at a collective level, five qualitatively different ways analyst/designers conceive of analysis/design and four qualitatively different ways analyst/designers approach analysis/design.

The descriptivist theoretical perspective of phenomenography is that the researcher *describes* each meta-individual and qualitatively different way that people experience a phenomenon. Descriptivism, as Giorgi (1992) presents it, entails that the researcher describes what is in the data and does not go beyond the data, that is, into interpretation. The researcher is required to bracket her experience of the phenomenon and focus on the data, regarding all that is within the data as having equal value. When the phenomenographer moves into constituting the limited number of qualitatively different ways people at the collective level experience a phenomenon, she makes judgements about the data, which, according to Giorgi, is interpretivism (p. 122). For this study, I described and interpreted the data as the qualitatively different ways analyst/designers at a collective level conceive of and approach analysis/design.

1.3.4 Phenomenographic Research Methods

A phenomenographic research method as a single, prescribed research method does not exist (Ashworth & Lucas 2000; Booth 1993; Bruce 2006; Harris 2011; Hasselgren 1997). Phenomenographers are therefore obliged to describe their research method and process, which they achieve using varying interpretations of theoretical perspectives, epistemologies, philosophies, and levels of detail (Ashworth & Lucas 2000; Bruce 2006; Harris 2011; Hasselgren 1997). However, there is orthodoxy to doing phenomenographic research. The theoretical perspective, described above, persists (e.g., Marton 1981a; Marton 1986; Marton & Booth 1997; Marton & Pong 2005). The results are categories of description and the set of categories from a study are formed by the researcher into an outcome space.

1.3.5 Phenomenographic Research Techniques

A category of description describes one qualitatively different way a phenomenon is experienced by a particular group of people at the collective level. As shown in Figure 1.1, sampling is used to select the group of people from whom data is collected. For this study, I used combination or mixed purposeful sampling (Patton 2002, p. 242). The data is most often collected using semi-structured interviews, though for this study I used unstructured interviews. The interviews are recorded and transcribed. The transcripts are interpreted and described, often using comparative analysis and interpretive methods. Some phenomenographers use other research techniques. Categories of description are typically presented as prose and quotes from the interviews to support the researcher's interpretation and description.

When the phenomenographer has a set of categories of description, she forms an outcome space by interpreting a logical relationship between categories. The presentation of the outcome space depends on a phenomenographer's analysis of the data. Her choice of presentation is influenced by the type of relationship between categories (e.g., hierarchical or network) and what she has constituted from the data, described in categories, and interpreted as the theoretical perspective, epistemology, and philosophy of the research.

1.3.6 My Non-dualistic–Experiential–Interpretivist/Descriptivist Research Position

Earlier, I stated that the dualistic–objectivist–positivistic position is familiar to me as this position was the foundation upon which I was educated. *If* I had conducted this study, for example, as survey research with a positivistic theoretical perspective, objectivist epistemology, and dualistic philosophy, I would have taken the position shown in the left-hand column of Table 1.1.

Table 1.1: A comparison of the philosophical, epistemological, and theoretical perspective positions for survey and phenomenographic research.

A dualistic–objectivist–positivistic position for research using survey research as an example	The non-dualistic–experiential–interpretivist/descriptivist position taken for this phenomenographic study
The constructs of the survey in some way represent the truth about analysis/design. Surveying analyst/designers shows their agreement with the truth about analysis/design. The knowledge contributed from the results of the survey is determined to be accurate and certain based on validity and reliability measures.	An interview with an analyst/designer represents the truth about analysis/design as experienced by that analyst/designer. A representation of the truth, such as what an analyst/designer may say during an interview, can only ever be partial. By interviewing analyst/designers we can understand a part of analyst/designers' experiences of analysis/design. The knowledge contributed from the results of this study is determined to be accurate and certain based on: the reader's confidence and my confidence in the results; the congruence of the theoretical perspective, research method, research process, and results, and; the quality of the interpretive awareness I brought to bear on the study.

I conducted this research from the non-dualistic–experiential–interpretivist/descriptivist position shown in the right hand column of Table 1.1. This position challenged my previously taken for granted dualistic–objectivist–positivistic based education. The truth about analysis/design as experienced by the analyst/designer and the truth I present as the knowledge contributed from this study are relative to the position I have taken for this research (Sandberg 2005).

This non-dualistic–experiential–interpretivist/descriptivist position challenged me. My attempt to make sense of the orthodoxy of phenomenographic research produced initial results in which I was not confident. During the research process, I found it necessary to elaborate the theoretical underpinnings of this study and thus, go beyond the orthodoxy of phenomenographic research.

1.4 Study Process and Thesis Structure

This thesis represents the change that took place in me while I conducted this study. I changed as a researcher: learning, applying, and accepting the difference in the non-dualistic–experiential–interpretivist/descriptivist position from my previously taken for granted dualistic–objectivist–positivistic based education. As an analyst/designer, I became more aware of my own experience of analysis/design. I am now able to articulate my awareness in a consistent way and discern and describe the variation in my experience as I developed my level of analysis/design expertise.

As shown in Figure 1.2, the study process took a number of paths. The first was the preliminary work on choosing the topic and method, setting the initial research question, establishing a gap in the knowledge with the first phase of the literature review, and obtaining ethics clearance (UTS HREC 03/99). After obtaining ethics clearance, the path of the study process split. One path was the practical side of the research (shown in Figure 1.2, in the study process, on the left-hand side), involving data collection and analysis. The other path was the theoretical side of the research (shown in Figure 1.2, in the study process, on the right-hand side).

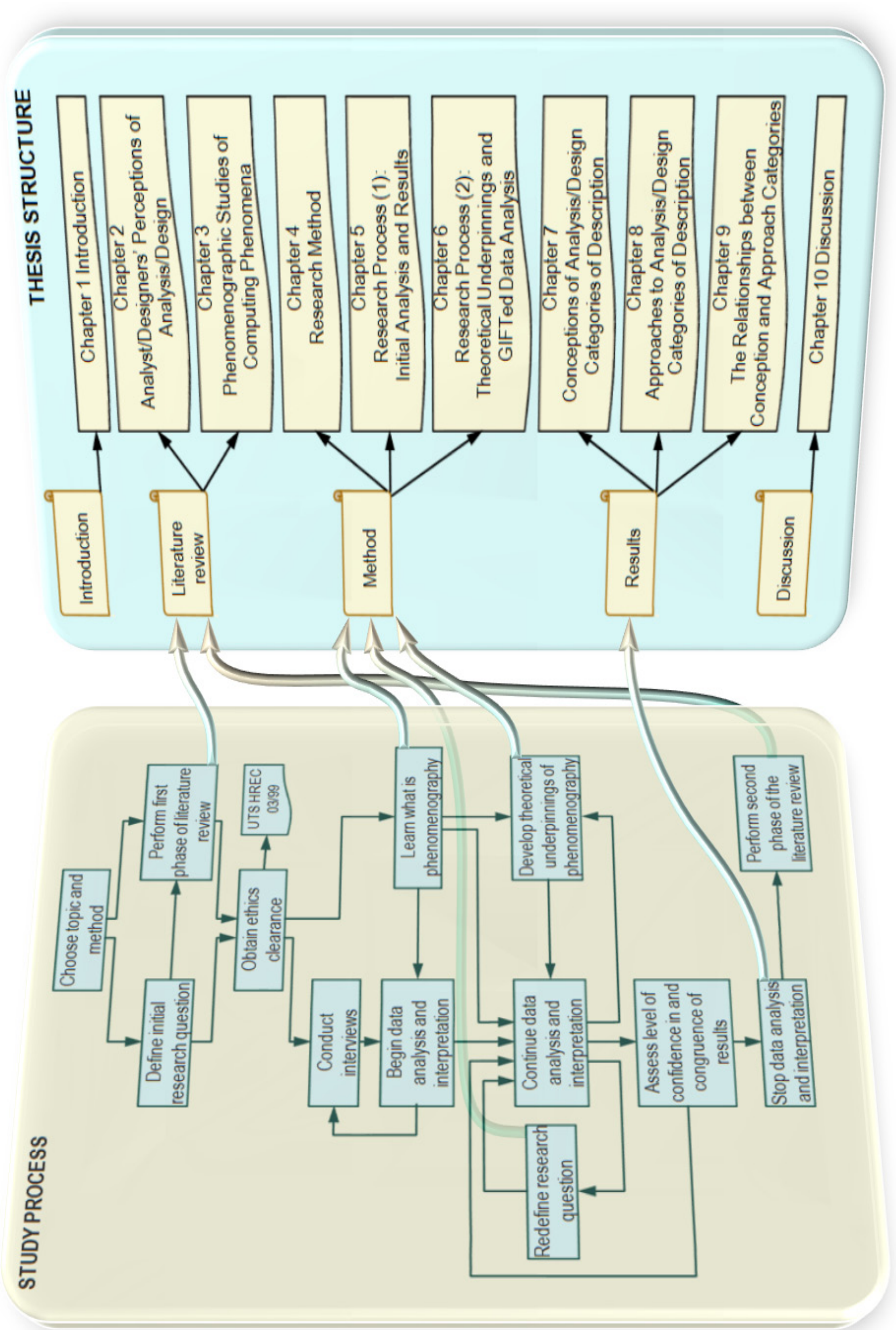


Figure 1.2: An overview of the study process and thesis structure for this study

The theoretical side of the study began by learning about phenomenography, then developing the theoretical underpinnings of phenomenography as used in this study, and concluding with the second phase of the literature review. What I learnt about phenomenography and the theoretical underpinnings that I developed appears in the research method and process chapters (Ch. 4 to 6). Chapter 4 is the research method based on the orthodoxy of phenomenography. In Chapter 5, I present the research process realised by following the research method described in Chapter 4.

As I stated earlier, a single and prescribed phenomenographic research method does not exist and this raised problems in developing congruent results in which I was confident. Crotty (1998) recognised that there are inconsistencies and contradictions in research literature, and phenomenographic research is no exception (Harris 2011). Part of what I have learnt from the literature about phenomenography (shown in Figure 1.2, in the study process, on the right-hand side) is that the interpretations of phenomenography are diverse. Therefore, resolving the problems in developing congruent results and settling on a theoretical perspective is part of any phenomenographic research process. In Chapter 6, I present the theoretical underpinnings of the phenomenographic research method as used in this study. I clarify the language and terminology I use to describe my research process and results. Just as Marton and Booth (1997) used phenomenological terminology somewhat differently from how it was originally used, I use several theoretical underpinnings as sources of terminology, also somewhat differently from how those terms were originally used, but remaining in the spirit of the intent of the terms. The theoretical underpinnings I used lead me to developing GIFTed data analysis, which is also described in Chapter 6. GIFTed is an acronym for *G*estalt theory, *i*ntentionality, and *f*ield *t*heory of consciousness. The application of these theories is described in Chapter 6 as part of the theoretical underpinnings of phenomenography as used in this study.

I conducted the literature review in two phases. A two phased approach is recommended when the results constituted from the data determine the topics for the literature review (Ashworth & Lucas 1998; Glaser 1978). As reported in detail in Section 4.2, researchers need to bracket, or set aside, their pre-conceived and presupposed conceptions of the phenomenon of interest while analysing the data for a phenomenographic study. Reading the literature before analysing the data adds to the difficulty of bracketing. Reading the literature increases the researcher's knowledge of the people, the phenomenon of interest, and the relationship between the two, thereby increasing what must be bracketed. Consequently, some have argued that the researcher need not review the literature before analysing the data (Glaser 1978, p. 31). Their argument is that the researcher is not trying to fit the results into an established field. Instead, she is allowing the results to guide her to what is important to search for in the literature. In this study, the first phase of the literature review established there was a gap in the knowledge about analyst/designers' experiences of analysis/design. I found that most studies measured, rather than described the experiences of analyst/designers. At the time of the first phase of the literature review, I found one phenomenographic study of professional analyst/designers related to analysis/design in English (Isomäki 2002). (I have since become aware of another related thesis, written in Finnish (Kuosa 1997).) There was one published educational phenomenographic research study related to analysis/design at the time of the first phase of the literature review (Cope 2000).

The second phase of the literature review commenced once I had stopped data analysis and interpretation (see Figure 1.2). By this time, I had a clearer idea, from the results, of the scope of the topics I needed to search for. Performing the second phase of the literature review after I had results meant that during the analysis and interpretation of the data I was focused on the data. Also, once I had the results, the scope of the literature review was set. Though the process of the literature review was in two phases, I chose to follow convention and placed the review of the literature after this introductory chapter. The outcome of the two phases of the literature review is presented as analyst/designers' perceptions of analysis/design, in Chapter 2, and phenomenographic studies of computing phenomena, in Chapter 3.

The practical side of the research, data collection and analysis, was an iterative process. During the data analysis and interpretation, I assessed my level of confidence in the results and the congruence of the results. I completed some data analysis with a focus on the research question:

What is the variation in awareness that analyst/designers have of analysis/design?

As I became familiar with the data and learnt more about phenomenography, I redefined this single question as three questions:

1. *What is the variation in analyst/designers' qualitatively different conceptions of analysis/design?*

2. *What is the variation in analyst/designers' qualitatively different approaches to analysis/design?*

3. *How are the qualitatively different conceptions of, and approaches to, analysis/design related?*

I answer these three questions in the results chapters, Chapters 7, 8, and 9.

I close this thesis with Chapter 10, a discussion about the results and the implications of this study for the profession, education, and research.

1.5 What this Study Contributes

We know little about analyst/designers' experiences of analysis/design, though the paradigms through which BISD professionals view the world are recognised as inherent in the success of a BISD project (Adolph & Kruchten 2011; Bostrom & Heinen 1977a, 1977b; Brooks 1975; Glass 2002; Land et al. 1980). Researchers seldom engage in conversation with BISD professionals who are developing systems upon which organisations depend (Niederman et al. 1999). Therefore, a study that engages in a conversation with BISD professionals will contribute to the field.

The aim of this phenomenographic study was not to measure but to reveal (Johansson, Marton & Svensson 1985). The results reveal the variation in analyst/designers' conceptions of analysis/design (Ch. 7), their approaches to analysis/design (Ch. 8), and the relationships between their conceptions of, and approaches to, analysis/design (Ch. 9). The results are useful in a number of ways.

Revealing "different ways in which people experience, interpret, understand, apprehend, perceive, or conceptualise various aspects of reality is sufficiently interesting in itself" (Marton 1981a, p. 178). The results contribute to satisfying our interest in what analyst/designers think analysis/design is and what they say they do when doing analysis/design.

“[BISD] involves complex human behaviour in an environment and circumstances that are to date not well developed theoretically or empirically” (Dybå, Prikladnicki, Rönkkö, Seaman & Sillito 2011, p. 426). There is an acknowledged need to better understand computer professionals (Briand, Arisholm, Counsell, Houdek & Thévenod–Fosse 1999; Curtis, Krasner & Iscoe 1988; Kautz & Nørbjerg 2003; Ott, Kinnula, Seaman & Wohlin 1999). The results from this study formalise and improve our understanding of the complex human behaviour of the analyst/designer, which contributes to developing a people-centred foundation for research on increasing BISD project successes.

The results provide a taxonomy. I draw from Stern (2004) to make the case for the importance of a taxonomy. A specific nomenclature provides concise and convenient names to recognise and record an analyst/designer’s conception or approach as a particular category, more than other categories, at a particular moment. The categories of description are descriptions at the collective level and do not identify a particular individual’s entire way of experiencing a phenomenon. Therefore, we can recognise and record awareness only at a particular moment. We cannot classify the analyst/designer as *always* having a particular conception or taking a particular approach. The nomenclature is linked to the categories of description. The categories of description are a reference that stabilises the meaning and application of the taxonomic labels.

At a practical level, the lack of knowledge about analyst/designers’ experiences of analysis/design limits the development of IS education and the development of professional competence (Sandberg 2000). The more we, as researchers, can reveal about the experiences of analyst/designers, the better able we are to make sense of their work. We can channel that knowledge gleaned into the teaching and learning of analysis/design (Dall'Alba & Sandberg 2006). By making analyst/designers, or students of analysis/design, aware of the variation in how analyst/designers experience analysis/design, they may connect alternate ways of conceiving analysis/design to the possibility of approaching analysis/design in different ways. When an analyst/designer changes her way of experiencing analysis/design by deliberately becoming aware of different ways of experiencing analysis/design, she has taken a great step in learning. The results of this study could be used to create learning contexts which could facilitate this great step (Larsson & Holmström 2007).

Identification of the characteristics of highly competent analyst/designers has led to changes in the hiring and training of analyst/designers (Hunter & Beck 1996). When designing personnel selection procedures, organisations need detailed information about the analyst/designers' conceptions and approaches, and whether these are appropriate to the organisation's context. Therefore, identifying the variation in analyst/designers' experiences of analysis/design is useful to the development of instruments for the assessment of and selection procedures for analyst/designers. The results "will enable them [in this case, analyst/designers] or others to change the way their world operates" (Bowden 1996, p. 52).

2 Analyst/Designers' Perceptions

In this chapter, I review non-phenomenographic research that informs us about analyst/designers' perceptions of analysis/design. I present analyst/designers' reports of what analysis/design entails and the knowledge and skills they need to do analysis/design. In the next chapter, I review research conducted using phenomenography to study computing phenomena. Some of these phenomenographic studies inform us about analyst/designers' experiences of phenomena related to analysis/design.

2.1 Perceptions of Project Failure

Software projects, which include BISD projects, fail at rates that concern researchers and the BISD profession. A sample of software project failure rates are:

- 90% did not achieve schedule, cost, *and* quality objectives (Jones 2004)
- 65% had cost and time overruns *or* did not fully meet user requirements (2007 Standish Group CHAOS report as cited in Rubinstein 2007), down from 84% reported in 1994 (The Standish Group 1995a) and 71% reported in 2004 (The Standish Group 2004)
- 26% to 34% are cancelled or delivered with unsuccessful performance (El Emam & Koru 2008)
- 10% to 15% of projects fail according to Glass (2005) based on his experience as a software developer and user

That the definition of failure determines the rate of project failure does not change the concern that the rate is high. (By way of comparison, consider if one in ten bridges failed.) As well as varying definitions of failure, some of the research methods and techniques used to calculate the failure rates are considered questionable by some and hence the failure rate is questioned (Glass 2005; Jørgensen & Moløkken-Østvold 2006).

Project failure rates come from assessments made by stakeholders in the software projects, such as project managers, organisation executives, users, and developers. An interesting insight provided by Linberg (1999) is that software developers can perceive the product of a software project as a failure, yet the project as a success. His project success continuum, shown in Table 2.1, highlights the variation in software developers' perceptions of the definitions of success and failure for projects that were completed or cancelled. Whether a project is completed or cancelled did not determine the success or failure of the project for the software developers. According to Lindberg, what determined failure or the degree of success for software developers is meeting quality expectations, the level of performance on cost, effort, and schedule expectations, and what was learnt from doing the project. Linberg found that software developers perceived completed projects to be exceptionally successful when the product met all the quality, cost, effort, and schedule expectations. Then again, a cancelled project that allowed the software developers in some minimal way to apply what they had learnt to future projects was still perceived as a success, albeit a low success. The narrow definitions of software project success, which other stakeholders have, "may create negative perceptions about software developers" (Linberg 1999, p. 191). Other stakeholders might regard a project as a failure when the software developer considers it successful.

Table 2.1: Project success continuum: software developer perspective (Linberg 1999, p. 190).

Project outcome	Failure	Low success	Successful	High success	Exceptionally successful
Project completed	Developing a product that causes customer discontent (not meeting quality expectations)	Below average performance on cost, effort, and schedule expectations compared to industry AND meeting quality expectations	Average performance on cost, effort, and schedule expectations compared to industry AND meeting quality expectations	Better than average performance on cost, effort, and schedule expectations compared to industry AND meeting quality expectations	Meeting all quality, cost, effort, and schedule expectations
Project cancelled	Not learning anything that can be applied to the next project	Learning can be minimally applied to future projects	Learning can be applied to future projects. Some artefacts from the cancelled project can be directly used on a future project	Substantial learning can be applied to future projects. Significant numbers of artefacts from the cancelled project can be directly used on a future project	A cancelled project cannot be called "exceptionally successful"

Why software projects fail has been reported in different ways (e.g., Boehm 1976, 1991; Bostrom & Heinen 1977a; Brooks 1975, 1987, 1995; Cerpa & Verner 2009; El Emam & Koru 2008; Field 1997; Glass 2002; Jones 2004; Linberg 1999; Naur & Randell 1969; Petroski 1985; The Standish Group 1995a, 1995b, 1999, 2001; Weber 2003). The link between project failure and the poor performance of BISD professionals, which includes analyst/designers, was made early in the history of analysis/design (e.g., Boehm 1981; Bostrom & Heinen 1977a; Brooks 1975, 1987, 1995) and most software projects fail because of humans (Bostrom & Heinen 1977a; Jones 2004; Petroski 1985; The Standish Group 1995a). Yet researchers of BISD project failure do not often explicitly attributed the cause to humans. Table 2.2 shows two examples of the causes of failures: causes of failures in any type of engineering construction from McKaig (1962) and the failure factors of software development projects from Cerpa and Verner (2009). Petroski (1985) states that McKaig "clearly places the blame on human error" (p. 204). Cerpa and Verner deflect the blame, leaving the reader to decide who is blame worthy. However, McKaig (1962) does not take an accusatory position. Failures are accidents, he states, adding, no one sets out to cause a project to fail and so we should extend sympathy and commiseration to the victims of these accidents (p. v). The victims are not only the recipients of the project outcome, but also those people working on the project. What is noticeable is that the causes have become impersonal, as if the people were no longer accountable for the project failures.

Table 2.2: Two examples of why projects, including BISD projects, fail

"Causes of failure… encompass[ing]… any type of engineering construction" (Unknown as cited in McKaig 1962, pp. 4–5)	**"All failure factors found in at least 60 percent of projects"** (Cerpa & Verner 2009, p. 131)
1) Ignorance a) Incompetent men [sic] in charge of design, construction, or inspection b) Supervision and maintenance by men without necessary intelligence c) The assumption of vital responsibility by men without necessary intelligence d) Competition without supervision e) Lack of precedent f) Lack of sufficient preliminary information 2) Economy a) In first cost b) In maintenance 3) Lapses, or carelessness a) An engineer, or architect, otherwise careful and competent, shows negligence in some certain part of the work b) A contract or superintendent takes a chance, knowing he is taking it c) Lack of proper coordination in production of plans 4) Unusual occurrences Earthquakes, extreme storms, fires, and the like	• Delivery date impacted the development process • Project under-estimated • Risks were not re-assessed, controlled, or managed through the project • Staff were not rewarded for working long hours • Delivery decision made without adequate requirements information • Staff had an unpleasant experience working on the project • Customers/users not involved in making schedule estimates • Risk not incorporated into the project plan • Change control not monitored, nor dealt with effectively • Customer/users had unrealistic expectations • Process did not have reviews at the end of each phase • Development methodology [viz. method] was inappropriate for the project • Aggressive schedule affected team motivation • Scope changed during the project • Schedule had a negative effect on team member's life • Project had inadequate staff to meet the schedule • Staff added late to meet an aggressive schedule • Customers/users did not make adequate time available for requirements gathering

Brooks (1975) provided us with reasons for project failure nearly 40 years ago, which are similar to McKaig's, such as "gutless estimating" (p. 21). Today, "projects still fail for the same reasons" (Cerpa & Verner 2009, p. 133), though the reasons for project failure are stated without blaming BISD professionals. The impression is that "the software field tends to be stuck in place, making the same mistakes on project after project" (Glass 2002, p. 111); spinning its wheels into a deeper rut (Kellner, Curtis, DeMarco, Kishida, Schlumberger & Tully 1991). To get out of the rut and to reduce project failure rates Brooks (1987, 1995) recommended growing great designers by first systematically identifying top performing designers as early as possible.

At worst, Brooks claimed the quest for a silver bullet in the form of an ideal method, tool, or technique is futile, and at best, the silver bullet delivers a small, disproportionate return for the cost of its implementation (Brooks 1987; Glass 2002; Harris 1991). According to a study of 2000 software projects, there is close to a fourfold increase in productivity made by experienced BISD professionals than the contribution made by effective methods and more than a fourfold decrease in productivity made by inexperienced BISD professionals compared to ineffective methods (Jones 2000, pp. 133–4). Instead of a silver bullet, Boehm (1981) argued that addressing the non-technical, that is, human issues of BISD, "provide by far the largest source of opportunity for improving software productivity" (p. 666). Others have argued similarly (Adolph, Kruchten & Hall 2012; Hall & Wilson 1997).

2.2 Performance Linked to Project Failure

Brooks (1975, 1987, 1995) made explicit the link between the performance of IS professionals and project failure by describing his beliefs about managing large programming projects. He states that few have challenged his beliefs (Brooks 1995).

Bostrom and Heinen (1977a) studied tens of studies spanning more than a decade. From that study, they made the link between IS professionals and failure explicit by linking systems designers' frames of reference to information system (IS) failures. They described systems designers as "all people who actually influence MIS design decisions" (p. 19), which includes analyst/designers. They linked systems designers' frames of reference to management information systems (MIS) project failures to justify their silver bullet, the Socio-Technical System approach. (MIS are the same types of systems as BIS.) Their figure (Figure 2.1) presents a summary of their argument that the systems designers' frames of reference are reflected in seven conditions, "which are the major causes of inadequate designs and unsuccessful change strategies" (p. 19).

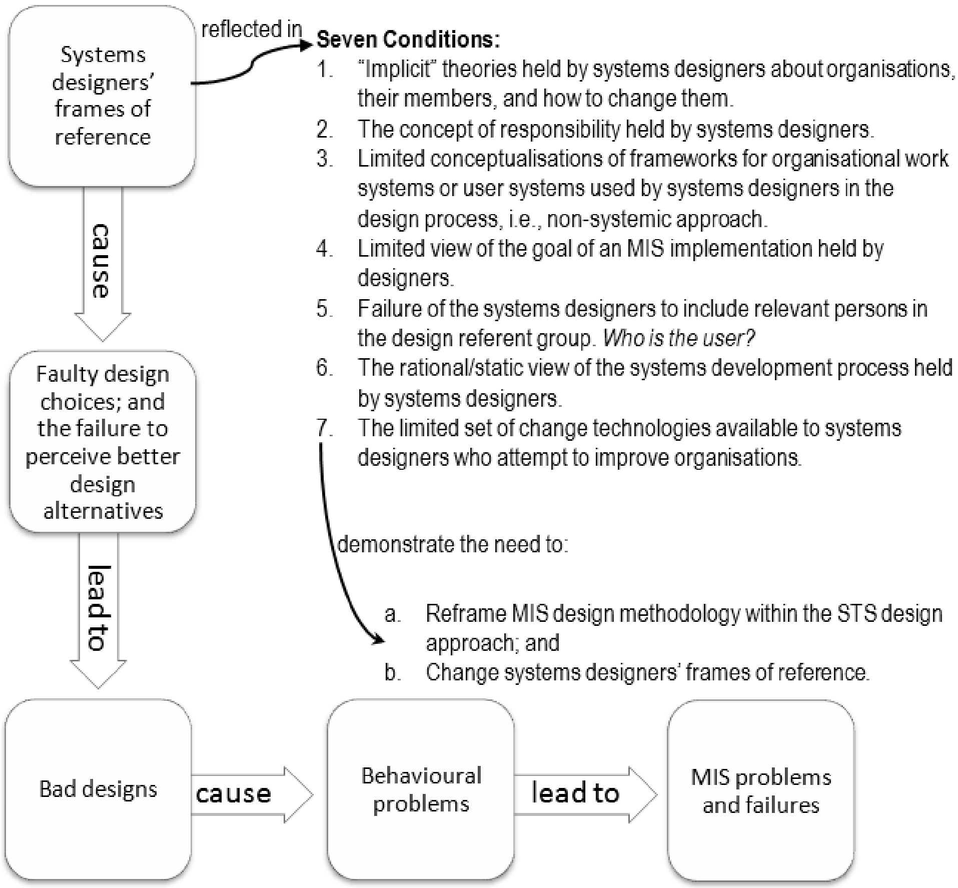


Figure 2.1: Bostrom and Heinen's association between systems designers' frames of reference and BIS project failures. (Reproduced from Bostrom & Heinen 1977a, p. 21)

Bostrom and Heinen applied the seven conditions that reflect the systems designers' frames of reference to all systems designers and thus provide a single description of analyst/designers. Their description emphasises the deficiencies of systems designers. For example, to describe the implicit theories held by systems designers (Figure 2.1, Condition 1) they draw on McGregor's (1960) Theory X and Theory Y of human motivation and state:

> *It is quite apparent that systems designers in general hold a Theory X view… [A systems designer is] a person… who likes order, wishes to work within tightly specified boundaries, and does not want to have a great deal of personal control over one's activities* (Bostrom & Heinen 1977a, p. 20).

Bostrom and Heinen (1977a) describe the contradictions between systems designers conceptions and observations of their practice. While systems designers "deny completely that they assume responsibility" (p. 23) for the BISD process, the observation is that systems designers *are* the ones taking responsibility for it. While MIS practitioners conceive themselves as very system oriented people they are observed not to have a very systemic view (p. 26).

Bostrom and Heinen go on to describe systems designers as lacking concern for the quality of working life of certain users, clerks, and supervisors, but instead design the system to increase efficiency, and for the managers who receive the outputs of the BIS (pp. 26–7). They also described systems designers as perceiving the BISD process as "a rational, systematic process that proceeds in a static environment" (p. 28). Also, systems designers have a limited skill set to instigate change, as is required when deploying a BIS (p. 29).

Bostrom and Heinen's seven conditions, which reflect system designers' frames of reference (Figure 2.1), apply to "current [pre-September 1977] systems designers" (p. 17). In the context of my study, the seven conditions provide a single description of analyst/designers' (and others') experience of analysis/design (and other parts of BISD).

Bostrom and Heinen were making a case for their Socio-Technical System approach. Thus, it was to their advantage to describe systems designers as lacking or having contradictory conceptions and practices. Couger and Zawacki (1978) found from their survey research that "system professionals have a startlingly low proclivity to social interaction" and "*negligible* need to work with other individuals [emphasis in original]" (p. 117). If we were to take the description from Bostrom and Heinen (1977a) and the findings from Couger and Zawacki (1978) as all there was to analyst/designers' experience of analysis/design then it is not surprising that project failure rates are high. They present analyst/designers as lacking the necessary skills and knowledge to perform their job in a manner that would lead to consistent project successes.

2.3 Descriptions of Analyst/Designers

This thesis presents an investigation of analyst/designers; what they think and what they report they do in relation to their experience of analysis/design. Therefore, the previous research on what analyst/designers think and what they report they do is most relevant to this study. Most germane are the qualitative, interpretive, and descriptive studies where analyst/designers have reported their experience of doing analysis/design or their understanding of analysis/design. There are not any reports that set out to describe the variation in analyst/designers' ways of experiencing BIS analysis/design as a whole. In the literature, there are few descriptions of top performing analyst/designers in comparison to other levels of performance—a necessity if we are to act on Brooks' (1987, 1995) recommendation and systematically identify top performers. There are also few reports that describe analyst/designers' ways of experiencing BIS analysis/design. Therefore, I expanded the scope of my literature search to include studies where analyst/designers were all or part of a study's sample and included analysis/design within the study's phenomenon of interest.

Other studies indicate there is more to analyst/designers than the deficiencies described by Bostrom and Heinen (1977a) and Couger and Zawacki (1978). Other studies of analyst/designers, or professionals including analyst/designers, provide a different view of analyst/designers' and their experiences. These other studies suggest there is variation in the experiences analyst/designers have of analysis/design. I describe those studies in the rest of this chapter.

Some IS studies have collected data from analyst/designers to describe analyst/designers or their conceptions of and approaches to analysis/design. The studies by Curtis, Krasner, and Iscoe (1988), Stolterman (1991), Hunter (1994, 1999), Hunter and Beck (1996) and Adolph, Kruchten, and Hall (2012) provide descriptions of analyst/designers and their experiences based on data from analyst/designers. Each used different non-phenomenographic research methods and techniques. Curtis, Krasner, and Iscoe (1988) conducted 97 structured interviews with project team members with various roles. Their sample included, but was not exclusive to, those doing analysis/design (e.g., system engineers and senior software designers). The professionals sampled were developing BIS as well as operating systems, communications, command, and control systems, and avionics systems (p. 1270). Curtis et al. analysed the interview transcripts using a layered behavioural model of software development, reproduced in Figure 2.2, which focuses on the human factors influencing software productivity. The individual level is where "software development is analysed as an intellectual task subject to the effects of cognitive and motivational processes" (p. 1269). Descriptions of the human factors at the individual layer provided most of the material of interest to this study. Curtis et al.'s study drew from a population that is broader than this study. Their sample was broader in the system development roles of the interviewees and the types of systems developed. My study focuses on BIS analyst/designers.

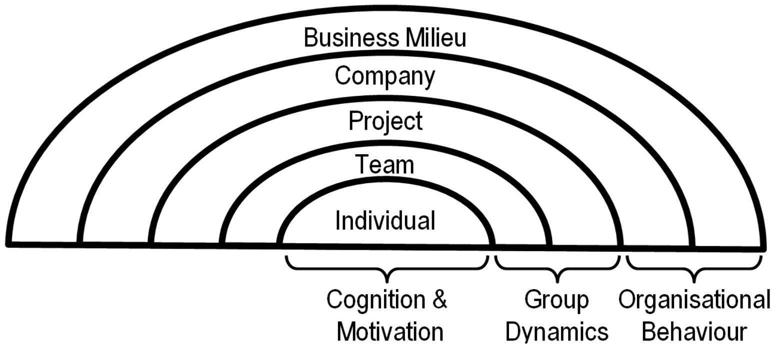


Figure 2.2: Curtis et al.'s layered behavioural model for software development upon which they base their description of software project design team members. (Reproduced from Curtis et al. 1988, p. 1269)

Stolterman (1991) drew from the population of systems designers developing IS, which is a similar population to this study. He conducted 20 structured interviews with systems designers from a bank, an insurance company, and two consulting companies. He set out to "understand how practitioners think about themselves and about system design" (p. 138), which is somewhat similar to this study. However, he used "the interviews… as a basis for qualitative interpretations" (p. 140), to look for the similarities, rather than variation, in the systems designers' conceptions about design practice.

Hunter (1994, 1999) and Hunter and Beck (1996) also used structured interviews. They structured their interviews around the Repertory Grid technique from Kelly's (1955, 1963) Theory of Personal Constructs. Hunter (1994) began the study with 10 interviews of system analysts (and 45 other professionals) in Canada. The follow-up study (Hunter & Beck 1996), interviewed four systems analysts (and 13 other professionals) in Singapore. This later study compared the Singaporeans to the Canadians to look for cultural differences. For their studies, "systems analyst" means "individuals who developed and/or maintain information systems" (Hunter 1994, p. 15), which includes, but is not exclusive to, those doing analysis/design. The interviewees were from a Canadian grain handling company, a Canadian financial and insurance company, and a Singaporean international air carrier. The Grounded Theory (Glaser & Strauss 1967) principle of allowing the results to emerge from the data, was used to interpret from the data the qualities of "excellent" systems analysts (Hunter 1994, 1999; Hunter & Beck 1996).

A study by Adolph, Kruchten, and Hall (2012) used classical Grounded Theory (Adolph, Hall & Kruchten 2011, p. 493) to create a substantive theory of how IS professionals manage the process of software development. They collected data over 42 non-consecutive days of participant observation and from 20 semi-structured interviews with managers, team leaders, architects, developers, and analysts. Their sample was drawn from "three different organizations, an onsite customer support field office, a small product company, and a software research and development centre for large multi-national software product vendor" (p. 501). Their sample included people who were analysing/designing BIS.

These studies (Adolph et al. 2012; Curtis et al. 1988; Hunter 1994, 1999; Hunter & Beck 1996; Stolterman 1991) contribute to the description, in Sections 2.3.1 to 2.3.6, of analyst/designers and their:

- understanding of the systems they develop, the application domains the systems are for, and requirements
- regard for communication, documentation, modelling, and the system development process
- abilities to abstract
- attitudes to what they do and what they produce.

We should regard the description in Sections 2.3.1 to 2.3.6 as partial because, as Stolterman (1991) concluded, the analyst/designers' "own picture of their role and skill is very complex and not consistent and complete" (p. 147). Also, with so few studies contributing to this description and each having a different purpose and research method, the description is indicative, rather than conclusive.

The descriptions in the studies by Curtis et al. (1988), Stolterman (1991), Hunter (1994, 1999), Hunter and Beck (1996) and Adolph et al. (2012) are of analyst/designers in general and/or exceptional or excellent analyst/designers. In Sections 2.3.1 to 2.3.6, I refer to *weaker-analyst/designers*, as the analyst/designers these authors describe as less knowledgeable and skilled than the exceptional or excellent analyst/designers. I refer to *stronger-analyst/designers*, as the analyst/designers these authors refer to as exceptional or excellent, that is, those who have a high level of analysis/design knowledge and skill. These terms place analyst/designers on one side or another of a dichotomy. However, descriptions of the weaker-analyst/designer are broad, which suggests the descriptions apply to analyst/designers along a continuum from unskilled at analysis/design, to not quite exceptional or excellent. The stronger analyst/designer is further along the continuum next to the not quite exceptional or excellent, but still weaker, analyst/designer.

2.3.1 Understanding of the System and the Application Domain

Analyst/designers vary in the perspective they take when trying to understand a system. Weaker-analyst/designers take a technical perspective (Adolph et al. 2012), seeing the computer as the all-important element in the solution to the problem (Curtis et al. 1988). Their understanding of the system is incomplete. They do understand some of the components in the system, but not all of them (Curtis et al. 1988). They are novices in the application domain and hold misconceptions about it (Curtis et al. 1988), and therefore do not fully appreciate the business impact of their decisions (Adolph et al. 2012). They have difficulty with understanding the problem (Curtis et al. 1988). An inadequate understanding of the system and problem means the weaker-analyst/designer works with obvious scenarios of system use and are "unable to envision problematic and exceptional [scenarios]" (Curtis et al. 1988, p. 1282).

Stronger-analyst/designers have more understanding of the system, are more thorough in getting to know the system, and have spent more time working on the system or in the application domain (Hunter 1994, 1999; Hunter & Beck 1996). They have more understanding of the system by integrating the knowledge gained from previous experiences with other systems and organisations and also being "extremely familiar with the application domain" (Curtis et al. 1988, p. 1272). They are thorough in getting to know the system by interacting with others, which enhances their knowledge about the system (Curtis et al. 1988). They also improve their understanding of the system by integrating what they learn into their mental model of the system (Curtis et al. 1988). They will test and develop their envisioned solution, which they begin to form early in the system development process, against what they know and learn about the system (Stolterman 1991). The stronger-analyst/designer is adept at going beyond the obvious scenarios of system use and is able to see the problematic and exceptional scenarios (Curtis et al. 1988).

2.3.2 Communication, Documentation, and Modelling

Both weaker-analyst/designers and stronger-analyst/designers regard documentation as a weak form of communication. They devote time to verbal communication rather than documenting, as the project becomes larger (Curtis et al. 1988). For both weaker-and stronger-analyst/designers, an emphasis on modelling conventions and representational formats is intended to facilitate communication rather than provide rules for creating static documentation (Curtis et al. 1988). Weaker-analyst/designers will use informal communication or social networks to gather information (Curtis et al. 1988). Stronger-analyst/designers will also use informal networks, but will create more networks (Adolph et al. 2012). Stronger-analyst/designers have superior ability to initiate, engage in, and manage communications with project members (Adolph et al. 2012; Curtis et al. 1988; Hunter 1994, 1999; Hunter & Beck 1996). The stronger-analyst/designer is more skilled at modelling the system and occasionally develops a specific modelling notation for the project (Curtis et al. 1988).

2.3.3 System Development Process

Weaker-analyst/designers and stronger-analyst/designers choose different processes to deal with complexity and uncertainty (Adolph et al. 2012). While both choose different processes, their ideas and arguments for choosing a process are as complex as the IS development process itself (Stolterman 1991). Both view system development methods more as a project management tool, than something they must follow to get the job done (Adolph et al. 2012; Stolterman 1991). Both analyst/designers experience analysis/design, the activities before construction and implementation, as a negotiation process that may or may not reach a consensus (Adolph et al. 2012; Curtis et al. 1988). Weaker-analyst/designers may fail to complete their job because they are unable to express their understanding of the system during negotiation or they may complete the job from their own perspective without reaching consensus amongst stakeholders (Adolph et al. 2012). The stronger-analyst/designer brings more insight to the negotiation process (Curtis et al. 1988). They are more inclined to change their mental model and vision of the solution based upon the progress of, and all stakeholders' contributions made to, the negotiation process (Stolterman 1991). Stronger-analyst/designers will strive for a consensus (Adolph et al. 2012).

2.3.4 Requirements

When gathering requirements, during the negotiation process, analyst/designers prefer verbal communication to written documentation. Weaker-analyst/designers misinterpret requirements due to insufficient understanding and knowledge of the organisation and system (Curtis et al. 1988) and they work at getting the job done without correcting misinterpreted requirements (Adolph et al. 2012). On the continuum towards stronger-analyst/designers, analyst/designers view requirements as the starting point for clarifying poorly understood system functions with the customer (Curtis et al. 1988). Stronger-analyst/designers are adept at gathering facts and identifying unstated requirements, constraints, or exception conditions (Curtis et al. 1988; Hunter 1994, 1999; Hunter & Beck 1996). Stronger-analyst/designers involve the users of the system in gathering requirements (Hunter 1994, 1999; Hunter & Beck 1996).

2.3.5 Ability to Abstract

The ability to abstract varies from weaker- to stronger-analyst/designers (Curtis et al. 1988; Stolterman 1991). A weaker-analyst/designer will tend to focus on details (Stolterman 1991). A stronger-analyst/designer has the ability to see the whole. They take a wider view and are logical and analytical when they do so (Stolterman 1991).

2.3.6 Attitude

All analyst/designers take pride in what they do and have a strong desire to create quality products (Adolph et al. 2012). They all become frustrated when they are under pressure to complete (Adolph et al. 2012). However, weaker-analyst/designers and stronger-analyst/designers manifest their frustration in different ways (Adolph et al. 2012). Weaker-analyst/designers have personal barriers that prevent the stakeholders from reaching a shared perspective of the system (Adolph et al. 2012). The stronger-analyst/designer has attitudes and/or personal beliefs about how to approach analysis/design, project team members, and users, that distinguishes him/her from weaker-analyst/designers (Hunter 1994, 1999; Hunter & Beck 1996). Stronger-analyst/designers' establish a comprehensive mental model of the system (Curtis et al. 1988) and a vision of the solution early (Stolterman 1991), which gains them recognition as the intellectual core of the project and the keeper of the project vision (Curtis et al. 1988).

The above description of analyst/designers was drawn from descriptive studies that are about or include analysis/design as the topic of interest. The description is partial and indicative. During the second phase of the literature review, I searched for and found the above descriptive studies and the quantitative studies reviewed in the next section by expanding the scope of the literature search. While searching for descriptions of analyst/designer's experiences I came across studies that fell outside the scope of this study. Examples of these out-of-scope studies are shown in Table 2.3. These out-of-scope studies caught my attention as they have a bearing on analyst/designers and their work. However, these out-of-scope studies are not about analyst/designers and analysis/design in the way analyst/designers, analysis/design, and the analyst/designer–analysis/design relationship is revealed in the results of my research. Therefore, these studies are outside the scope set by the results and are not reviewed.

Table 2.3: Examples of research topics outside the scope set by the results of this study that are related to analyst/designers and analysis/design.

Example Studies	Research Topics
Linberg (1999)	Software developers' perceptions about software project failure mentioned above
Kim and Peterson (2003)	IS developers' perceptions of the importance of success factors
Hall and Wilson (1997)	Practitioners' experiences of quality initiatives
Du, Keil, Mathiassen, Shen, and Tiwana (2007)	Analyst/designers' perceptions of project risk, control, and subsequent project continuation decisions
Brown (2009)	The perceptions of development managers and application developers in terms of secure systems development
Jiang, Klein and Discenza (2002), Keable, Landry and Banville (1998), Klein and Jiang (2001)	Differences between IS professionals and users
Forward and Lethbridge (2002)	Perceptions of software development practices, such as preferences for and aversions against software documentation tools
Baddoo & Hall (2003), Couger & Zawacki (1979), Fitz-Enz (1978); French, Metersky, Thaler and Trexler (1973)	The motivation of analyst/designers
Woodruff (1990)	System analysts' perceptions of organisational practices

The studies of analyst/designers, or professionals including analyst/designers, contributing to the description of analyst/designers' experiences, in Sections 2.3.1 to 2.3.6, suggests there is variation in the experiences analyst/designers have of analysis/design. There are hints that there is more variation in analyst/designers' experiences than the described dichotomy of weaker- and stronger-analyst/designers. If there can be a development from a weaker- to stronger-analyst/designer, then are there intermediate stages of development? Can these stages be described?

2.3.7 Quantitative Research

The results from the quantitative studies of analyst/designers display a recurring pattern: analyst/designers favour communication skills, knowledge of the organisation, and knowledge of the system over technical skills. This recurring pattern reflects the weaker-analyst/designer's technical perspective and the stronger-analyst/designer's better understanding of the system and communication skills described above (ss. 2.3.1 & 2.3.2).

In responses to surveys and card sorts (Coxon 1999), analyst/designers rank highly communication skills, knowledge of the organisation, and knowledge of the system, often expressed as understanding requirements (Benbasat, Dexter & Mantha 1980; Berger 1964; Lothridge 1964; Shrout 1971). In responses to surveys, analyst/designers rank technical skills low (Benbasat et al. 1980; Shrout 1971). It is interesting to note that Vitalari (1985) reports that Shrout's (1970, PhD thesis, unavailable) study of rankings of 468 survey respondents, "did not vary according to level of education, years of experience, organisation size, or level of systems responsibility" (p. 222).

The opposite of this recurring pattern was found by some studies (Hoyle & Arvey 1972; Vitalari 1985). Hoyle and Arvey (1972) used the critical incident method (Smith & Kendall 1963) to specify major dimensions of work behaviour for individual systems analysts and programmer analysts. Later, Arvey and Hoyle (1974) used their dimensions of job behaviour to develop a behaviourally-based rating scale to assess job performance. While systems analysts did rank technical knowledge highest, there is a large variation in the importance ratings as re-presented in Figure 2.3. The vertical dashed line in Figure 2.3, at one standard deviation lower than the mean of technical knowledge, shows there is considerable overlap in the population distribution. Other survey results reveal a similar overlap in the population distribution (Kim, Shim & Yoon 1999; Lee, Trauth & Farwell 1995). The large standard deviations of each importance rating indicate there is a large variation in analyst/designers' experiences of doing analysis/design.

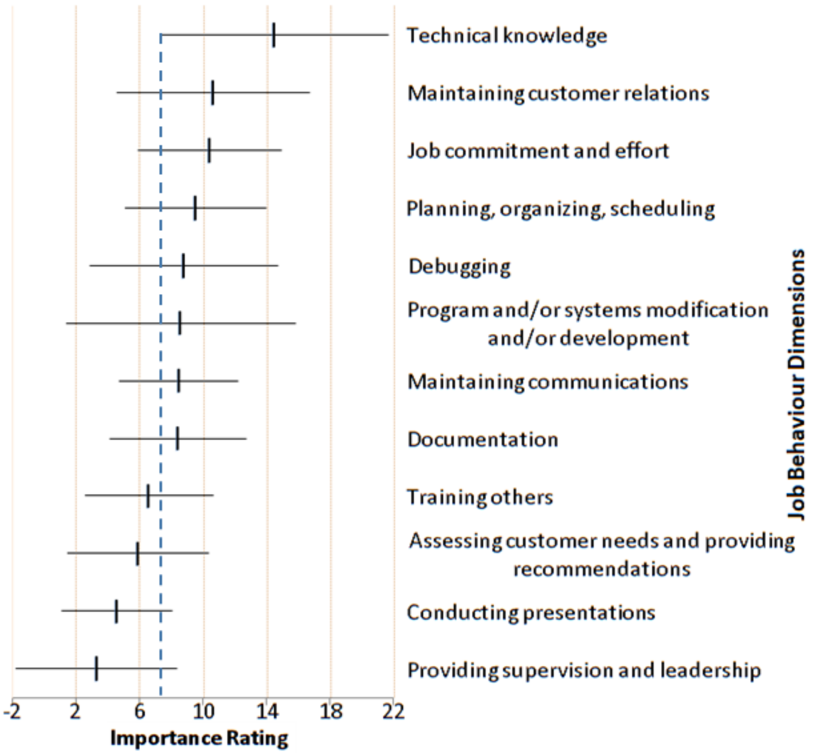


Figure 2.3: The mean (from highest to lowest) and standard deviations of the importance ratings by systems analysts of 12 job behaviour dimensions. (Adapted from Arvey & Hoyle 1974, p. 64)

Vitalari's (1985) study focused on the "knowledge used by practising systems analysts in the requirements determination phase of systems development" (p. 221). He instructed 18 systems analysts to think aloud while determining requirements for an accounts receivable system. The data collected from the experimental task was coded using protocol analysis. In contrast to other studies, communication and knowledge of the organisation were not emphasised; knowledge of system inputs, outputs, and processing, (i.e., the details required to understand the system) were emphasised as most relevant.

Surveys of analyst/designers (Arvey & Hoyle 1974; Benbasat et al. 1980; Kim et al. 1999; Lee et al. 1995; Shrout 1971) reflect the respondents' foci at the time of the survey as well as past experiences (Holyk 2008). For instance, a respondent who has experienced a project failure, which she strongly attributed to a lack of technical knowledge rather than poor communication, recalls technical issues first and therefore ranks technical issues higher than communication. Vitalari (1985) conducted his study using an "artificial" think aloud experiment, directing the systems analyst's attention to the story of the accounts receivable system. Rather than contradicting the importance of communication and knowledge of the organisation (Lee & Han 2008, p. 23), Vitalari's findings indicate analyst/designers emphasise the commensurate skills and knowledge for the task that is before them (p. 237).

As well as participants' foci determining research findings, the stage of career of the analyst/designer may also be an influence. Shrout (1971) did not indicate years of experience as an influence on importance rankings. However, Lee, Yen, Havelka, and Koh (2001) found early career analyst/designers have higher technical skills and later career analyst/designers have higher behavioural skills. In this relatively recent study, the level of expertise, which is independent of years of experience (Ericsson 2006), might have been an influence on analyst/designers' responses when they are asked for proficiency ratings.

The argument that the job of analyst/designers is changing from the need to have technical skills towards meeting organisational knowledge and communication skills (Hunter & Beck 1996, p. 267) is not supported by the quantitative studies mentioned above, in this section. Other survey studies, which have not exclusively sampled analyst/designers for their studies, confirm that behavioural skills are perceived as becoming more relevant to BISD in general than technical skills (e.g., Green 1989; Monin & Dewe 1994; Noll & Wilkins 2002; Tye, Poon & Burn 1995). In contrast, an equal mix of technical and business skills was deemed important by IS professionals in their IS education (Richards & Pelley 1994). For these studies, where analyst/designers are included as part of the sample, and a separate data analysis of the data from analyst/designers is unavailable, the results about analyst/designers and their experiences are inconclusive. For example, in Monin and Dewe (1994) systems analysts were 4.3% of the total sample and 17% of the sample when grouped with others into a "more technically-oriented" (p. 215) job category, of which 64% were programmers.

Other survey studies, which sample IS executives and managers, report perceptions of what knowledge and skills are important for analyst/designers to possess (e.g., Brancheau, Janz & Wetherbe 1996; Brancheau & Wetherbe 1987; Caudle, Gorr & Newcomer 1991; Cheney & Lyons 1980; Deans, Karwan, Goslar, Ricks & Toyne 1991; Dickson, Leitheser, Wetherbe & Nechis 1984; Niederman & Brancheu 1991; Trauth, Farwell & Lee 1993). These studies do not describe analyst/designers' experiences by analyst/designers. Though, again, a similar overlap in the population distribution as found in Arvey and Hoyle (1974) (see Figure 2.3) was also found in the current and future importance rankings of IS tasks by IS executives (85%) and managers (15%) (Trauth et al. 1993).

The statistical analysis of analyst/designers' characteristics, such as importance rankings of knowledge, skills, or IS issues does not describe the complex relationship between analyst/designers and their analysis/design knowledge, skills, or experiences.

2.4 Conclusion

If the BISD success rate is to increase then the understanding of the human factors in BISD needs to increase. "Embracing the human elements means identifying ways to learn from the human aspects rather than trying to simply ignore them or factor them out" (Ott et al. 1999 p. 384). Nor is it necessary to reduce the human elements to commonalities (such as ranking what is important) or dichotomies, such as the weaker- and stronger-analyst/designer. Instead, studying and describing the diversity of analyst/designers thinking and actions may yield benefits.

The studies that are most germane to this study are the qualitative, interpretive, and descriptive studies where analyst/designers have reported their experience of doing analysis/design or their understanding of analysis/design. However, these studies of analyst/designers or IS professionals including analyst/designers provide descriptions of analyst/designers' experiences that are reductions to commonalities or dichotomies.

If we are to understand analyst/designers' experiences from the point of view of the analyst/designers then quantifying the data makes such an understanding largely unachievable (Dybå et al. 2011). What we do understand from the quantitative studies is that analyst/designers need communication skills, knowledge of the organisation, knowledge of the system and some technical knowledge and skills.

The few descriptions we have of analyst/designers' and their experiences suggest there is variation in analyst/designers' experiences of analysis/design. Analyst/designers' experiences are complex and diverse. Analysis/design is also complex and difficult to generalise for every situation. Analyst/designers have differing experiences of how they understand and do analysis/design. Not described in the literature is the complex relationship between analyst/designers and analysis/design.

The knowledge we do have of analyst/designers' experiences of analysis/design is revealed in the review of the non-phenomenographic qualitative and quantitative studies reviewed in this chapter. These studies present a small number of differing perspectives of analyst/designers' reports of what analysis/design entails and the knowledge and skills they need to do analysis/design. The researchers of these studies conducted their research using diverse, non-phenomenographic research methods. In the next chapter, I examine research conducted using phenomenography. This phenomenographic research is about the variation in people's experiences of computing phenomena. These phenomenographic studies give insight into the role phenomenography has played in computing.

3 Phenomenographic Studies of Computing Phenomena

The studies reviewed in the previous chapter describe commonalities and dichotomies among analyst/designers. The commonalities include rankings of what knowledge or skills are important to their being able to do their job. Revealing what is common among analyst/designers' perceptions is of value as it allows us to gain an idea about analyst/designers without making distinctions about the relationship between the analyst/designers and their perceptions. The dichotomies include the weaker- and stronger-analyst/designer. Describing a dichotomy is of value as it allows us to identify what lies toward either end of a continuum about analyst/designers and their analysis/design experiences.

There is value in going beyond studies of commonalities and dichotomies to report the diversity of analyst/designers' experiences. Studying the diversity of a group's experiences of the phenomenon has value as it contributes to our understanding of the group's relationship with the phenomenon; there is the potential to reveal something new, as well as formalising what we know.

Phenomenography is a research approach created to report on the diversity of a group's relationship with a phenomenon. It began in the early 1970s, within the research group at the Department of Education and Educational Research, University of Göteborg, Sweden (Booth 1992; Dall'Alba 1996; Marton 1988b; 1994c, § Origin, ¶ 1; Svensson 1994). This heritage anchored phenomenography in educational research. There are hundreds of phenomenographic studies (Alexandersson 1994) and most are studies of students and teachers and their ways of experiencing educational content or teaching and learning phenomena.

Phenomenography is also used to study professionals' ways of experiencing phenomena in their professional lives, although such phenomenographic studies are far less common than education studies. These non-educational phenomenographic studies include: medical practitioners' ways of experiencing medical phenomena (e.g., Dahlgren, Diwan, Tomson & Wahlström 1992; Dall'Alba 1998; Larsson, Holmström &

Rosenqvist 2003) and executives', managers', and clerical and administrative workers' ways of experiencing work-related phenomena (e.g., Ballantyne & Gerber 1994; Gerber & Velde 1997; Stewart 2002). The few phenomenographic studies describe computing professionals' ways of experiencing computing phenomena are described later in this chapter (s. 3.2).

Of the six educational and non-educational phenomenographic studies of computing phenomena that are relevant to this study, five address relationships between either professionals' or students' and information systems development (ISD) phenomena, and one addresses the student–information systems (IS) relation. (There is a seventh on IS professionals' views of their work, which was not reviewed as it is in Finnish (cited in Kaapu, Saarenpää, Tiainen & Paakki 2006; Kuosa 1997).) The six studies are described in Sections 3.3.1 to 3.3.6. The results from the six studies are also examined for their potential to overlap with the results from this study (s. 3.3.7) and were used to profile analyst/designers (s. 3.3.8).

3.1 An Overview of Phenomenographic Studies in Computing Education Research

Given the heritage of phenomenography, it is not surprising that most phenomenographic studies in the computing discipline are educational research. Within those educational studies, phenomenographers have studied the students' internal relation with computing phenomena more often than the teachers' internal relations. Students' ways of experiencing learning to program have received the most attention. The seminal work by Booth (1992) has been followed by several others (e.g., Bruce, Buckingham, Hynd, McMahon, Roggenkamp & Stoodley 2004; Eckerdal, Thuné & Berglund 2005; Govender & Grayson 2008; Stamouli & Huggard 2006; Stoodley, Christie & Bruce 2004; Wellington, Ward & Armstrong 2010). The students are most often university computing undergraduates, though pre-service and in-service computing teachers (Govender & Grayson 2008) and masters of information technology students (Stoodley et al. 2004) have also been studied.

Phenomenographers have reported on some of students' ways of conceiving aspects of programming. For example:

- undergraduate, first year university, engineering students' ways of understanding the object oriented programming concepts of object and class (Eckerdal 2004; Eckerdal & Thuné 2005)
- undergraduate, second year university, computer science (CS) or computer engineering students' conceptions of the interface and plug-in in the context of a system (Boustedt 2007).

Other phenomenographic studies of students and computing phenomena have investigated topics, such as:

- students', in "third and fourth years[, who] were aiming for a Masters degree in [CS]", ways of thinking about learning CS (Berglund & Wiggberg 2008, p. 23)
- "advanced students[',] in [CS]… in their third or fourth years of studies" ways of learning about network protocols (Berglund 2002, p. 2).

Within the broad topic of IS, there has been a small number of studies of students and IS or ISD phenomena. Relevant to this research are the studies by Boustedt (2010), Cope (2000), and Rose, Heron, and Sofat (2005). I describe the results from these studies in Section 3.3.

Other studies of students and IS or ISD phenomena include work on moral conflicts (Vartiainen 2005, 2010), errors in CRUD (create, read, update, delete) matrices (Box & Lister 2005), and distribution of power and the decision-making process (Wiggberg 2008). These studies report results that are either, a list of types of the phenomenon studied (Vartiainen 2005, 2010), or are applicable only to the educational context (Box & Lister 2005; Wiggberg 2008), and therefore are not reviewed further. There are so few phenomenographic studies of computing phenomena; I have mentioned these to show I have not overlooked them.

There are a handful of phenomenographic studies of teachers' experiences of computing phenomena. As with the phenomenographic studies of student experiences the emphasis is on CS and programming rather than IS. These studies are of computing academics and phenomena that include:

- intentions for teaching data structures in CS2 (Lister, Box, Morrison, Tenenberg & Westbrook 2004)
- perceptions of moral conflicts in ISD (Vartiainen 2005)

- conceptions of the UNIX operating system and the purpose of teaching UNIX (Doyle & Lister 2007)
- perceptions of computing student success and failure (Kinnunen, McCartney, Murphy & Thomas 2007; Lister, Berglund, Box, Cope, Pears, Avram et al. 2007; Pears, Berglund, Eckerdal, East, Kinnunen, Malmi et al. 2008)
- understandings of teaching (Lister et al. 2007)
- understandings of lab practicals (Lister et al. 2007; Simon, de Raadt & Venables 2007)
- understandings of motivating computing students (Lister et al. 2007).

The papers by Lister et al. (2007) and Simon et al. (2007) listed above are the products of the first Phenomenography in Computing Education (PhICER) workshop (Berglund, Box, Eckerdal, Lister & Pears 2008a; Lister, Berglund & Box 2005). Those PhICER workshops and the Nordic workshops on phenomenography (Berglund, Box, Eckerdal, Lister & Pears 2008b; Berglund & Eckerdal 2006; Berglund & Pears 2010; Malmi 2008) have supported the use of phenomenography in the predominantly dualist–objectivist–positivist computing research area. The workshops are a demonstration of the penetration of phenomenography as a research method into computing research.

3.2 An Overview of Phenomenographic Studies of Professionals and Computing Phenomena

While there are few phenomenographic studies of students' and teachers' ways of experiencing computing phenomena, there is a smaller number still of studies of professionals' ways of experiencing computing phenomena.

Thompson (2008) studied practitioners' perceptions of the nature and design characteristics of object oriented programming. Thompson's primary motivation was to improve the learning of novice programmers by identifying critical aspects of object oriented programming as experienced by practitioners. Thompson's motivation, to influence educational practice, is an example of a common motivation for doing a phenomenographic study of professionals. The motivation to influence educational practice maintains the link between phenomenography and educational research.

A few researchers are motivated to do phenomenographic studies of professionals' experiences by the desire to improve the professional environment. For example, Stewart and Klaus (2000) examined the relationship between senior business managers and information technology (IT) managers. They identified four ways the IT managers conceived the relationship between business managers and IT managers: impersonal, ambiguous, supportive, or lateral-creative. Their motivation for the research was to improve the interactions between business managers and IT managers and thus assist in aligning business and IT activities (p. 1913).

There are three studies of professionals' experiences of IS or ISD phenomena of interest to this study (Davey & Cope 2009; Isomäki 2002; Reiter, Stewart, Bruce, Bandara & Rosemann 2010). I discuss these studies in the next section.

3.3 Phenomenographic Studies of Professionals, Students, and IS and ISD Phenomena Relevant to this Study

Of the phenomenographic studies of IS or ISD phenomena that have the potential for overlap with this study, three are of professionals' ways of experiencing IS or ISD phenomena:

1. the variation in ways IS designers conceptualise humans as users of IS (Isomäki 2002)
2. the variation in ways that consultants experience requirements elicitation interviews (Davey & Cope 2009)
3. the variation in practitioner conceptions of business process management (Reiter et al. 2010).

The remaining three phenomenographic studies that have the potential for overlap with this study are from educational research of students' ways of experiencing IS or ISD phenomena:

4. the variation in CS undergraduates', who were close to completing their degrees, ways of experiencing software development (Boustedt 2010)
5. the variation in second-year university IS design students' experiences of IS design (Rose et al. 2005)

6. the variation in early undergraduate IS students' conceptions of an IS (Cope 2000).

The results from the above six studies are presented below. After presenting the results from these six studies, I show the relevance of these studies to my study as the potential overlap of those studies with the outcome space of my study. Following that discussion, I align the categories in the outcome spaces from five of those studies in relation to educational and professional views. (Reiter et al. (2010) does not provide an outcome space of categories.) I then use that alignment to profile lower, middle, and higher professional views of analyst/designers.

3.3.1 Systems Designers and Humans as Users of IS

Isomäki (2002, 2007) describes ways systems designers conceive of the human being as a user of an IS. The outcome space, shown in Figure 3.1, is an adaption of the three forms of thought from Isomäki (2002, 2007). Forms of thought is an expression used by Marton (1981a, p. 1482), though he later described this expression as categories (Marton 1986, p. 35). Isomäki (2002) categorised 18 qualitatively different conceptions of the human being as a user of IS, which she then constituted as three forms of thought, or categories of description: the separatist, the functional, and the holistic. Figure 3.1 shows are each category's label, description, and illustrative quotes.

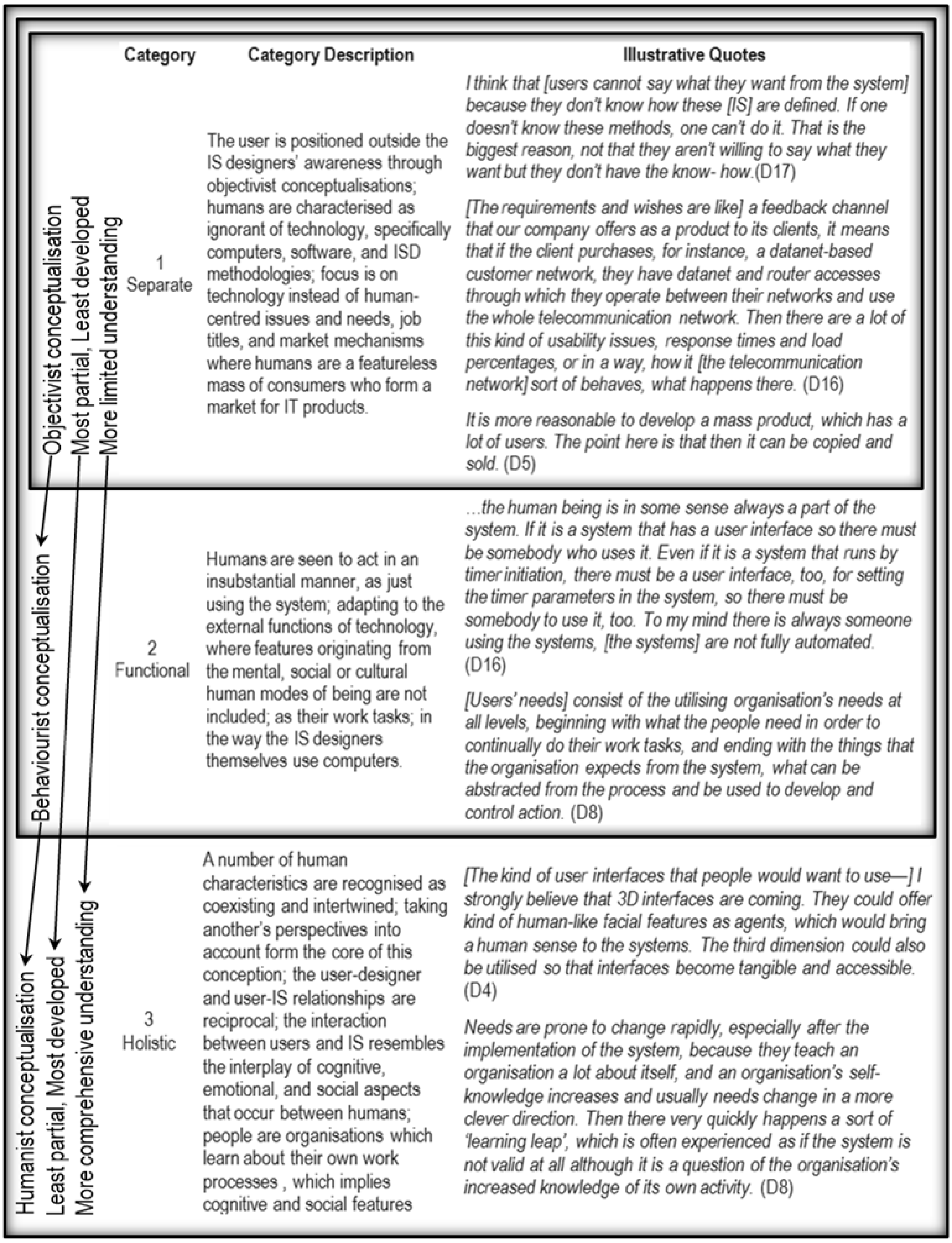


Figure 3.1: The variation in IS designers' ways of conceptualising humans as users of IS. (Adapted from Isomäki 2002, 2007)

Isomäki (2002, 2007) related her categories based on the content of the conceptualisation, the completeness of the conceptualisation, the level of development of the conceptualisation, and the comprehensiveness of the understanding of humans as users of IS. Her separatist category is an objectivist conceptualisation, is the most partial and least developed conception, and expresses a more limited understanding of human beings as users of IS. Her functional category is a behaviourist conceptualisation of human beings as users of IS, falling somewhere between the separatist and holistic categories in terms of completeness, development, and level of understanding of human beings as users of IS. Her holistic category is a humanist conceptualisation, is the least partial and most developed conception, and expresses a more comprehensive understanding of human beings as users of IS.

The inclusion of a category within another implies a person whose experience is more complete includes the experience described in a lesser category (Marton & Booth 1997). Isomäki describes an inclusive relationship between her separatist category and her functional category. Figure 3.1 shows this inclusive relationship as the separatist category within the functional category. Similarly, the inclusion of the separatist and functional categories within the holistic category, in Figure 3.1, indicates Isomäki's inclusion of her separatist and functional categories within her holistic category. However, the person with a more complete experience does not focus upon the conceptions of a more partial experience in the same way as the person whose experience is more partial. For instance, in her separatist category objectifying things predominates, however, the experience of her holistic category may be to objectify things while "being theoretically sensitive to human activity and deriving abstracted conceptions from that activity rather than … [overlooking] humans and their behaviour" (Isomäki 2007, p. 44).

3.3.2 Consultants and Requirements Elicitation Interviews

Davey and Cope (2009) describe ways "consultants" experience requirements elicitation interviews. A consultant is a business analyst, analyst/programmer, senior analyst or similar (p. 1284).

The outcome space, shown in Figure 3.2, is adapted from the five categories of description provided by Davey and Cope (2009). The order of the categories shows the "range from a collection of many of the simple ideas to a collection of the complex [without intending] to imply any other order" (p. 1286). In contrast to Isomäki (2002, 2007), Davey and Cope have not indicated that their categories are inclusive. Each category describes a requirements elicitation interview experience that is independent of the categories describing other experiences. For instance, it is not possible to experience a requirements elicitation interview as domination (Category 1) and as a partnership (Category 5) at the same time, though it may be possible to experience the interview as domination and then partnership.

Simpler ideas → More complex ideas

Category	Category Description	Illustrative Quotes
1 Domination	The requirements elicitation interviews are experienced as conflict; the consultant, believing he knows the client's requirements, pre-determines a set of requirements; the RE interview is needed for client sign off.	*Because [person in the consulting company] had come to a certain conclusion about the 'right' way forwards with this, which was effectively one based around conflict. It was based around 'let's set up an us against them trial, and see who wins*
2 Manipulation	The requirements elicitation interviews are experienced as a one-way presentation to and a manipulation of the client; the consultant convinces the client that her predefined requirements are needed and desirable; the client need not understand the requirements, but feels happy and considered when signing off.	*[The clients] obviously don't understand… they don't understand what our [consulting company] processes are, and so we explain a bit about our processes so that hopefully [the clients] both, get the answer to their questions and feel happy, but also have a better understanding of what we do*
3 Problem Resolution	The requirements elicitation interviews are experienced as an exchange of information; the information is needed by consultants to correct their initially proposed solution and by clients to change the known solution.	*Since everybody in the meeting know[s] each other really well, we shoot straight into the problems that we were facing [in the] last couple of weeks. And we are pretty much just brainstorming ways of solving those problems*
4 Bargaining	The requirements elicitation interviews are experienced as two sided bargaining around a contract; the client specifies as many needs of the company as possible; the consultant narrows this to the things that can be done within the skills and budget available so that the consultant's needs are met.	*They know that most of the things that I [the consultant] suggest to them are to the best of their interest, as long as they are not conflicting with [the consulting companies'] interest*
5 Partnership	The requirements elicitation interviews are experienced as a partnership aimed at creating a greater whole and maintaining an ongoing relationship; there is mutual respect between client and consultant; the real needs of the business are sought; the consultant helps to meet those needs.	*That means they [the client] understand it so deeply, that they can understand where to apply it in a way that you haven't told them.* *What the purpose of meeting them [the client] right now is and um what we are going to be looking to do with them in the future and so what sort of things we should be talking to about when we are meeting them*

Figure 3.2: The variation in consultants' ways of experiencing requirements elicitation interviews (Adapted from Davey & Cope 2009)

3.3.3 Business Analysts and Business Process Management

Reiter et al. (2010) investigated practitioners' conceptions of business process management (BPM). Practitioners, in their study, were defined as: program managers who manage and drive multiple interdependent projects; project managers who plan, organise, and manage resources to achieve specific project goals; business analysts who work at an execution level defining work packages of a project, such as process analysis and process controlling and monitoring (p. 723). The conceptions business analysts' have of BPM are of interest here.

Reiter et al. (2010) studied the emphasis practitioners placed on their explanations of BPM to a business colleague who is unaware of BPM (p. 724). Of the 26 interviewees, seven (27% of the sample) worked at the execution or business analyst level. Shown in Table 3.1 is the list of conceptions of BPM adapted from Reiter et al. (2010). Five of the eight conceptions of BPM described for all practitioners' were also emphasised by business analysts. Given that three conceptions were not present in the data for business analysts and only seven business analysts were interviewed, it is possible there are business analysts who would emphasise these conceptions of BPM.

Table 3.1: The conceptions business analysts' emphasise when describing business process management. (Adapted from Reiter et al. 2010)

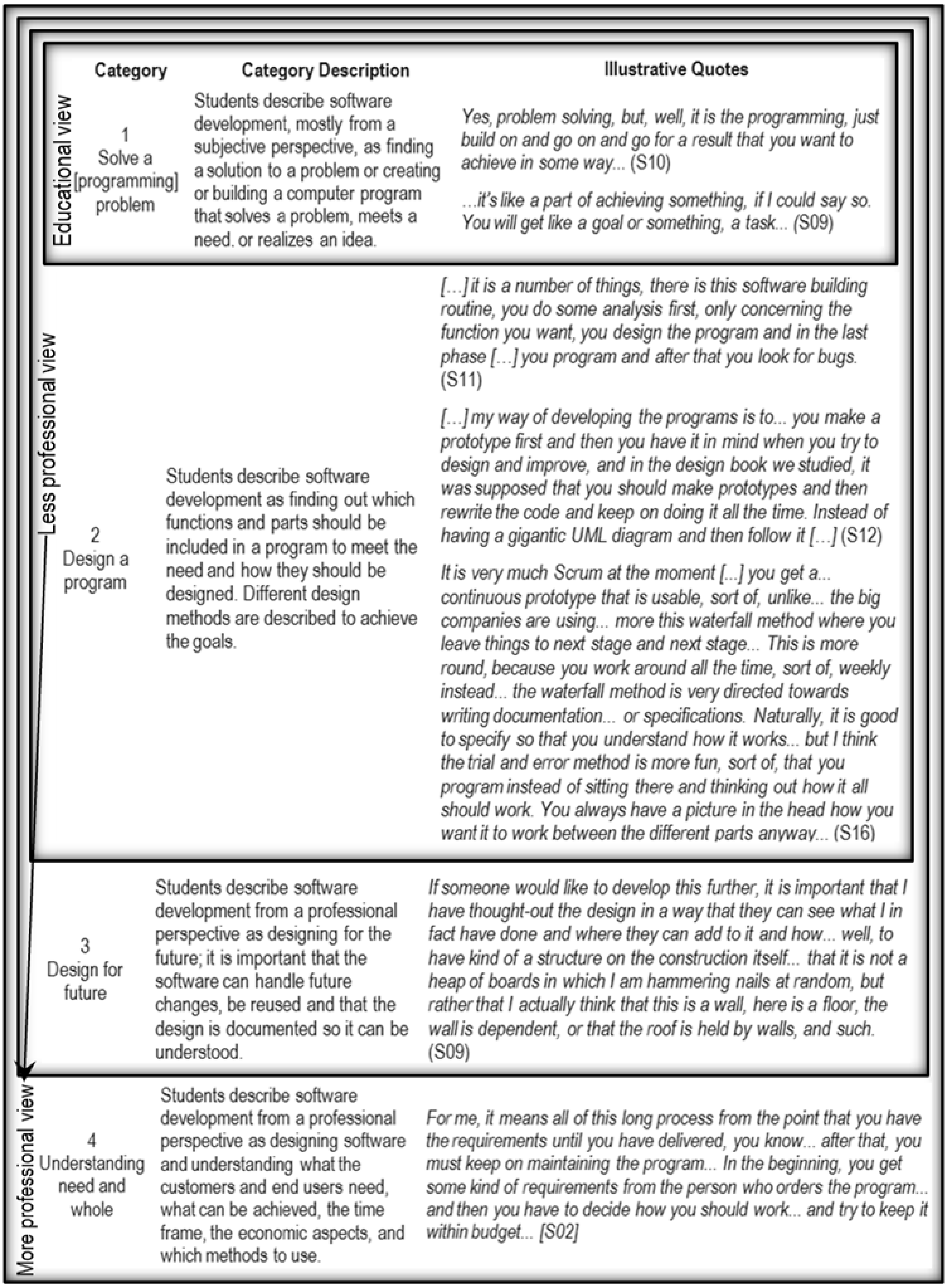
	Conception	Conception Description	Illustrative Quotes
No emphasis	Customer orientation	Practitioners, except business analysts, placed emphasis on activities or circumstances with a strong customer orientation.	*The important thing is that there is at the end there is the customer and even within an organization in the various faces of a process there are internal customers. (*ProgMgr-04)
	End-to-End orientation	Practitioners, except business analysts, placed emphasis on a holistic overarching "end-to-end" view of business processes, whereby the beginning and the end depend upon the counterpart's perspective.	*BPM is a management philosophy, a way of managing companies, which is orientated towards the idea of an End-to-End process (*ProjectMgr-05)
	Improvement orientation	Practitioners, except business analysts, placed emphasis on improvement and/or described activities to improve business or specific processes e.g. through changing variables.	*…Focus on Business Process improvements; we want to improve the way of working. The improvement can be done in different ways. (*ProjectMgr-03)
Least emphasis	1 Organization specific	Business analysts placed emphasis on aspects specific to an organization.	*... A managed way that takes into account the company's objectives, the overall company objectives, and strategy. (*ProjectMgr-06)
	2 Process orientation	Business analysts placed emphasis on "process" as the central point, underlining process thinking or orientation versus the orientation along functional units.	*... the people, the management are completely committed to process orientated thinking.(*ProgMgr-02)
	3 Orientation towards value generation	Business analysts placed emphasis on generating output or creating deliverables, which are of value to a customer of internal or external nature.	*… Make sure [...] processes deliver business objectives in the most effective way... (BA*-04)
	4 Management of business	Business analysts placed emphasis on accenting management of all business related matters by getting people together to accomplish desired goals and objectives.	*... Approach focused on managing your business by managing the process that operate your business. (BA*-04) *BPM is a mean[s] of organizing and managing a company.* (BA-02)
Most emphasis	5 Management of processes	Business analysts placed emphasis on a process or activity itself. These can include phases of the process lifecycle management such as: process definition, controlling, or implementation etc.	*... To identify and define the business processes define what are the activities in the processes... (*BA-07)

Reiter et al. (2010) provide a list of conceptions (Table 3.1), but they did not constitute categories of description. Their list of conceptions are at an earlier stage of data analysis than, for example, the 18 conceptions Isomäki (2002) categorised. However, where Isomäki went further with the data analysis and constituted forms of thought or categories of description, Reiter et al. (2010) did not do so. Consequently, I included this work in Section 3.3.7 on the potential overlap of the relevant studies with my study, but not in Section 3.3.8 on the profiling of analyst/designers.

3.3.4 Students and Software Development

Boustedt (2010) described ways students understand software development. He drew his sample from undergraduates who were within one month to one year of completing a Bachelor of Computer Science or engineering degree that included computer science.

The outcome space shown in Figure 3.3, which is adapted from Boustedt (2010), shows his four categories of description. Boustedt's categories are inclusive. That is, each succeeding category includes the proceeding categories. His first category of description, Solve–a–[programming]–problem, "emanate[s] from an educational point of view or a hobby situation" (p. 4). Category 2, Design–a–program, includes Category 1, however, hobby projects are recognised as something different from professional projects. There is an indication of a professional attitude in Category 2, which is the least professional of Categories 2 to 4. Category 3, Design–for–future, while including the perspectives of Categories 1 and 2, "takes a wider perspective… in addition to being a solution to a specific problem… the focus is on inner quality requirements [of] the software" (p. 4). Category 3 "has an obvious professional point of view" (p. 4). Category 4, Understanding–need–and–whole, "describe[s] software development from a professional and businesslike perspective" (p. 4). Important in Category 4 are the external quality requirements of developing an understanding of the needs expressed by customers and end users and adapting the project to the budget and time limits.



Category	Category Description	Illustrative Quotes
1 Solve a [programming] problem	Students describe software development, mostly from a subjective perspective, as finding a solution to a problem or creating or building a computer program that solves a problem, meets a need, or realizes an idea.	*Yes, problem solving, but, well, it is the programming, just build on and go on and go for a result that you want to achieve in some way...* (S10) *...it's like a part of achieving something, if I could say so. You will get like a goal or something, a task...* (S09)
2 Design a program	Students describe software development as finding out which functions and parts should be included in a program to meet the need and how they should be designed. Different design methods are described to achieve the goals.	*[…] it is a number of things, there is this software building routine, you do some analysis first, only concerning the function you want, you design the program and in the last phase […] you program and after that you look for bugs.* (S11) *[…] my way of developing the programs is to... you make a prototype first and then you have it in mind when you try to design and improve, and in the design book we studied, it was supposed that you should make prototypes and then rewrite the code and keep on doing it all the time. Instead of having a gigantic UML diagram and then follow it […]* (S12) *It is very much Scrum at the moment [...] you get a... continuous prototype that is usable, sort of, unlike... the big companies are using... more this waterfall method where you leave things to next stage and next stage... This is more round, because you work around all the time, sort of, weekly instead... the waterfall method is very directed towards writing documentation... or specifications. Naturally, it is good to specify so that you understand how it works... but I think the trial and error method is more fun, sort of, that you program instead of sitting there and thinking out how it all should work. You always have a picture in the head how you want it to work between the different parts anyway...* (S16)
3 Design for future	Students describe software development from a professional perspective as designing for the future; it is important that the software can handle future changes, be reused and that the design is documented so it can be understood.	*If someone would like to develop this further, it is important that I have thought-out the design in a way that they can see what I in fact have done and where they can add to it and how... well, to have kind of a structure on the construction itself... that it is not a heap of boards in which I am hammering nails at random, but rather that I actually think that this is a wall, here is a floor, the wall is dependent, or that the roof is held by walls, and such.* (S09)
4 Understanding need and whole	Students describe software development from a professional perspective as designing software and understanding what the customers and end users need, what can be achieved, the time frame, the economic aspects, and which methods to use.	*For me, it means all of this long process from the point that you have the requirements until you have delivered, you know... after that, you must keep on maintaining the program... In the beginning, you get some kind of requirements from the person who orders the program... and then you have to decide how you should work... and try to keep it within budget... [S02]*

Figure 3.3: The variation in students' ways of experiencing software development (Adapted from Boustedt 2010)

Boustedt used a professional perspective of software development to analyse his data. His perspective is that soft skills are valued highly. His view is consistent with most of the literature cited in the previous chapter. As shown in Figure 3.3, Boustedt found his lowest category had an educational perspective and Categories 2 to 4 increased in professional perspective. Boustedt's categories are a reflection of Lee's (2001) findings: a lower professional perspective, such as that in Category 2, focuses on technical skills such as programming; a higher professional perspective, such as in Category 4, focuses more on non-technical skills than technical skills.

3.3.5 Students and IS Design

Rose et al. (2005) studied students' conceptions of teaching and learning as well as IS design and was part of a much larger study (p. 186).

The outcome space shown in Figure 3.4 is an adaption of Rose et al's categories describing students' conceptions of IS design. In my adaption, I excluded Rose et al's field dependent/field independent (FD/FI) cognitive styles and SOLO taxonomy classifications. While those classifications are useful to their investigation of students' conceptions of teaching and learning, it is not relevant to the students' conceptions of IS design.

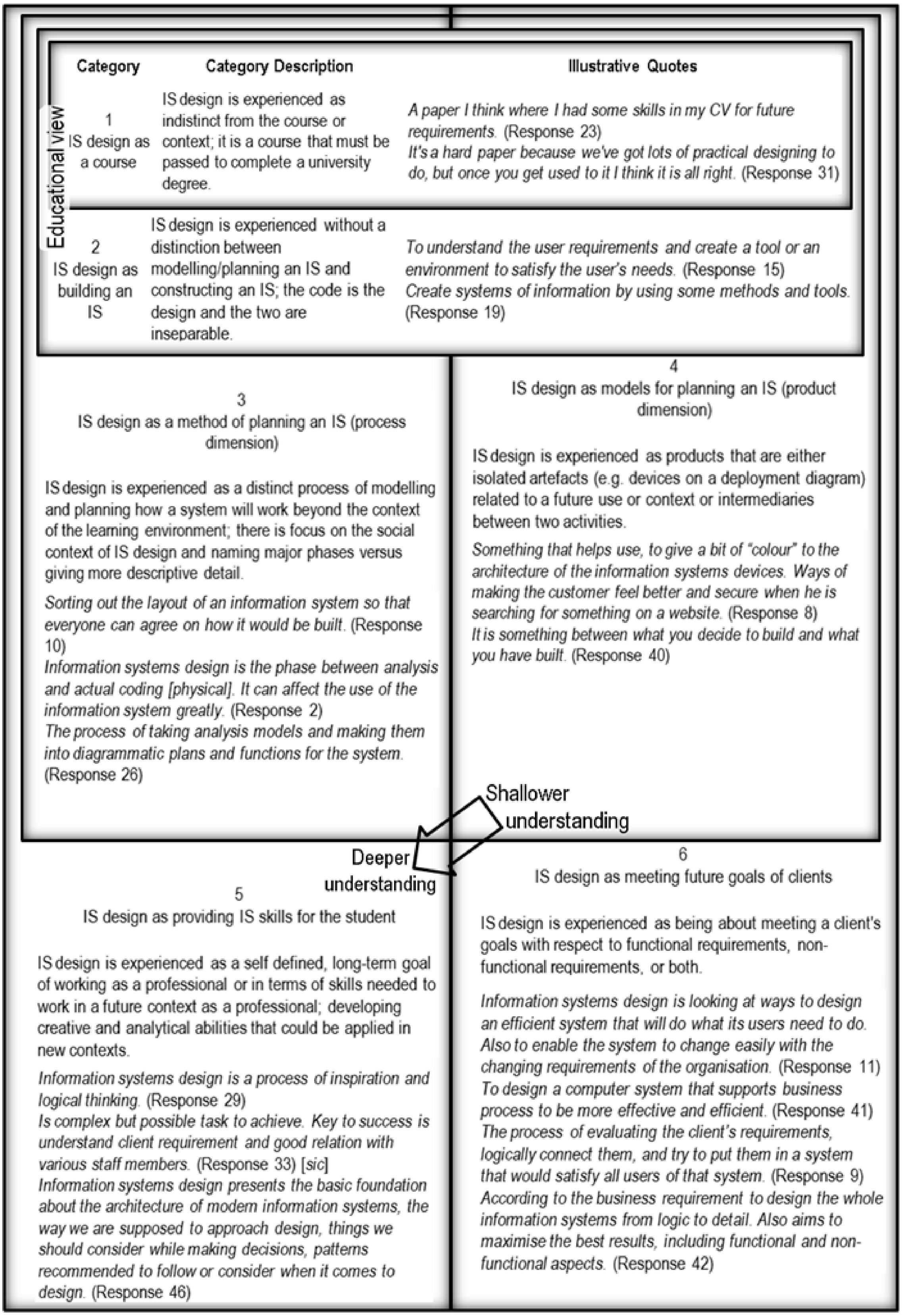


Figure 3.4: The variation in second year university students' ways of conceiving IS design. (Adapted from Rose et al. 2005)

I have concerns about Rose et al.'s (2005) study, which include the quality and quantity of data collected, the quantity of data discarded, aspects of their data analysis, and their use of bracketing. They used three open ended questions that asked for brief written statements of the student's understanding of teaching, learning, and IS design (Rose et al. 2005, p. 186). Brief written statements fall short of the representations of conceptions captured in longer communications typical of phenomenographic studies, such as interviews (Bradbeer, Healey & Kneale 2004). Without explicit information about the quality and quantity of data collected, especially the length of the responses, it is not possible to judge the adequacy of the data collected by Rose et al.

Of their 60 responses, they discarded 17 as the responses were either blank, tautological, or indicated insufficient understanding (p. 188). The number of responses they discarded for each of these reasons is not stated. Discarding a response for being tautological or showing insufficient understanding is counter to the purpose of phenomenography, that is, to reveal variation in understandings.

Rose et al. (2005) "derive[d]" (p. 187) conceptions of IS design by recording initial conceptions after the third reading of the responses, allocating responses to conceptions on the fourth reading, and reducing the number of conceptions and moving some responses on subsequent readings. Marton (1986) described the constituting of categories as "tedious, time-consuming, labour in-intensive, and interactive… entail[ing] the continual sorting and resorting of data" (p 43). Given there were 43 brief written responses analysed, the derivation of conceptions in the way described in "three days" (Rose et al. 2005, p. 187) may be sufficient, but unusual, for a phenomenographic study.

Rose et al. (2005) claim their "interpretation [was] bracketed" (p. 187), which obscures their research process, which was to "manag[e] researcher subjectivity through bracketing" (p. 187). Their "pre-conceptions" (p. 187) of IS design, not their interpretation should have been bracketed. When describing bracketing, their choice of expression could have been clearer.

The outcome space, shown in Figure 3.4, is adapted from Rose et al.'s (2005) outcome space, which includes student conceptions of IS design, teaching, and learning. They believe that: Categories 1 and 2 are an educational view of IS design within "the current learning environment" (p. 190), the former "as a course in a university degree" (p. 190) and the latter "as indistinct from programming" (p. 190); Categories 3 and 4 describe IS design “as planning an IS solution” (p. 190), the former as process and the latter as product; Categories 5 and 6 describe IS design “as meeting future goals of working as an IS professional” (p. 190), the former as skills a student acquires to become a professional and the latter as meeting goals of the client. Though they have nested Categories 3 and 4 within Categories 5 and 6, they state Categories 3 and 5 “[indicate] deeper understandings of IS design” (p. 191).

Despite the above issues with Rose et al.’s (2005) research process, their results do show some alignment with Boustedt’s (2010).

3.3.6 Students and Information Systems

The final study is Cope’s (2000) phenomenographic analysis of early undergraduate IS students’ ways of conceiving an IS. Cope’s study is educational research that takes a “phenomenographic perspective on learning” (p. vi).

Figure 3.5 shows Cope’s six categories of students’ ways of experiencing the concept of an IS. The transition from Category 1 to Category 6 is one of increasing complexity and deepening understanding. The categories become more complex as more parts are added to what an IS is and how those parts relate. The transition from shallower to deeper understanding is logical, based on the empirical evidence.

Less complex, shallower understanding

Educational view

Category	Illustrative Quotes
1 A personal search of a static information source.	*Yeah, [I would consider an encyclopaedia to be an information system] sort of - you're [...] looking for some particular thing that you're looking for to find out information from it. So you look up the name, subject and receive the information on it.* ***So you look up a name?*** *Use the index to find a certain page - go to that page, reference and find all the information on it.* ***So what are the processes happening in that circumstance?*** *Index, that would be the process.* ***So you are actually looking up the index?*** *Another process would be look up the index for a certain page and another process would be just searching through the whole lot. And then you would have a process after you got your page number to go and find the information and retrieve the information from the book.* (Student AS)
2 A simple information retrieval system.	*Basically [an information system is] a system for retrieving information from raw data - that can be anything - it doesn't necessarily have to be a computer sitting in the corner or whatever - a process that - the step between the human and the data that sort of theoretically looks at the data - sort of there's you and this bit - but you know I understand it comes from the database and you can look at, I don't know - how many books have been sold this week from a company - and just that sort of thing.* (Student AM)
3 A data manipulation system supporting an individual within a single organisational function.	*Basically I see an information system now as more or less, I suppose, a set of rules, not something physical, um, or, something physical and not physical basically. A means of collecting data, storing it and organising it and making it accessible.* (Student SR)
4 A computerised data manipulation system supporting many people within a single organisational function.	*Yeah, [the enrolment procedure is] using an information system - you go there, give over your personal details to the person there and they enter them into the student administration system.* ***[...] could you think of anybody else who might use the system?*** *When they make up your transcripts or whatever they would have to access that - or get your results from each of your subjects and that - each department that you study in.* ***Now that's totally different from the enrolment procedure?*** *Yeah.* ***Are there two separate information systems there?*** *One system - I think it contains lots of details - all the details that are relative to your study at the Uni here and they can do a number of different things with that information that's on the system.* ***Do you think that's normal for information systems - different people to use it in different ways?*** *Yeah, I think so - well it would be in any sort of business there's going to be a number of things that need to be done and if you can design a system to be able to do more tasks, the better off the business is going to be in the long run.* (Student NM)
5 A computerised data manipulation system and all the people and the data-related procedures they perform to support a single organisational function.	*Perhaps the first thing I think about [when I bring to mind the words "information system"] is the environment - the information system environment I suppose. It's not just your computer it's everything but a lot of it revolves around the computer.* ***Alright, what's in that environment?*** *Well, it does include the computer system, I suppose it's a good place to start - but it includes the people and processes as well are the first things that come to mind.* ***What are the people doing?*** *The people basically follow procedures - they would be procedures that are predetermined or literal procedures which are for one off situations - which is basically determined by someone who has developed the system and they are communicating as well, with each other and the computer.* (Student SR)
6 A number of communicating information systems within the one organisation, which includes all people, computer hardware, data, and information related processes.	*[Deciding on which subjects to do is] perhaps an interaction with two systems - I mean, you're doing the processing within yourself and everything is part of the system - every system has smaller systems in it as far as I can tell, and that's just an interaction with two systems. There is no specific boundary where one ends and the other begins.* ***And what about the results - now you're enrolling, what have your results got to do with that?*** *I suppose whether you want to call it an enrolment system or a learning system - if you include it as a learning system then your enrolment system is a sub-system of your learning system and so are your results and things like that.* ***So you think when lecturers enter your results their dealing with a system that the enrolment is part of?*** *Yes, well I wouldn't imagine they give you results unless you are enrolled in that subject - so it's the interaction.* (Student SR)

More complex, deeper understanding

Figure 3.5: The variation in early undergraduate students' ways of conceiving an IS (Adapted from Cope 2000, 2002a; n.d.)

Note: Text in bold in the illustrative quotes are interviewer questions.

3.3.7 Potential Overlap

The researchers of the six phenomenographic studies examined above overcame the challenge of qualitative analysis by making sense of large amounts of data (Patton 2002). Each study presents results that I have adapted and represented as outcome spaces in Figure 3.1 to Figure 3.5 and listed in Table 3.1. As shown in Figure 3.6, each of the studies investigated a relationship between people and a phenomenon that has the potential to overlap, or be associated with, the relationship between analyst/designers and analysis/design. Figure 3.6 reflects both some of the ways I experience or understand IS, ISD, analysis/design, as well as the six studies of IS and ISD phenomena.

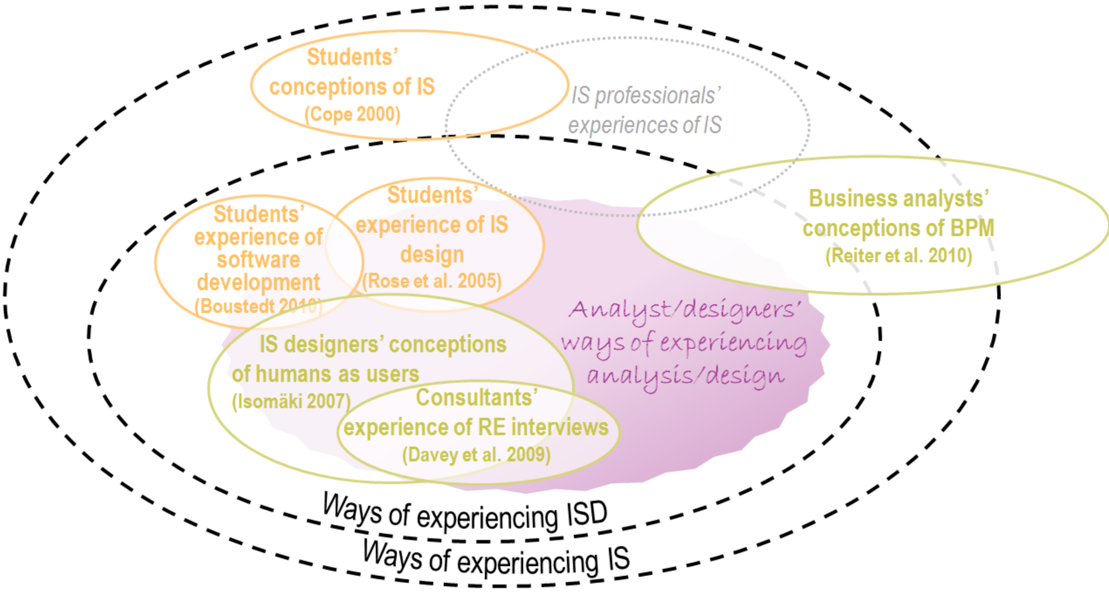


Figure 3.6: The *potential* overlap of phenomenographic results from studies of IS and ISD phenomena with analyst/designers' ways of experiencing analysis/design.

Note: Orange indicates studies of students. Gold indicates studies of professionals. Grey indicates a study of professionals yet to be done. Purple indicates the possible result of this study. RE is requirements elicitation. BPM is business process management. Shape or size is not indicative of, or relative to, anything.

Analyst/designers are part of a larger group of professionals and students who are involved in the analysis, design, construction, and deployment of IS. IS designers, consultants, and business analysts are among the professionals in that larger group. Students who are learning about IS and ISD are part of that larger group.

The professionals' or students' ways of experiencing IS and ISD phenomena reviewed above share some common ground with analyst/designers' ways of experiencing analysis/design. IS is a broad topic area within which ISD is the analysis/design, construction, and deployment of those systems. As shown in Figure 3.6, ways of experiencing ISD are within ways of experiencing IS. It is improbable that a person can have a way of experiencing ISD without also having a way of experiencing IS. Cope's (2000) categories of students' conceptions of an IS describe ways of experiencing IS without specific mention of ways of experiencing ISD. Cope's interview schedules (p. 210 & p. 220) emphasised the concept of an IS rather than experiences of IS. Perhaps the emphasis on the concept of an IS rather than experiences of IS precluded students mentioning ISD. Alternatively, perhaps Cope interpreted ISD to be beyond the boundary of the concept of an IS if it was mentioned. In the illustrative quote for Cope's Category 5 (Figure 3.5), Student SR mentions that someone who communicates with other people and the computer develops the system. This portion of the quote for Category 5 does suggest that ISD can be part of the experience of IS.

I expect, if a study were to be done, IS professionals' ways of experiencing an IS would overlap with Cope's categories of students' conceptions of IS and analyst/designers' ways of conceiving analysis/design. I expect IS professionals who are working in ISD would include ways of experiencing ISD in their experiences of IS.

Business process management (BPM) and business information systems (BIS) are either the same or one is part of the other. Where BIS are data driven, BPM systems are process driven (van der Aalst, ter Hofstede & Weske 2003). For example, the following definitions of a BPM system and BPM are similar to a definition of a BIS:

- A BPM system is "a generic software system that is driven by explicit process designs to enact and manage operational business processes" (p. 1). BPM is "supporting business processes using methods, techniques, and software to design, enact, control, and analyse operational processes involving humans, organizations, applications, documents and other sources of information" (p. 4); the IS is "process aware" (p. 5)
- "[B]IS exist to generate, record, manipulate, and communicate data necessary for the operational and planning activities which have to be carried out if the organisation is to accomplish its objectives" (Land & Kennedy-McGregor 1987, p. 63)

The equivalence of BPM systems with BIS and Reiter et al.'s (2010) conception 5 (Table 3.1) adds weight to my argument that IS professionals' ways of experiencing IS would include ways of experiencing ISD. In Figure 3.6, the placement of the ellipse representing Reiter et al.'s (2010) business analysts' conceptions of BPM reflects my understanding of the definitions of a BPM system and BIS above. I can regard BPM systems as being the same as BIS. Therefore, business analysts' conceptions of BPM fall partly inside IS professionals' ways of experiencing IS. Conversely, I can regard BIS as a part of BPM systems. Therefore, business analysts' conceptions of BPM fall partly outside the ways of experiencing IS.

Reiter et al.'s (2010) conception 5, Management–of–processes, is the conception most emphasised by business analysts (p. 727). Reiter et al.'s conception 5 includes elements of the design and improvement of BPM systems such as process definition and implementation (Rosemann & vom Brocke 2010). Business analysts' conception of BPM that includes BPM system design and improvement would fall inside IS professionals' ways of experiencing ISD and potentially overlap analyst/designers' ways of experiencing analysis/design.

In Figure 3.6, there are four smaller ellipses within the ellipse of ways of experiencing ISD. Those four ellipses represent the four studies of professionals' and students' relationships with ISD phenomena. A fifth ellipse represents analyst/designers' ways of experiencing analysis/design. Students' and professionals', especially early career professionals, may have some common experiences. Boustedt's (2010) and Rose et al.'s (2005) categories describing students' experiences have the potential to partly overlap analyst/designers' ways of experiencing analysis/design.

I expect IS designers' conceptions of humans as users (Isomäki 2007) and consultants' experience of requirements elicitation interviews (Davey & Cope 2009) will have a clear overlap with my findings of analyst/designers' ways of experiencing analysis/design. Both of these studies are about professionals' way of experiencing part of ISD. My understanding is that humans as users are integral to the analysis/design of BIS and therefore I identify with Isomäki's Category 3, Holistic. I have experience of working with and teaching people whose actions appear to be guided by conceptions described in Category 1, Separate, and Category 2, Functional. Isomäki's categories have the potential to almost completely be within analyst/designers' ways of experiencing analysis/design.

Requirements elicitation interviews are a technique used by analyst/designers to do analysis/design. I anticipate Davey and Cope's (2009) categories of consultants' ways of experiencing requirements elicitation interviews to be completely within analyst/designers' ways of experiencing analysis/design.

The potential overlap of the results from phenomenographic studies related to another phenomenographic study, as shown in Figure 3.6, is an innovative way of looking at phenomenographic results. It is a means of reporting my awareness of analysis/design and its place in ISD and IS.

3.3.8 Profiling Analyst/Designers

Of the six phenomenographic studies of people's relationships with IS and ISD phenomena, five presented categories of description that I adapted into outcome spaces with similar formats (Figure 3.1 to Figure 3.5). I used a similar format so that I could align the outcome spaces as shown in Figure 3.7. The alignment of the outcome spaces allowed me to extrapolate profiles of analyst/designers based on the variation described in the categories of description from each study.

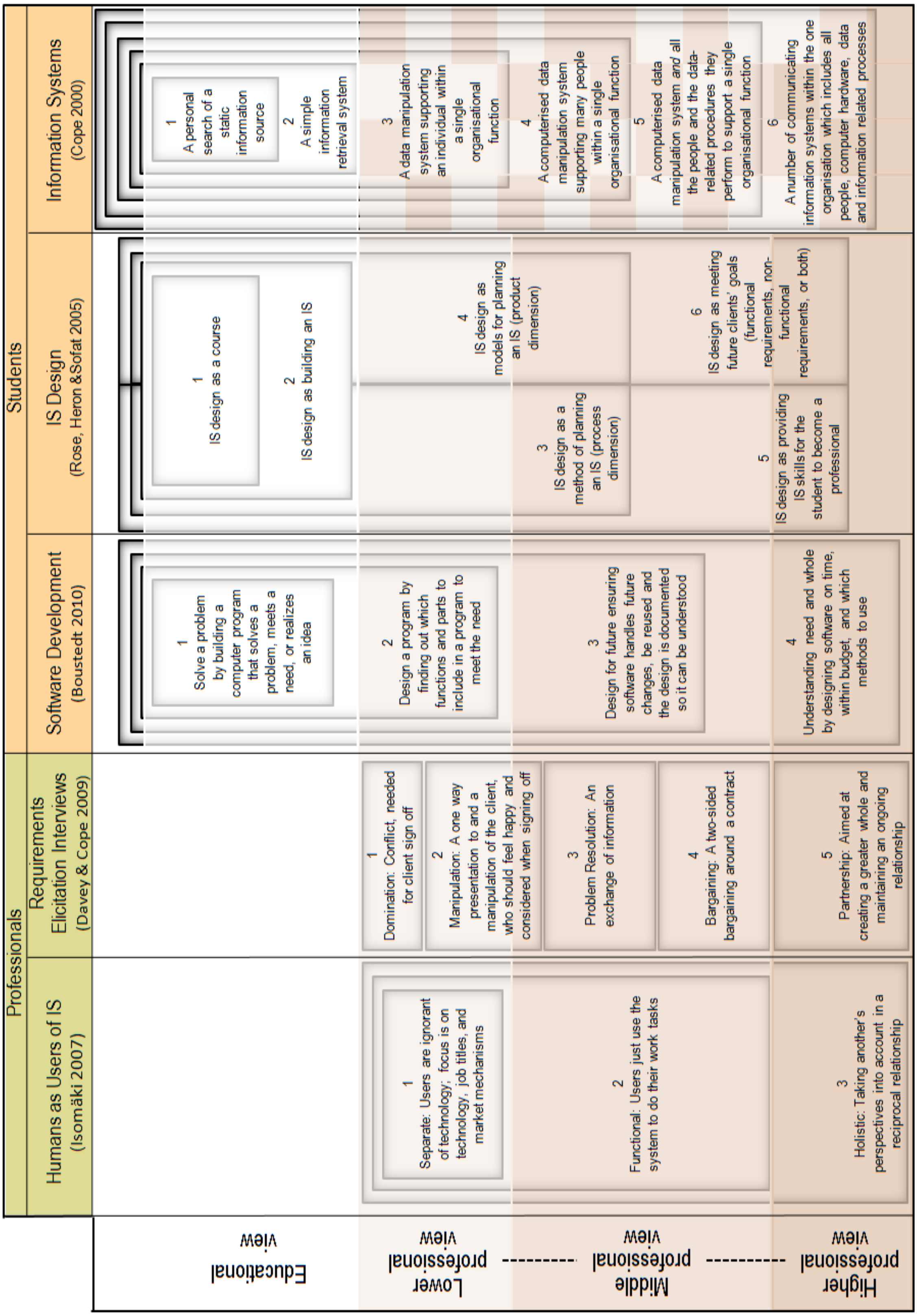


Figure 3.7: An alignment of the outcome spaces from phenomenographic studies of professionals' and students' ways of experiencing ISD and IS phenomena. (Adapted from Boustedt 2010; Cope 2000; Davey & Cope 2009; Isomäki 2007; Rose et al. 2005 & Figures 3.1 to 3.5)

Figure 3.7 shows the alignment of the outcome spaces from five of the studies (Boustedt 2010; Cope 2000; Davey & Cope 2009; Isomäki 2007; Rose et al. 2005). For Figure 3.7, I reduced the categories in the outcome spaces to short descriptions. I aligned the outcome spaces on two assumptions: (1) the students and professionals who participated in the studies are part of a larger group of people who are involved in ISD, which includes analyst/designers, and (2) the experiences described in the studies overlap in the way depicted in Figure 3.6. The four bands from white to the darkest tan indicate the view or level of the categories in the outcome spaces as educational, lower professional, middle professional, and higher professional respectively.

The white band in Figure 3.7 is the educational view as interpreted by the researchers of the studies of students (Boustedt 2010; Cope 2000; Rose et al. 2005). The educational views in Boustedt's Category 1, Rose et al.'s Category 1 and Category 2, and Cope's Category 1 and Category 2 are of interest to this study only in that these ways of experiencing ISD phenomena from an educational view are distinct from a professional view.

The lower professional view (the lightest tan band in Figure 3.7) shows a profile of analyst/designers that I would regard as the least desirable. Analyst/designers with the lower professional profile see the human users of BIS as being ignorant of technology (Isomäki, Category 1). The human users are seen to be unable to articulate their requirements (Isomäki, Category 1), which could account for the domination and manipulation of the client during requirements elicitation interviews (Davey & Cope, Categories 1 & 2). Analyst/designers with the lower profile focus on programming (Boustedt, Category 2), and the models for planning an IS more than the process for planning an IS (Rose et al., Categories 4 & 3 respectively).

In Figure 3.7, the middle professional view shows a broad profile of analyst/designers that I regard as mediocre. They do not have the lower professional view, yet the filters they do have inhibit them from being guided by a higher professional view when they act. Analyst/designers with the middle professional profile see human users of IS as just using the system (Isomäki, Category 2). During requirements elicitation interviews, the users or clients are seen as a source of requirements (Davey & Cope, Categories 2, 3, & 4). As the clients are just using the system, the analyst/designer acts without including human users' mental, social, or cultural qualities (Isomäki, Category 2); the analyst/designer either manipulates or bargains with the clients or sees the requirements as a problem to be resolved (Davey & Cope, Categories 2, 4, & 3 respectively). The middle professional view ranges from: a lower middle professional view that focuses on modelling or documenting (Boustedt, Category 3; Rose et al., Category 4); through method and process (Rose et al., Category 3); to a higher middle professional view that focuses on meeting future goals or requirements (Boustedt, Category 3; Rose et al., Category 6). The process of ISD has a structure (Boustedt, Category 3) and phases (Rose et al., Category 3) that helps the analyst/designer develop and design IS for the future (Boustedt, Category 3; Rose et al., Category 6).

The higher professional view shows a profile of analyst/designers I regard as the most desirable way of experiencing the IS and ISD phenomena shown in Figure 3.7. Analyst/designers with the higher professional profile see humans as users of IS as coexisting and intertwined in a holistic way with the IS (Isomäki, Category 3). Analyst/designers form the holistic view of human users around their conception that they must consider other people's perspectives. Requirements elicitation interviews need to be a partnership for the analyst/designer to maintain an ongoing relationship with the client (Davey & Cope, Category 5). There is a reciprocal relationship between the user/client and analyst/designer (Isomäki, Category 3), which is a relationship of mutual respect (Davey & Cope, Category 5) and actively helping (Boustedt, Category 3). The higher professional profile is focused on the whole. Requirements elicitation interviews are aimed at creating a greater whole by seeking the real needs of the business (Davey & Cope, Category 5). Software development is about understanding needs, what is feasible within the budget and time available, and the selection of methods to achieve that greater whole (Boustedt, Category 4). The analyst/designers focus on the whole includes the professional development of the analyst/designer (Rose et al., Category 5).

The profiling of analyst/designers' conceptions of an IS into the three professional levels in Figure 3.7 is open to interpretation. This is perhaps because, as Cope (2000, 2002a) described, there are more sophisticated and complex conceptions of IS than those constituted from Cope's interviews with students. Alternatively, as described in the previous section, ISD is absent from the descriptions of ways of experiencing an IS, which complicates aligning Cope's categories. As shown in Figure 3.7, Cope's Categories 3, 4, 5, and 6 could be part of any of the three professional profiles. For example, the functional view of humans as users of an IS (Isomäki, Category 2) could align with Cope's Categories 3 to 6. Human users as an individual or many people manipulating data for a single purpose (Cope, Categories 3 & 4) or people being included as part of IS (Cope, Categories 5 & 6) are aligned with a conception of users using the system to do their work tasks (Isomäki, Category 2). However, in agreement with Cope's findings, I expect a higher professional profile would have a more complex and sophisticated conception of an IS than that described in Cope's Category 6.

Each of the outcome spaces of the five phenomenographic studies is a description of the ways of experiencing a phenomenon at the collective level. A category does not apply to any particular individual, as a category is an abstraction constituted by the researcher. An individual experiences a phenomenon in varying ways. The researcher interprets the varying ways to constitute categories. While the three profiles of analyst/designers may describe a stereotype, an individual may experience different combinations of the categories describing ISD and IS phenomena. For example, an individual who experiences humans as users of IS as just using the system to do their work tasks (Isomäki, Category 2) may see that it is important to form a partnership with the client during requirements elicitation interviews (Davey & Cope, Category 5) because she does not equate users and clients.

Some alignments of categories from the five phenomenographic studies would be contradictory. For example, an individual whose conception of humans as users of IS is formed around taking another's perspective into account (Isomäki, Category 3). This individual would experience requirements elicitation interviews at a qualitatively similar level, namely as a partnership aimed at creating a greater whole and maintaining an ongoing relationship (Davey & Cope, Category 5).

The profiling of analyst/designers, as I have done in this section, is an innovative way of using the results from earlier phenomenographic studies of phenomena related to, but not necessarily the same as, the phenomenon of interest in a new study. In the discussion (Ch. 10), I return to the profiles of analyst/designers to add the results from this phenomenographic study to the profiles of analyst/designers.

3.4 Conclusion

As mentioned previously, our actions are guided by the perceptions, knowledge, skills, beliefs, preferences, and paradigms through which we experience the world. Identifying and describing how we relate to phenomena, both in thought and action, is an important contribution to the knowledge of the world. The quantitative psychological studies mentioned in the previous chapter help us understand what is common among analyst/designers. The studies reviewed in this chapter provide insight into a portion of the perceptions, knowledge, skills, beliefs, preferences, and paradigms that guide the actions of analyst/designers. These studies describe variation in the relationship between a group of people, a group to which analyst/designers belong. Those studies also describe IS and ISD phenomena related to analysis/design. Even though the relevant studies have not described the variation in analyst/designers ways of experiencing analysis/design, they do contribute to the profiling of analyst/designers.

In Chapter 1, I indicated that my study process (Figure 1.2) involved two phases of literature review. I wrote this chapter, and the preceding one, largely based on the review of literature after I had the results of this study. However, I followed convention of putting the literature review after the introduction, and before the research method, to illuminate what we knew about analyst/designers before revealing my results. What follows is the report on the major effort of this study, the exploration of that variation in analyst/designers ways of experiencing analysis/design.

4 Research Method

Phenomenography is about studying the variation in people's experiences of a phenomenon. For example, suppose a researcher did a phenomenographic study into phenomenographers' experiences of doing phenomenography; that researcher would be interested in my experience of phenomenography from doing the study that I describe in this thesis. The researcher would be interested in my simplest view of phenomenography, when I knew that phenomenography involved in-depth interviews and looking for differences between the utterances of the interviewees. The researcher would also be interested in my later view of phenomenography, in which I came to know the orthodoxy of phenomenography and attempted to produce results by accommodating this orthodoxy (Ch. 5). A phenomenographic researcher might find particularly interesting (given its rarity) my most recent and sophisticated experience of phenomenography, into which I incorporate the philosophy that underpins my phenomenographic data analysis (Ch. 6), with the aim of presenting results that are confidence inspiring (Ch. 7–9). Phenomenography is all of these things *because* that is my experience of it. This variation in experience is what a phenomenographic study attempts to describe.

Phenomenography, as a research method, lacks a prescribed method or set of techniques for carrying out an investigation (Ashworth & Lucas 2000; Bruce 2006; Harris 2011; Hasselgren 1997). Yet, there is orthodoxy to phenomenography, which is indicated by the acceptance of phrases such as "phenomenographic approach", "phenomenographic method", and "phenomenographic analysis" without further elaboration (e.g., European Association for Research on Learning and Instruction 2011). The general characteristics of phenomenographic research methods have remained constant from its founding (Marton 1981a, 1986; Marton & Booth 1997; Marton & Pong 2005). These methods typically comprise research techniques of sampling, interviewing, transcribing, and analysing and interpreting the data.

Typically, the researcher selects a sample from a group of people with the aim of maximising the variation of experiences within the sample. The typical means of collecting data are open, deep interviews with the people in the sample. The interviewer asks people to describe their experiences of a phenomenon. The interviews are transcribed. The researcher then analyses the transcripts to constitute the variations in the data. The data analysis is a comparative process. Analysis of the data continues until the categories describing the variation are stable. The resulting phenomenographic description takes the form of a small number of qualitatively different categories and an outcome space describing the relationship between those categories. To establish the validity and reliability of her results, the phenomenographer must (usually) provide a description of how she conducted her research.

For this study, I selected and interviewed a sample of analyst/designers. From the transcripts, I constituted and described a small number of qualitatively different categories of what those analyst/designers report they do and what they conceive analysis/design to be. In this chapter, I describe the research method that guided my study. I also describe how I established the validity and reliability of this study. My research process is the realisation of this research method. I report that research process in the following two chapters.

4.1 Sampling

A phenomenographic description is not of an individual, but of a group. At the widest possible extent, the group is all people who have experienced the phenomenon. Of course, it is not usually possible to interview every person in the group. The phenomenographer selects a sample. The sample is purposefully selected for the widest possible variation of experience (Figure 4.1).

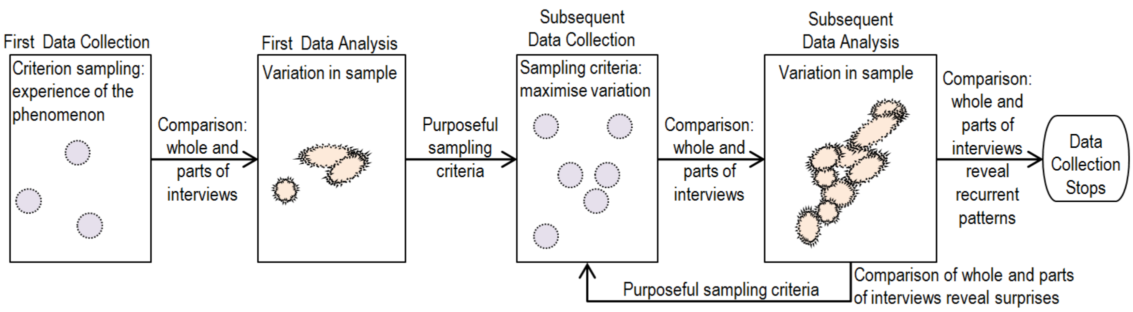


Figure 4.1: The method of sampling for the widest possible variation of experience

Note: The purple circles represent data collection instances, the orange shapes represent overlaps in the data after data analysis.

A combination of purposeful sampling techniques are employed during phenomenographic data collection, that is, (i.e., combination or mixed purposeful sampling, Patton 2002, p. 242). As shown in Figure 4.1, sampling commences by selecting the target group (i.e., criterion sampling, p. 238). The research question sets the target group criterion. A minimum selection criterion is that a person must have experience of the phenomenon at the start of data collection. Additional criteria are set before and during interviewing, that is, emergent sampling (i.e., emergent sampling, p. 240), to purposefully select for the widest possible variation of experience (i.e., maximum variation sampling, pp. 234–5).

Other factors, such as resourcing of the study, can place limitations on what sampling is feasible (Kvale 1996; Seidman 2006). If the interviewer can travel only within a limited area, then there is a geographical limitation on the sample. For example, Stoodley (2009), limited his travel to Southeast Queensland due to resourcing (p. 76). Such a geographical limit imposes a cultural limit on a sample.

As with many other qualitative methods, the number of interviewees is not set before interviewing begins (Kvale 1996; Seidman 2006). Interviewing between 15 and 30 people is an acceptable number for a phenomenographic study (Bowden 2005; Franz 1994; Sandberg 2000). In addition, people are usually interviewed only once. However, there are exceptions. For example, Franz (1994) interviewed eight people. McKenzie (2003) started with 29 people with the intention to interview them three times, but after some dropped out, she finished with 78 interviews.

Sampling continues until the researcher senses she has reached saturation. As illustrated in Figure 4.1, sampling continues until the researcher senses that the most recent interviews are reprising of patterns from earlier interviews (Bertaux & Bertaux-Wiame 1981; Kvale 1996; Mason 2010; Myers & Newman 2007; Strauss & Corbin 1998).

Saturation is a problematic term (Guest, Bunce & Johnson 2006; Mason 2010; Morse 1995). Since the first use of the term "theoretical saturation" by Glaser and Strauss (1967, p. 61), the meaning of saturation has become blurred. Glaser and Strauss intertwined data collection and analysis for *one* category until saturation, before moving on to collect and analyse data for another category. (In grounded theory, a category is a conceptual element of the grounded theory being discovered (p. 36).) The type of saturation the researcher is aiming for in phenomenography is not theoretical saturation. "Saturation of knowledge" (Bertaux 1981, p. 37) is a better term. Bertaux describes how the researcher is surprised or learns a great deal from the first few interviews. By (say) the fifteenth interview, the researcher recognises patterns in the interviewees' experiences. More interviews confirm what the researcher has already sensed.

How saturation of knowledge is reached or passed during sampling is uncertain. According to Mason (2010), it is more likely PhD students using qualitative interviews will stop sampling when the number of samples is a multiple of ten rather than when saturation has occurred. Guest et al.'s (2006) found that 12 interviews of a homogenous group is all that is needed to reach saturation. Conceptually, saturation may be the desired end point of data collection. Operationally, the decision to stop interviewing is a function of a combination of all or some of the following factors:

- interview structure and content (Guest et al. 2006); the more unstructured and variable the content, the more interviews are required
- heterogeneity of the group (Guest et al. 2006); the more heterogeneous, the more interviews are required
- the number of interviews done already (Ryan & Bernard 2006); the weaker the sense there are enough interviews, the more interviews are required
- the complexity of the interviews (Ryan & Bernard 2006); the greater the complexity the more interviews are required
- the researcher's experience, fatigue (Ryan & Bernard 2006), and confidence (Mason 2010)
- the number of researchers in the research team (Ryan & Bernard 2006)
- the more interviews, the more defensible the researcher believes the research will be (Mason 2010)
- doing what was stated in a research proposal (Mason 2010)
- the nature of the sample being limited by the sampling technique (Browne & Russell 2003)
- resourcing (Kvale 1996; Seidman 2006)
- the orthodoxy of the method: the number of interviews is expected to fall within a certain range
- meeting all of the purposeful sampling criteria the researcher has determined that are necessary for the study.

Within phenomenography, there is also the issue of collecting all data before any analysis starts, as advocated by some (Bowden 2005) or, commencing analysis while data is still being collected. The former approach makes detecting saturation problematic. The latter approach allows analysis between interviews to influence the maximum variation sampling criteria and allows the determination of saturation with greater confidence. When data collection should start and finish has not received much attention and is not of concern to all phenomenographers (Bowden 2005, p. 20).

4.2 Interviewing

Open and in-depth interviews are the typical means of collecting data for a phenomenographic study (Booth 1993). The interviewer asks interviewees to describe their experiences of a phenomenon. Interviews try to capture the stream of interviewees' thoughts and ideas. Each interview is an articulation representing an interviewee's reality. During an interview, the interviewee is asked to consider that reality which leads to clarification of expressed ideas or the expression of new ideas (Svensson & Theman 1983). It is the task of the interviewer not to stop the stream of thoughts and ideas; the interviewer is tasked with encouraging clarification by asking for more about what is uttered, while maintaining focus on the phenomenon (Svensson & Theman 1983). The aim and focus for the interviewer is to explore the relation between the person and the phenomenon by thematising the phenomenon of interest, drawing out the variation in the interviewee's experience, thus making the interviewees' experiences explicit (Bruce 1994; Francis 1996). The interviewer questions and probes, checking on the meaning of words (Larsson 1987), phrases, and the reflections of the interviewee.

During an interview, the interviewer is interpreting the interviewee's utterances. To maintain the flow of the interviewee's thoughts and ideas about the phenomenon of interest, the interviewer is making the most intelligent and conducive guesses about what is important, what to probe further, and what is not relevant to the study. Sandberg (1997) states that the phenomenographic interviewer does better by adopting the rules from phenomenological reduction; the hermeneutic rules of epoché, description, and horizontalization (Ihde 1977). Epoché, which I previously referred to as bracketing (s. 1.4), and which is also called presuppositionlessness, is one of the key elements in phenomenographic data collection and analysis (Ashworth & Lucas 1998). The interviewer needs to *set aside* or bracket *her own experiences of the phenomenon*: this is the hermeneutic rule of epoché. Through epoché, the interviewer enters into the life world of the interviewee.

While the interviewer may want the interviewee to explain their experience, this is ill-advised. It is important to obtain the description of the interviewee's experience rather than an explanation of why it is so: this is the rule of description. Describing rather than explaining is important because what is important is the presentation of the phenomenon, what appears, not why the experience of the phenomenon is that way (Ihde 1977).

While bracketing their own experience (as much as possible, since understanding the language of the interviewee relies on the interviewer's prior experience of the phenomenon), the interviewer must not judge the value or significance of the description as being better or worse, more or less significant than any other: this is the rule of horizontalization. The interviewer needs to treat each presentation of the phenomenon as equal to any other. In this way, the interviewer presents impartiality (Ihde 1977).

While the phenomenographer may do better by adopting the rules of phenomenological reduction, it places the interviewer in a dilemma. While the interview is underway, the interviewer needs to bracket her own experience of the phenomenon, draw out descriptions, and be impartial about the utterances of the interviewee. Yet, she must also interpret (guess) on-the-fly (Sjöström & Dahlgren 2002) the best, or better, path for the interview so that the phenomenon of interest remains the focus of the interview.

In an interview, "language provides the medium in which we communicate and influences the manner in which we construct experience and give meaning to it" (Polkinghorne 1989, p. 28). The interviewer wants the interviewees to "call to mind" the linguistic representation of their experiences of the phenomenon of interest and then to express their linguistic representations so that the researcher has data. The interviewees may reflect on their experiences of the phenomenon before, during, or after an interview. The phenomenographic interviewer has only the opportunity during an interview to capture that meaning of the interviewees' experiences. The hermeneutic rules aid the interviewer to interpret the interviewee's intended meaning.

The most common style of interview for phenomenographic studies is semi-structured (Cope 2000). A semi-structured interview has a schedule of questions that the interviewer asks every interviewee. The interviewer is free to explore the responses provided by the interviewee to the scheduled questions. When a phenomenographic study is concerned with the ways of experiencing a phenomenon in the world in general (see Hasselgren 1997), having a schedule of questions is a risk. The preset questions may bias or confound the study by suggesting a desired response from the interviewee, what the researcher is looking for, or how the researcher might look at the data (Hasselgren 1997).

An unstructured or non-scheduled interview is an alternative to a semi-structured interview. Unstructured interviews have been used in phenomenographic studies (e.g., McCosker, Barnard & Gerber 2004; Svensson & Theman 1983) and are accepted for information systems research (Butler 1988). An unstructured interview provides the opportunity for the interviewees to reflect and volunteer their experience (Morse 2001). The unstructured interview allows the interviewer to explore the relation between the person and the phenomenon in depth (Myers & Newman 2007). The interviewer maintains the focus on the phenomenon of interest and draws out the variation in the interviewee's experience by asking questions and probing.

As well as the interviewer applying epoché, description, and horizontalization, yet still interpreting on-the-fly, there are other potential problems. Myers and Newman (2007) describe some problems for the IS researcher using qualitative interviews that are applicable to research interviews in general, including phenomenographic interviews, such as:

- the artificiality of the interview
- the interviewer needs to build trust
- gathering necessary and sufficient data given the length of interview
- Hawthorne effect (French 1953)
- ambiguity of language.

Other problems for the phenomenographic interviewer can be:

- the interviewee's motivation for participating (Sjöström & Dahlgren 2002)
- an interviewee raising what may be judged as something other than the phenomenon of interest from the interviewer's point of view, but not necessarily from the interviewee's (Marton 1996)
- the change in the researcher's way of experiencing the phenomenon while interviews are being collected (Kvale 1996)
- the change in interviewing skills of the interviewer while conducting the interviews (Kvale 1996)

- the exploration of the most complex experience in the same amount of time it takes to explore the least complex experience.

4.3 Transcribing Interviews

Interviews are short-lived speech events (Mishler 1986; Ricoeur 1979). The interview is an "instance of discourse" (Ricoeur 1979, p. 74) captured by recording, note taking, and remembering. The audience during an interview is the interviewer (Myers & Newman 2007).

The transition from an interview to a transcript changes the audience of the discourse. The transcript, as written discourse, fixes what was said in the interview (Kvale 1996), and widens the audience. The researcher interprets, describes, and reduces the transcript text to show the wider audience what the researcher believes is important in the expressed experience.

A transcript is a decontextualised, hybrid, artificial abstraction of an interview (Kvale 1996). A transcript is a text in which the verbal meaning that an interviewee intended is hopefully accessible to the interpreter of the text (Hirsch 1967, p.18). A risk in transcribing is the "dissociation of the verbal meaning of the text and the mental intention" (Ricoeur 1979, p. 78) of the interviewee. An interview needs to be reliably transcribed to suit the research for which it was intended (Kvale 1996).

For phenomenographic analysis and interpretation, a useful transcript is a verbatim transformation of the interview, including nuances, pauses, repetitions, false starts, and colloquialisms. For presentation in results, extracts from transcripts should capture the meaning, as interpreted, and be easy to read, only including pauses, repetitions, false starts, and colloquialisms where it is believed the meaning is affected.

Transcribing, similar to interviewing, is resource dependent (Kvale 1996). Depending on resourcing, either the researcher or a transcriber can do the transcribing. When a transcriber is used, a good practice is for the researcher to check the first one or two interviews to make sure the instructions for transcription to the transcriber are appropriate.

Transcripts are the empirical material for qualitative analysis (Larsson 1987; Sjöström & Dahlgren 2002).

4.4 In Data Analysis the First Move is a Guess

The transcripts are analysed to investigate the variations in the data. Data analysis starts with a guess, albeit an intuitive guess that is sympathetic to the data (Hirsch 1967). As during interviews, ideally, the researcher needs to prepare for data analysis by adopting the rules of phenomenological reduction: bracketing her own experience, looking to describe rather than explain, and seeing all descriptions of the phenomenon in the transcripts as being equally important. She needs to become familiar with the data by reading the transcripts while adopting the rules of phenomenological reduction. The researcher, if also the interviewer, would develop a sense of what is important from doing the interviews and from preparing for data analysis. The researcher needs to take the first step of data analysis by making a judgement of what is important. "The judgement of importance is a guess" (Ricoeur 1979, p. 89), though the guess is not an undisciplined guess (Packer & Addison 1989). After the researcher has prepared for data analysis, at the time at which judgment occurs, the researcher is so familiar with the data that she grasps the meaning of the data, in its parts and as a whole. She must be prepared to step into the abyss, the analysis of page upon page of data, to maintain the focus on what she has judged to be important, and feel that she can abandon that focus if she judges it incorrect.

While an interview can be an hour long and result in some 20 pages of transcript, a crucial question is: can the researcher be guided to what is most important in an interview (Sjöström & Dahlgren 2002). Indicators of importance suggested by Sjöström and Dahlgren (2002) are:

- frequency: how often a word, phrase, or idea is expressed
- position: if the interview has started with the focus on the phenomenon then the ideas that are upfront are usually more important
- pregnancy: explicit emphasis made by the interviewee on what is important.

In addition to the indicators of importance suggested by Sjöström and Dahlgren (2002), the researcher is guided to what is important in the data when she is also the interviewer. When the interviewer/researcher has conducted all the interviews, then she has a sense of the particular knowledge that has reached saturation. That particular knowledge can guide the researcher to what is important during data analysis.

4.5 Analysing and Interpreting the Data

After making the first move, "interpretation commences when [the researcher] begin[s] to test and criticise [her] guesses" (Ricoeur 1979, p. 89). The testing and criticising is the data analysis. The analysis of the interview transcripts is a comparative process. Comparison of interpretations of the data continues until the categories, which describe the variation in the relationship between the group interviewed and the phenomenon of interest, are stable (Marton 1986, p 43).

Phenomenography requires a detailed and systematic analysis of the data to arrive at the results (Marton 1994a). There is close interplay between the interpretivist and descriptivist theoretical perspectives (presented in s. 1.3.3). As mentioned (see s. 1.3.4 and the introduction to this chapter), there is orthodoxy to phenomenography. Furthermore, when phenomenographers describe their research methods and processes, they often refer the reader to phenomenographic works (especially when restricted by publication page limits), which is also evidence of the orthodoxy (Ashworth & Lucas 1998; Bowden 1996; Francis 1996).

Yet, some have questioned the adequacy of the referral of the reader to other works for details of the research method (Ashworth & Lucas 1998; Bowden 1996; Francis 1996). As well as arguing for the validity and reliability of her research method, when a researcher refers her reader to other works, there must be a match between the referenced work's research method and the citing work's research process (Bowden 1996). Davey and Cope's (2009) study (reviewed in s. 3.3.2) is an example where the match between the research methods of referenced works and the citing work's research process is unclear. When describing their "phenomenographic approach" (p. 1286) to data collection and analysis, they refer the reader to the phenomenographic work of Bowden and Green (2005), Marton (1981a), and Marton and Booth (1997). Åkerlind, Bowden, and Green (2005) state that "the stories [in Bowden and Green (2005)]… are not intended to provide authoritative accounts of phenomenographic practice or theory" (p. 74). The works by Marton (1981) and Marton and Booth (1997) discuss "phenomenography's epistemological foundations… and lack detail about how it is carried out in practice" (Ashworth & Lucas 1998, p. 296).

Furthermore, when authors refer their reader to other works for details of the research method they used, the referenced work should be identifiable as phenomenographic. An example to the contrary is Rose et al.'s (2005) study (reviewed in s. 3.3.5). They used "a phenomenographic research design" (p. 185) based on the "analysis procedures" (p. 187) of Bradbeer et al. (2004). Bradbeer et al. (2004) describe their method of data analysis as "derived from phenomenography rather than as pure phenomenography" (p. 20). Bradbeer et al. do not explain this statement, but they do suggest their data may be inadequate for phenomenographic data analysis. Their data analysis involved reading and classifying responses. Classifying responses is not typical of phenomenographic data analysis. Rose et al.'s research process is similar to Bradbeer et al.'s method. Though based on both groups of researchers' descriptions of their research methods and processes, whether either group has done a phenomenographic study is uncertain.

Researchers also described their phenomenographic methods using other, usually more established, qualitative research methods and techniques. For example, Larsson (1987), citing work on grounded theory by Glaser and Strauss, shows that phenomenographic data analysis is similar to and draws from more established qualitative research methods. As well as indicating similarities, he also identifies other aspects of phenomenographic analysis. Phenomenographic analysis, as described by Larsson, is "substantive (Glaser and Strauss, 1979), but it is also decontextualized, in the sense that [ways of experiencing] are described without reference to a specific situation or background" (p. 37). Larsson goes on, describing "the nub of this work… as comparison (Glaser and Strauss, 1979) and empathy" (p. 38). As well as phenomenographic analysis being substantive and decontextualised and that it does require comparison and empathy, what distinguishes phenomenography is that it is the study of *variation* in ways of experiencing.

In a phenomenographic study, the method of analysing and interpreting the data is similar to the constant comparison method described by Glaser and Strauss (1967). The Glaser and Strauss constant comparison method has been used as a supplement to phenomenography (e.g., Boulton-Lewis & Wilss 2007; Crowley 2002) or made integral to the phenomenographic data analysis process (e.g., McKenzie 2003; Samuelowicz 1999). In the next section, I describe a phenomenographic constant comparative method based on the Glaser and Strauss constant comparison method.

My phenomenographic constant comparative method is a method of joint coding and analysis. The purpose of the phenomenographic constant comparative method is to constitute the categories of description systematically by using explicit coding and analytic procedures. (The idea of making systematic use of explicit coding and analytical procedures is from Glaser and Strauss (1967).) The constant comparisons of the data need to cover the breadth of variation experienced by the interviewees of the phenomenon of interest. The size of the segment of data that is compared could be from the smallest meaningful part of the transcript up to almost the full dataset. The researcher compares the accounts of the ways of experiencing the phenomenon in part, and as a whole.

My purpose in presenting my phenomenographic constant comparison method is to detail the development of this study's data analysis method. "When a considerable body of such [detailed accounts] are available it will be possible to *codify* methods of [phenomenographic data] analysis with something of the clarity with which quantitative methods have been articulated [emphasis in original]" (Merton 1968, p. 444). (This is not to say that we should adopt the philosophical, epistemological, or theoretical perspectives of quantitative methods.) The work by Harris (2011) is an example of a codification of phenomenographic methods. My description of a phenomenographic constant comparison method serves another purpose. As far as I have been able to establish, there is not a previous description of a phenomenographic constant comparison method in the literature that is not embedded in the description of a researcher's phenomenographic research process.

4.5.1 My Phenomenographic Constant Comparison Method

The four stages of my phenomenographic constant comparative method (Figure 4.2) based on Glaser and Strauss (1967, pp. 101–15) are: (1) comparing salient constituents of the articulated experience of the phenomenon, (2) relating salient constituents to constitute categories, (3) delimiting the categories, and (4) writing the category descriptions. Whereas Glaser and Strauss were looking to generate theory, the phenomenographer is looking to describe the variation in people's ways of experiencing a phenomenon. This difference of intent is another reason why detailing a phenomenographic constant comparative method is worthwhile.

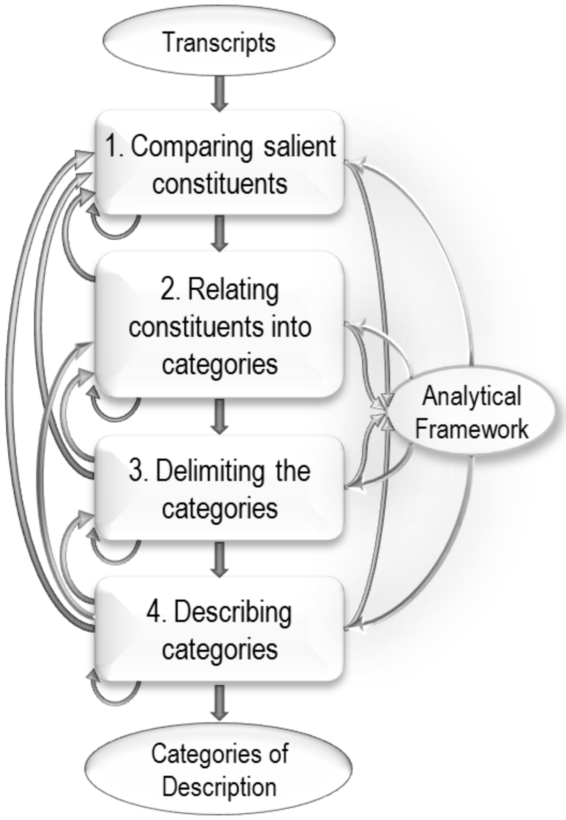


Figure 4.2: My phenomenographic constant comparison method based on Glaser and Strauss (1967).

4.5.1.1 Stage 1: Comparing salient constituents of the articulated experience of the phenomenon

The analysis starts by coding what the researcher considers most important, that is, making an informed guess as the first move (s. 4.4). Coding is the marking of transcripts with information about the initial informed guess, and then later with reasoned judgement (Hirsch 1967). The marking of transcripts can be done on hard copy or, preferably, electronically with qualitative analysis tools, such as NVivo. An advantage of the electronic qualitative analysis tool is the automatic maintenance of the traceability of transcript portions as the data is reorganised. When the researcher is coding part of a transcript as an illustration of a salient constituent, she compares the transcript portion with previous coded illustrations. A transcript portion may be as small as a phrase or as large as a number of interviews. The transcript portion is interrogated by asking questions such as: “What is this about?” (Ryan & Bernard 2006, § Compare and Contrast) and “What is the interviewee aware of when they said this?”. Also, questions are asked about the variation in the transcript portion or between transcript portions such as: “Is there variation in this transcript portion for the salient constituent and if so what is the variation?” and “How is this portion similar to, or different from, previously coded transcript portions for the same salient constituent?” The intent of this fine-grain data analysis is to interpret the meaning of a transcript portion so that it defines and can be described as the relation, or part thereof, between the individual and the phenomenon as experienced by that individual (Svensson & Theman 1983, p. 6).

The constant comparison of transcript portions with other transcript portions, within a salient constituent and between salient constituents, starts to form salient constituents into potential categories of description. (In the grounded theory constant comparison method, the researcher develops one category at a time, whereas in phenomenography the entire set of categories is developed.) The researcher thinks in terms of: (a) what are the range of values present in the data for a salient constituent; (b) how are the salient constituents or particular values of a salient constituent related to other salient constituents or their values; (c) how do the values or constituents form a category; (d) how are the categories related.

The researcher may code a salient constituent as belonging to only one category. She may also suspect she has coded a salient constituent in a way that spans categories. She needs to question whether the spanning of categories is because she needs to do more coding or the spanning of categories indicates an inclusiveness of possible lesser categories within a possibly higher category. If the latter applies, then the spanning of categories suggests a relationship between the categories. When considering such matters, part of the coding process is to make notes about her decisions.

As interpretation continues, the researcher will find that there are salient constituents she has interpreted and labelled and other salient constituents that are abstracted from the language of the transcripts. The emphasis on both of these kinds of salient constituent must be on describing, not explaining the phenomenon. Describing rather than explaining is an important distinction from the Glaser and Strauss constant comparison method.

After coding a salient constituent for a time, possibly by coming to the end of the data set or an interview, “the analyst will find conflicts in the emphasis of his thinking” (Glaser & Strauss 1967, p. 107). At this point, the researcher should pause coding and describe a salient constituent by addressing points (a) to (d) above. The analyst should try to “carry his thinking to its most logical (grounded in the data, not speculative) conclusion” (p. 107) by focusing on the way(s) of experiencing the phenomenon.

A researcher can spend varying amounts of time coding parts of the data set. A part of the data set could be a sentence, paragraph, a set of responses to a question and related probes, or a complete transcript. The time spent on coding parts of the data set depends on: the relevance of the material to the phenomenon of interest, the degree of familiarity the researcher has with the data, the emergence of new salient constituents, the stage of constituting the categories, and “of course the mood of the analyst, since this method takes his personal sensitivity into consideration. These factors are in a continual process of change” (Glaser & Strauss 1967, p. 107).

Discussing the coding and interpretation of the data with others, from the early days of coding to the final result, is an opportunity for the researcher to work through her ideas and knowledge of the data before returning to the data for more coding and comparison (Glaser & Strauss 1967, p. 108).

4.5.1.2 Stage 2: Relating salient constituents to constitute categories

Data comparison starts small with the comparison of salient constituents and their values independent of categories. As coding continues, comparison expands to include the comparison of salient constituents within and between categories. Each comparison of the data accumulates as the knowledge that a researcher has about the data, the salient constituents, and categories. As data analysis progresses, the researcher can more readily call this knowledge to mind and thus, is better able to relate a salient constituent to a category.

The researcher relates salient constituents to other salient constituents as the analysis and interpretation progresses. The researcher’s constant comparisons are the means by which she must make some logical sense of the relatedness of each constituent to other constituents: deciding what belongs together and what does not. Thus, the researcher constitutes the categories from different constituents and their values.

Emergence of an analytical framework also occurs during data analysis. The analytical framework guides the interpretation of the data by providing a consistent frame of reference for comparisons. The researcher refers to the analytical framework when making logical sense of each comparison and constituting and describing categories. An analytical framework develops with iterations of ongoing analysis and interpretation of the data. Analytical frameworks are discussed further in Section 4.5.2.

4.5.1.3 Stage 3: Delimiting the categories

Delimiting occurs at the level of category and salient constituent. The categories stabilise, in the sense that major modifications become fewer and fewer as the researcher sorts the salient constituents into categories (Marton 1986). Later, modifications mainly clarify the logic of the relationships of the constituents within categories and between categories. The researcher removes non-relevant constituents and categories. She outlines the details of the relationships. She refines the constituents in categories until only the salient constituents remain. She refines the set of categories until only the categories remain that describe the variation of experiences at the collective level.

The researcher's delimiting of categories continues until she achieves the parsimony required of categories of description (Marton & Booth 1997, pp. 125–6). The researcher becomes committed to and confident in the constituted results. Her interpretation becomes more select and focused. She can devote more time to the constant comparison of the refined constituents and categories to the exclusion of non-relevant data.

The researcher may still interpret new constituents, categories, and relationships after many hours of coding. This prompts another round of coding, relating, delimiting, and refinement. The analytical framework helps maintain the focus on the phenomenon of interest and make the dataset manageable.

4.5.1.4 Stage 4: Describing categories

At this stage in the process, the researcher possesses illustrative quotes as coded data, salient constituents related into categories, related categories, the analytical framework, and notes about all of these.

The researcher writes prose, which she intersperses with illustrative quotes, to describe each category. She also describes the relationships between the categories as an outcome space. The nature of these phenomenographic results are discussed in Section 4.6.

The researcher can regard her categories and outcome space as definitive when she is convinced that she has described the categories in a useful way, her categories form an outcome space, and the outcome space is a reasonable representation of the variation in ways of experiencing the phenomenon. She can return to the data as needed and execute the four stages of phenomenographic constant comparison until she is confident in her results.

Data analysis is not a neat and consecutive execution of the four stages of the phenomenographic constant comparison method. The arrows in Figure 4.2 show the iteration and interdependency of the four stages. The mutual relationship between the stages of data analysis are difficult to describe (Sjöström & Dahlgren 2002). The difficulty of describing the mutual relationship is not unlike the difficulty of describing the point of separation of BIS analysis from design.

The hermeneutic rules, described in Section 4.2, are as applicable to data interpretation as they are to interviewing. The researcher needs to be aware that interpretation is a judgement of what is there in the data. Interpretation, and not inference, is desired when constituting categories. Interpretation comes from what is in the interviews, rather than inference, which is putting in something that is not there. *Interpretation describes* what is there in the interview, where as *inference explains* the interviewer's thinking about the meaning of the interview (Pollio & Humphreys 1996). For example, when Rose et al. (2005), reviewed in Section 3.3.5, included FD/FI cognitive styles and SOLO taxonomy classifications as part of the description in their categories, they were making inferences about the written responses they analysed. According to Rose et al., the written responses did not mention FD/FI cognitive styles and the SOLO taxonomy. In contrast, when Isomäki (2002), reviewed in Section 3.3.1, constituted 18 qualitatively different conceptions of the human being as three categories of description, she was interpreting her data.

4.5.2 Analytical Frameworks

Once a phenomenographer has become familiar with her data, coded data into salient constituents, and constituted some potential categories (i.e., stages one and two of the phenomenographic constant comparison method described above), she begins to work within an analytical framework that she develops in relation to the data (as shown to the right in Figure 4.2). The analytical framework helps the researcher maintain her focus on what she is analysing, interpreting, and describing. The function of the analytical framework is to guide consistent data analysis. Depending on when the researcher first creates her analytical framework, the framework can guide data analysis from the initial guess and interpretations, to the description of the full depth of the meaning and structure of the categories, all the while being grounded in the data.

In keeping with the hermeneutic rules, the analytical framework should not be presupposed; it should develop during the data analysis. The analytical framework is: grounded in the data, used when analysing transcripts and constituting categories of description, and modified as data analysis progresses. Figure 4.2 shows each stage of the phenomenographic constant comparison method contributing to the analytical framework. The researcher may first begin to develop the analytical framework after constant comparison is underway. For instance, the researcher may begin developing the analytical framework during stage two in the first iteration of the phenomenographic constant comparison method. The researcher then returns to stage one to apply the analytical framework and develops it further.

A researcher should not presuppose an analytical framework, as that would break the hermeneutic rules. The analytical framework should be developed from the data (Bruce 2003). Parallels in a study of a particular phenomenon with previous phenomenographic studies of the same or other phenomenon can lead to adopting an established analytical framework; this should not happen before the researcher is familiar with and coded some data. For example, Reiter et al. (2010), reviewed in Section 3.3.3, present their initial data analysis as a process to "identify and describe the conceptions which evolve from data in regards to their overall meaning" (p. 724). Looking for "overall meaning" is their analytical framework for initial data analysis. They go on to state "[in the future] the structural and referential aspects of each conception will be further detailed" (p. 724). Their mention of a structural/referential analytical framework may be interpreted as an intention to elaborate their overall–meaning–analytical–framework based on what they had found in the data.

4.5.2.1 The Analytical Frameworks of Marton and Booth

Many phenomenographers adopt the analytical framework or conceptual apparatus of Marton and Booth (1997, p. 91). Marton and Booth's conceptual apparatus (Figure 4.3) is "used to characterise qualitatively different ways of experiencing particular [learning] phenomena" (p. 92). They claim that every experience of learning entails every part of the experience of learning shown in Figure 4.3. They go on to state that not all, and probably none, of the data collected to investigate the relationship between learners and learning will contain all of the parts of the experience of learning (p. 92).

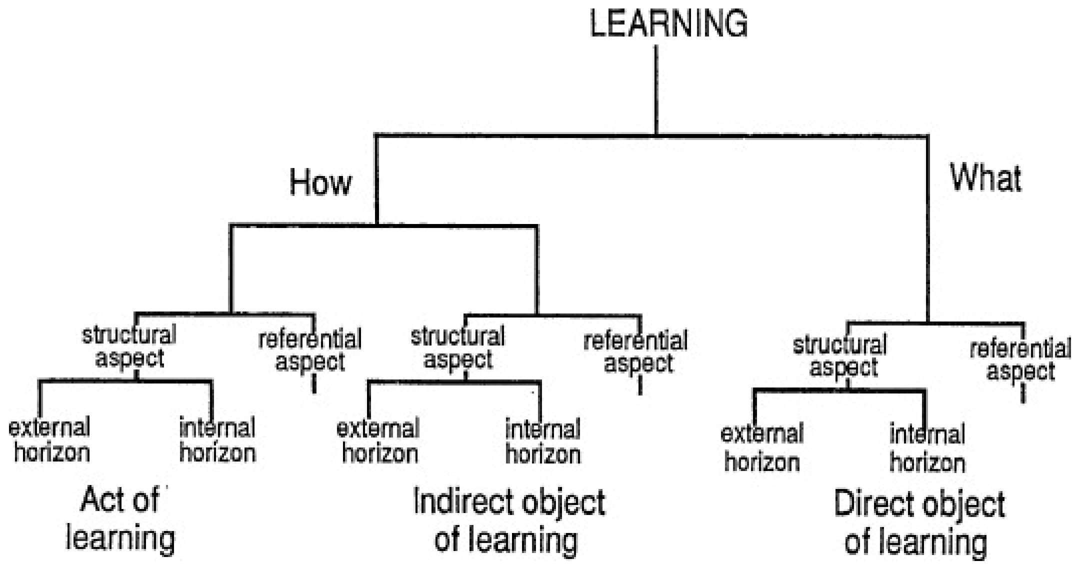


Figure 4.3: The conceptual apparatus of ways of experiencing learning (Reproduced from Marton & Booth 1997, p. 91)

Marton and Booth (1997) developed their conceptual apparatus or analytical framework of learning (Figure 4.3) from their characterisations of the basic structure of learning, the "elaborated" (p. 84) structure of learning, the basic unit of a way of experiencing a phenomenon, and the structure of awareness. The basic structure of learning (Figure 4.4) comes about from Marton and Booth's preference to describe "learning as coming to experience the world in one way or another" (p. 33). The how aspect of learning "involves a way of going about learning" (p. 33). The what aspect of learning is "an object of learning" (p. 33) or " the content of learning" (p. 47).

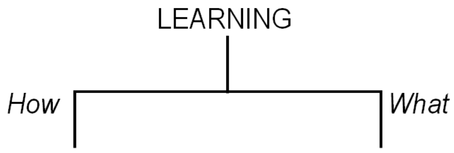


Figure 4.4: The basic structure of learning (Reproduced from Marton & Booth 1997, p. 84)

The elaborated structure of learning (Figure 4.5) is an elaboration of the basic structure of learning (Figure 4.4). The what and how aspects in the elaborated structure retain the same meanings they had in the basic structure of learning. In the elaborated structure of learning, the what aspect is further defined as the direct object of learning. The direct object of learning is the "specific content of learning" (p. 52), for example, a piece of text, deer anatomy, or a mathematical principle. The how aspect is further divided into the act of learning and the indirect object of learning. "The act of learning… can be characterised as having to do with the intentions of the experience of learning.… The act aspect… [is] something one does" (pp. 43–4). The indirect object of learning, also a what aspect of learning (p. 47 & p. 52), is "the kind of ability or capability that learning yields, whether a capability to do, to know, or to understand a certain thing" (p. 52).

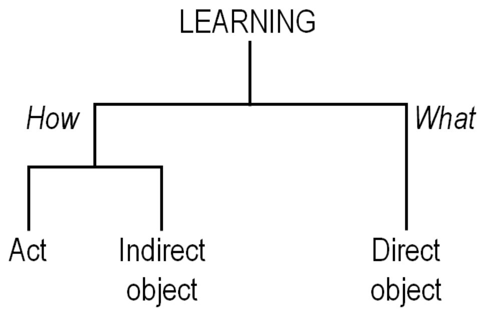


Figure 4.5: The elaborated structure of learning (Reproduced from Marton & Booth 1997, p. 85).

Marton and Booth's basic unit of a way of experiencing a phenomenon (Figure 4.6) comprises "a structural aspect and a referential (or meaning) aspect" (p. 87). The structural aspect of a way of experiencing is the parts that make up the structure, the way the structural parts relate to each other, and the way the structural parts relate to the whole way of experiencing the phenomenon. The referential aspect is the meaning of the way of experiencing the phenomenon. At this point of Marton and Booth's argument, they draw on phenomenology for terminology to expand the structural aspect (p. 87). The structural aspect comprises internal and external horizons. The internal horizon comprises the phenomenon itself, its parts, the way the parts relate to each other, the way the parts relate to the whole, and "the contours of the phenomenon" (p. 87). The external horizon comprises "that which surrounds the phenomenon experienced, including its contours" (p. 87). It seems that Marton and Booth are stating that the contours of the phenomenon are the boundary between the internal and external horizon, and also part of the internal horizon and part of the external horizon.

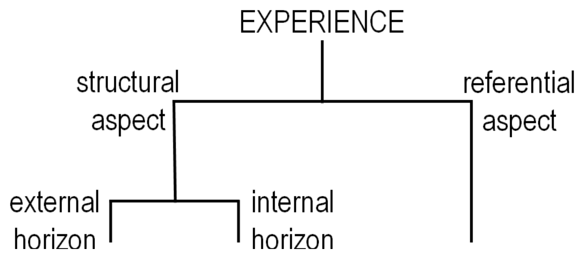


Figure 4.6: The basic unit of a way of experiencing a phenomenon (Marton & Booth 1997, p. 88, Figure 5.3).

Marton and Booth (1997) drew together their characterisation of learning (Figure 4.4 & Figure 4.5) and the depiction of the basic unit of experience (Figure 4.6) to describe the experience of learning as the conceptual apparatus (p. 91), as shown in Figure 4.3. However, they regarded the basic unit of a way of experiencing a phenomenon as incomplete; they had not accounted for "experiences… always [being] embedded in a context" (p. 96). Drawing from Gurwitsch (1964/2010) they described a structure of awareness for learning. Their structure of awareness for learning comprises a theme, thematic field, and margin (Marton & Booth 1997, pp. 98–9). A theme is "what [a learner] is thematically aware [of] and concentrates on" (p. 99). A thematic field is a "constituent field" (p. 99) related to the theme according to relevance. The margin is "what is ignored in [the] learning effort" (p. 99). They regard the theme as the internal horizon and the thematic field and margin as the external horizon. A "horizon" is the border or limit that sets the shape of the theme or thematic field (Ihde 1977). The horizons of an individual's experience are not distinct (Gurwitsch 1964/2010).

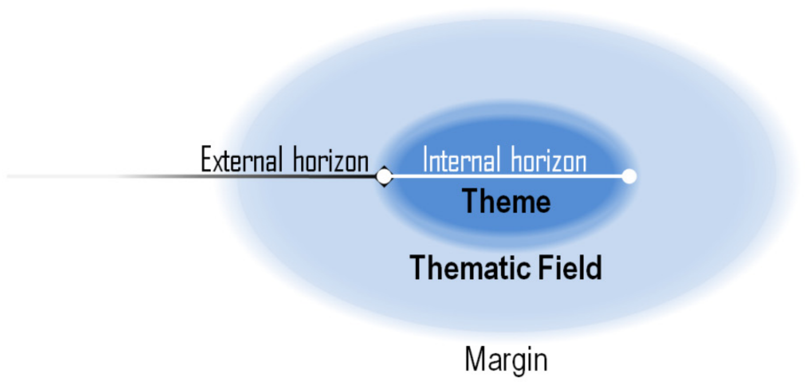


Figure 4.7: The structure of awareness

Few phenomenographers have chosen to use the entire Marton and Booth conceptual apparatus (Figure 4.3) as their analytical framework. Instead, many phenomenographers choose from the basic structure of learning (Figure 4.4), the elaborated structure of learning (Figure 4.5), the basic unit of a way of experiencing a phenomenon (Figure 4.6), and the structure of awareness (Figure 4.7). They may use one of these smaller frameworks or a combination as their analytical framework.

4.6 The Nature of Phenomenographic Results

A phenomenographic description is the result of a phenomenographic study. The phenomenographic description takes the form of a set of categories of description and an outcome space of the relationships between categories. A category of description is "built up through the systematic presentation of representative extracts from interview transcripts" (Marton, Hounsell & Entwistle 1984, p. xi). The researcher writes prose to describe a quote, often using some of the language of the interview transcripts (i.e., representative extract). The prose and quotes of each category describes one way of experiencing a phenomenon. A category should tell us something clear and distinct about that one way of experiencing the phenomenon (Marton & Booth 1997, pp. 125–6).

The set of categories of description are representative of the collective. The collective in the smallest sense is the data, such as the set of interview transcripts. Interviewees are drawn from the people who have experienced the phenomenon; in studies such as this, the interviewees are a cross section of the profession who have experienced the phenomenon. In a larger sense, the collective is the profession. However, phenomenographers need to be cautious about generalising their results to the larger sense of the collective.

The set of categories of description "denote[s] a series of increasingly complex subsets" (Marton & Booth 1997, p. 126) of the ways of experiencing the phenomenon. The logical relationship between categories denotes the series. The relationship is frequently hierarchical and inclusive, with each higher category including aspects of lower categories (e.g., Boustedt 2010; Cope 2000; Isomäki 2002, reviewed in s. 3.3). The relationship can also be hierarchical (as before) but exclusive (e.g., Davey & Cope 2009, reviewed in s. 3.3.2). When studying how professionals experience a phenomenon, a reasonable assumption is that a particular way of experiencing a phenomenon is preferred or more desirable than another way of experiencing that phenomenon. The professional aspires to the more desirable way of experiencing the phenomenon (e.g., to become a stronger-analyst/designer, described in ss. 2.3.1 to 2.3.6). Thus, a criterion of quality of a set of categories of description is the identification of a "structure of increasing complexity [and sophistication],… according to which the quality of each one can be weighed against that of the others" (Marton & Booth 1997, p. 126).

The outcome space contains categories of description, displays the logical structure between the categories, and (depending on the level of abstraction from the set of categories) within each category, its components (Booth 1992; Marton 1984; Svensson 1994). The outcome space is not a representation of the total way of experiencing a phenomenon. The outcome space is a representation of the *variation* in the ways of experiencing a phenomenon for a particular group. The outcome space at its smallest is one researcher's interpretation of one set of data, at one point in time. An outcome space is formed by comparing and judging the complexity, sophistication, and quality of one category to another (Marton 1986).

Each category, the set of categories, and the outcome space "should be parsimonious" (Marton & Booth 1997, p. 125). A category should describe that which distinguishes it from other categories (pp. 125–6). The set of categories "should be explicated [to as few categories] as is feasible and reasonable for capturing the critical variation in the data" (p. 125). The outcome space should be thoughtful, on the part of the researcher, and considerate to the data.

4.7 Validity and Reliability

> *Validation is an argumentative discipline… it is a logic of uncertainty and of qualitative probability… an interpretation must not only be probable, but more probable than another… [there] is a limited field of possible constructions… it is always possible to argue for or against an interpretation, to confront interpretations, to arbitrate between them, and to seek for an agreement, even if this agreement remains beyond our reach.* (Ricoeur 1979, pp. 90–1)

The lack of clarity in phenomenographers' research reports regarding their perspectives of the characteristics that define phenomenography and their consequent research process has led to criticism of phenomenographic research (Bowden 1994, 1996). With the above quote from Ricoeur and that criticism in mind, I established an audit trail for this study by describing the research method (this chapter) and research process (following chapters) that I used. The audit trail serves several purposes:

- to engender *confidence* in the reader and myself in my approach to the study and the results that I report (Sandberg 2005)
- to ensure *congruence* between the method, the process, the results, and theoretical basis of the work (Sandberg 2005)
- to demonstrate the *interpretive awareness* that I brought to bear on the study (Sandberg 2005).

Doing a phenomenographic study confronts a fundamental difficulty in accurately describing another person's intended meaning. Hirsch (1967) wrote:

> *I can never know another person's intended meaning with certainty because I cannot get inside his head to compare the meaning he intends with the meaning I understand, and only by such direct comparison could I be certain that his meaning and my own are identical.* (p. 17)

This fundamental difficulty applies equally *to the researcher* trying to know the interviewees' intended meanings *and the reader* trying to know the intended meaning of the researcher. Hirsch (1967) continued:

> *It is a logical mistake to confuse the impossibility of certainty in understanding with the impossibility of understanding. It is a similar, though more subtle, mistake to identify knowledge with certainty. A good many disciplines do not pretend to certainty, and the more sophisticated the methodology [viz. methods] of the discipline, the less likely that its goal will be to find a certainty of knowledge. Since genuine certainty in interpretation is impossible, the aim of the discipline must be to reach a consensus, on the basis of what is known, that correct understanding has probably been achieved.* (p. 17)

In Hirsch's terms, phenomenography is a sophisticated research approach. The reader of phenomenographic studies can understand what the researcher has come to know by the researcher not only presenting results, but also presenting the way the results came about.

A phenomenographic research method requires an explicit description of how the research was conducted to establish the validity and reliability of the results; not with the expectation of making the study replicable as that is not fruitful or necessary (Lung, Aranda, Easterbrook & Wilson 2008). Rather the purpose of the explication, for the reader and the researcher, is to inspire confidence in the research method, process, and results. Francis (1996) claims that by reporting the research method that guides the steps taken in the research process and also reporting the decisions made to reach the final result as explicitly as possible, the reader can judge on what grounds and in what sense the results are satisfactory. A clear process and framework to constitute the categories and the outcome space provides a context by which the reader is able to intuit (Ihde 1977) that the categories and outcome space have a “rightness”; that the results have a “recognisable reality” (Parlett & Hamilton 1972; Sandberg 2005). This intuition or confidence in the results is an indication of their validity (Francis 1996).

For example, I have expressed my lack of confidence in the study by Rose et al. (2005) (see Ch. 3 and s. 4.5). For example, they used 43 brief written responses as their data without defining “brief”. They “derive[d]” (p. 187) student conceptions of IS design by recording initial conceptions after the third reading of the responses, allocating responses to conceptions on the fourth reading, and reducing the number of conceptions and moving some responses on subsequent readings. Marton (1986) described the constituting of categories as “tedious, time-consuming, labour intensive, and interactive… entail[ing] the continual sorting and resorting of data” (p 43). Rose et al. (2005) analysed 43 brief written responses to derive conceptions in “three days” (p. 187). A reason their work does not engender my confidence in their results is because of the brevity of their data analysis and lack of detail about their research process.

While my preference for engendering confidence is an explicit description of how the research was conducted to establish the validity and reliability of the results, an alternative or adjunct is to rely on interjudge reliability. Interjudge reliability is the percentage of agreement between the researcher’s assignment of quotes or transcripts to categories and other people’s assignments (Kassarjian 1977; Scott 1955). One approach is to provide researchers outside the study (outside-researchers) with short descriptions of categories and a greater number of quotes than there are categories. These outside-researchers assign the quotes to the categories of description. The simplest calculation for interjudge reliability is the proportion of total pairwise agreements between the researcher and outside-researchers (Rust & Cooil 1994, p. 2). If, say, the researcher provided 10 quotes and an outside-researcher assigned eight of those quotes to the same categories as the data analyst did, then the interjudge reliability would be 80%. If more than one outside-researcher is involved, the reported figures can be an average of all the researcher and outside-researcher pairs and/or the percentage agreement between each outside-researcher and the researcher (Kassarjian 1977). An acceptable rate of interjudge reliability varies with the number of judges and the number of categories (Rust & Cooil 1994; Scott 1955). For qualitative studies, an acceptable level can be 70% or higher (Rust & Cooil 1994), 80% to 90% (Säljö 1988), or above 85% (Kassarjian 1977).

Some authors consider interjudge reliability is not as sound as or less appropriate than explicit reporting to establish the validity and reliability of a phenomenographic study (Francis 1996; Säljö 1988; Sandberg 1997). The interjudge reliability measure is less appropriate in a number of ways. First, the outside-researchers' assignment process and criteria are not made explicit in the way required of the researcher. Second, the research method and process are not taken into account by those relying on interjudge reliability as a measure of the quality of the research (Cope 2004). Third, interjudge reliability is from qualitative, positivistic research (Sandberg 1997), which is not philosophically consistent with phenomenography. For example, the objectivist epistemology of interjudge reliability (van Rossum & Hamer 2010) contrasts with the experientialist epistemological position I took for this research.

Although the researcher and reader may have confidence in the results, we can never expect the results to be a complete description of a way of experiencing a phenomenon. Phenomenographic results are about the variation, the differences that make one category distinct from another. By that definition, it is not necessary for all of an experience to be reported (Marton & Booth 1997). Another factor that makes the results less than a complete description of the way of experiencing a phenomenon is the fundamental difficulty of analysing another's intended meaning (Hirsch 1967, p. 17), which "can never be complete, there is always something that remains out of reach" (Anderberg 2000, p. 92). A third factor is that the categories are descriptions at a point in time and of a particular group. The categories exist at the group level. Sampling is aimed at collecting data from a group that expresses a reasonable diversity of experiences for the population. When the sample has a reasonable diversity, data collection has captured that diversity, and the researcher describes that diversity, there is congruence between the sample and the results.

There are no rules to follow when making the first move of data analysis and interpretation (Hirsch 1967; Ricoeur 1979) beyond being familiar with the data. The researcher improves her interpretation with each cycle through the data using techniques such as the phenomenographic constant comparison method (s. 4.5.1). The constant comparison method from Glaser and Strauss (1967) "is not designed… to guarantee that two analysts working independently with the same data will achieve the same results; it is designed to allow, with discipline, for some of the vagueness and flexibility" (p. 103). The same applies to the constitution of categories using the phenomenographic constant comparison method. The discipline shown in the explicit description of how the research was conducted and in the congruence between the sample and the results help establish the validity and reliability of the results.

The third purpose of my audit trail is to demonstrate the interpretive awareness that I brought to bear on the study. The alternation between epoché and making a judgement of the data can happen in milliseconds. The researcher's confidence in the research method, process, and results builds over months or years. The quality of the analysis is the researcher's awareness of the ebb of her own thoughts; stopping judgment when it is not justified; letting the thoughts flow when a verifiable path, or a justification for her judgment exists. The researcher develops an interpretive awareness of what she is trying to achieve and how she is achieving it (Sandberg 1997, 2005), helping establish the validity and reliability of the research as she works (Åkerlind 2003; McKenzie 2003).

The "good" researcher, from the beginning of her work to the end is learning; acquiring a breadth and depth of knowledge. An important skill she develops is

> *an ability to reflect on, to understand, to evaluate, and to see the interrelationships among the deep assumptions that underlie [her] work. [She] then need[s] to have the discipline and courage to stare at the underbelly of [her] research—to scrutinize it ruthlessly so [she] can learn more about [her] subject matter, the strengths and limitations of [her] research, and more broadly [herself] as [a researcher] and [her] place within a community of scholars.* (Weber 2003, p. v)

Interpretive awareness (Sandberg 1997, 2005) and reflexivity, which Weber wrote about, are similar. The researcher needs to reflect on or be aware of what she is doing while she is doing it. The quality of her reflection and awareness depends on:

- the breadth and depth of the knowledge she possesses; hopefully this is broadening and deepening as her research progresses
- the discipline with which she conducts her research; reflected in the explicit reporting of the research.

The reader can develop a sense of the interpretive awareness of the researcher from the quality of the research report. For example, Rose et al. (2005) claim their "interpretation [was] bracketed" (p. 187) and that they "manag[ed] researcher subjectivity through bracketing" (p. 187; citing Sandberg 1997). Their presuppositions of IS design, which they call "pre-conceptions" (p. 187), needed to be bracketed, not their interpretation. Sandberg (1997) suggests managing researcher subjectivity through interpretive awareness and a way to do that is using the hermeneutic rules, not just bracketing, as guidelines. Rose et al.'s (2005) choice of language when describing bracketing reduces my confidence in the validity and reliability of their results.

The separation of the research method, which I presented in this chapter, and the research process, which I present in the following chapters, is an additional demonstration of interpretive awareness and reflexivity. While doing the research and drafting this thesis, my reflexion refined my ideas about the research method described above. The research process described in the next two chapters captures what I did: my effort to accommodate the orthodoxy of phenomenography (Ch. 5) and, realising I was not confident in my results, how I addressed my concerns (Ch. 6).

5 Research Process (1): Initial Analysis and Results

The research method described in the previous chapter is one representation of what could be done when doing a phenomenographic study. The research process described below is a representation of what was done while doing this study. It shows the repetitions of the data analysis and interpretation. I do not describe all the returns to the data and re-drafting of the category descriptions. The following shows the development of a researcher acquiring a breadth and depth of knowledge. It reports how I conducted my research study.

I describe the sample, the interviews, the initial data analysis and interpretation process, and the results from that initial process. I review the initial analysis and results, which leads to an evaluation of analytical frameworks and an elaboration of the non-dualist–experientialist–interpretivist/descriptivist research position that I took for this study.

5.1 The Sample

A combination of purposeful sampling techniques was employed to select the people to be interviewed. Sampling commenced by selecting the target group using criterion sampling (Patton 2002, p. 238) The selection criterion was people with BIS analysis/design experience. The criterion was set by the research question:

What is the variation in awareness that analyst/designers have of analysis/design?

Emergent sampling (Patton 2002, p. 240) was used while doing interviews to take advantage of opportunities to interview analyst/designers in New Zealand and an overseas visitor to Sydney. Maximum variation sampling (pp. 234–5) was also used while doing interviews to purposefully select for the widest possible variation of experience. Figure 5.1 shows my perception of the variation in each interviewee's way of experiencing analysis/design in comparison to the other interviews and my own experience of analysis/design (not in relation to the categories of description). I created Figure 5.1 post hoc from my interview notebook in which I kept notes while doing the interviews. I would recommend creating such a graph during data collection as a demonstrable path of maximum variation sampling. After each interview the researcher could estimate the range of variation in an interviewee's way of experiencing the phenomenon using anecdotal comparison (Glaser & Strauss 1967, p. 67) with her own experience. Such a record could avoid the arbitrary stopping of data collection at a multiple of ten and better justify when to stop data collection.

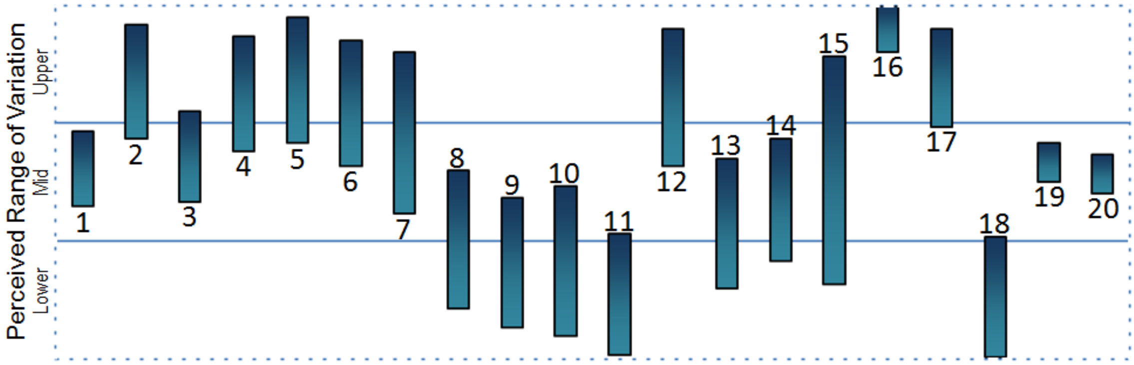


Figure 5.1: The variation in the interviewees' ways of experiencing analysis/design based on anecdotal comparison.

Note: The numbers adjacent to the bars indicate the interviewee number. This graph was created post hoc of all interviews, using my interview notebook and anecdotal comparison.

In Figure 5.1, it can be seen that by anecdotal comparison with my own experience I perceived the first interview to be in the mid-range of ways of experiencing analysis/design. The second to seventh interviews were mid- to upper range. I then purposefully selected for less experienced analyst/designers by soliciting students, on the assumption that students would express experiences that were in the lower to mid-range. By the 15th interview, I had a sense that I had a reasonable data set. However, I had not interviewed any females. I purposefully selected females for the final five interviews. The short bars of interviews 19 and 20 are an indication of confirming cases (Bertaux & Bertaux-Wiame 1981).

On examining Figure 5.1, it appears that I may have reached saturation of knowledge (s. 4.1) at interview 11. This is in accord with Guest et al.'s (2006) finding that as few as 12 interviews are needed for adequate data collection from a homogenous group. As I did not have female interviewees in the first 11 interviews (and that I drew Figure 5.1 post hoc), I continued to interview but encountered few surprises. By interviews 19 and 20, I was seeing recurring patterns and sensed that I had reached saturation of knowledge.

The proportion of five females to fifteen males is in keeping with the 22.4% of women working as professionals in the IT industry in 2001 (Byrne & Staehr 2005) and is therefore an adequate gender ratio for this study. As well as the gender of the interviewees, the background characteristics of the interviewees (Table 5.1): years of experience, country or region of education, country or region of origin, whether they have a computing degree, whether they have a university degree, and whether they have industry experience of analysis/design are sufficiently diverse to be adequate for this study. There is a bias to English-speaking, Western, industrial culture. However, the Western industrial culture strongly influences computing in general, as demonstrated by the incorporating of English computing terms into non-English languages.

Table 5.1: The background characteristics of the interviewees

Background Characteristic	Sample Distribution
Gender	5 female; 15 male
Years of experience	2 with 0 years, at the beginning of their analysis/design career; 7 with 1–5 years; 4 with 5–10 years; 3 with 10–20 years; 3 with 20–30 years; 1 with more than 30 years
Country/region of education	13 Australia; 5 New Zealand; 1 China; 1 Jordan; 1 Scandinavia; 1 Scotland (3 interviewees were educated in more than one country)
Country/region of origin	9 Australia; 5 New Zealand; 1 China; 1 Africa; 1 Vietnam; 1 Jordan; 1 Norway ; 1 Scotland
Have a computing degree	12 have a computing degree; 2 have Technical and Further Education (TAFE, vocational education and training) qualifications; 2 are undertaking a computing degree; 4 do not have a computing degree
Have a university degree	18 have a university degree; 1 is undertaking university degree; 1 does not have a university degree
Have analysis/design industry experience	19 have analysis/design industry experience; 1 does not have analysis/design industry experience
Was selected from industry or as a student	14 were selected from industry; 6 were selected as students (5 postgraduates and 1 undergraduate, all but one of whom had industry experience)

Table 5.1 also shows that I selected 14 interviewees from industry and six, who were students, from university. However, of the 20 interviewees, 19 have analysis/design industry experience. The one interviewee that did not have analysis/design industry experience was completing a computing degree. Based on my anecdotal comparison, the one student without industry experience happened not to have the lowest perceived range of variation in the way of experiencing analysis/design (Figure 5.1). Years of experience is not an indicator of the degree of expertise of a professional (Ericsson 2006; Sonnentag 1998). Interviewees with no industry experience and with either some education in analysis/design, or at the beginning of their career were likely to contribute

useful ranges of variation in experience. Therefore, selecting for interviewees with little industry experience added to the diversity of my sample.

Table 5.2 shows the types of information system (IS) and project characteristics the interviewees described as part of their experience. All interviewees did provide details about some of these characteristics. However, not all of the interviewees provided details for all of these characteristics, nor did I ask them for those details unless it seemed appropriate during the interview. For instance, some did not mention the technical platforms they had worked with, as it appeared that technical issues did not feature as important to their experience.

Table 5.2: The characteristics of the IS and projects described by the interviewees.

IS or project characteristic	Values provided by the interviewees of this study
Project duration	30 to 300-400 person-hours; days, weeks, and months; short, two weeks; 100 hours; one hour to a week; really short, four weeks maximum; 7-8 months; rolling or ongoing; a month to 6 weeks, 3-4 months; six months
Project size	\$20,000; \$2,000,000; \$250,000,000 company revenue; \$5000-\$5,000,000; up to \$600,000; millions of dollars; \$50,000; \$250,000; millions
Team size	Small, which was quantified as 1, 1 or 2, 2 or 3, 3, 3 to 5; large, which was quantified as 17; from 50 to 60 down to 9 to 10, 5 to 8, 2 to 18, 5 to 9
IS destinations	5 had experience where the IS was destined for in-house use; 9 had experience where the IS was destined for external use; 5 had experience with both in-house and external; 1 did not have experience with either
Types of IS	broadcast scheduling, student administration, telecommunications, business operations, banking, product testing, financial systems, credit card authorisation, airlines, career services, surveying, billing, business applications, client-server with thin or thick client for paperless work environment, digital marketing, SMS-based services, distributed applications, enterprise application integration, musical industry, hospital, shipping, veterinary, customs, Social Security, freight, car imports, risk management, credit operations, in-house data integrity, derivatives, accounts, government foreign affairs and immigration, pet food, chocolate, and freight forwarding
Types of methods, tools, and techniques	formal commercial product; formal specified in house; informal; some templates; none
Technical platforms interviewees had worked with	Web-based, Java, XML, JavaScript, Oracle8, CORBA, ITP middleware, Windows, Assembly, JADE, IBM mainframe, COBOL, PL1, CICS, HP calculators, Oracle database, Oracle PL/SQL, Excel spreadsheet, Web services, Perl scripting, VB, SQL Server, C, C++, C#, J2EE, UNIX, DEC, HP, Sun Solaris, IBM AIX, .Net, Access, SQL

The selection of interviewees from industry began with a phone call or email designed to attract analyst/designers with a wide variety of experiences. Each interviewee contributed to the sampling criteria for subsequent interviewees. For instance, for the first interview I selected an analyst/designer of BIS willing to participate. This first interview changed the criterion for the sampling criteria for the next interviewee. The second interviewee had more experience and was further into his career than the first interviewee was. The characteristics of the first two interviewees set the sampling criteria for the third interviewee, who was at an earlier stage of his career than the first two interviewees were, and so on.

Industry organisations approached for candidate interviewees varied from small to medium software houses, multi-national organisations providing hardware and software solutions, and organisations with in-house IS development staff. I chose a variety of sizes and types of organisation to maximise the range of perspectives of analyst/designers. From these industry organisations, 13 interviewees agreed to an interview. Only one request for an interview was refused.

The interviewees from university were six students and one academic. I asked students at a university in Sydney enrolled in the then Faculty of Information Technology to be interviewed. Five postgraduate students and one undergraduate student responded. The academic staff member was tutoring some of the students I had approached.

5.2 The Interviews

I conducted 20 unstructured interviews (s. 4.2). Each interview was face-to-face at a desk, or table, and digitally recorded. As my interviews were unstructured, I did not have any preset questions. I kept the focus on the interviewees' experience of analysis/design. I informed the interviewees before recording began that the purpose of this study was to find the variation in people's understandings of business information system (BIS) analysis and design. In the interviews, I asked the interviewees about their past and present experiences, and expectations in relation to analysis/design.

The average interview length was 67 minutes. The minimum length was 50 minutes and the maximum was 86 minutes. I recorded over 22 hours of interviews.

Using NVivo (qualitative data analysis software), I analysed the questions I asked in the interviews. This analysis led to the following classification of question types:

1. *Background questions* typically started an interview (15 interviews started with a background question, five interviews started with an awareness question). An example of a background question is "Can you tell me a bit about your background?"
2. *Awareness questions* aimed at getting the interviewees to focus on their awareness of analysis/design. I classified awareness questions as those questions

that tried to get the interviewees' to broaden their accounts. An awareness question used to start an interview was along the lines of "What is your understanding of business information systems analysis and design?". Other examples of awareness questions are:

  a. Comparative, for example, "How does ____ compare with what you said earlier?"
  b. Branching, for example, "Are you aware of ____ in another way?"
  c. Reflective, for example, "How would you have done ___ differently?"
  d. Associative, for example, "How are ____ and ____ connected?"
  e. About the role or characteristics of analyst/designers in general or themselves specifically

3. *Future questions* aimed at getting the interviewees to speculate or describe their expectations, for example, "Would you work that way in the future?"
4. *Probes*, which differ from awareness questions, are an attempt to delve deeper into the meaning of a response rather than broadening an interviewee's account. A probe focuses on the meaning and language of a response. In a single interview, I may have asked the same probe several times, and in different ways. A probe echoes the words used by the interviewee.
5. *Confirming questions* asked for confirmation that my understanding of what an interviewee uttered was correct.
6. *Introductory questions* were the one or more questions at the beginning of an interview. I asked introductory questions to gain an idea of the language, particularly the terms, that the interviewee used. I classified the 15 background and five awareness questions, which started interviews, as introductory questions.
7. *Concluding questions* were typically one question, I asked at the end of the interview, asking if the interviewee had anything more to say.
8. *Leading questions* were questions where I recognised during my analysis of questions that I may have led the interviewee to giving a particular answer or where I introduced a topic the interviewee had not mentioned (e.g., "Do you draw use cases?"). This classification is consistent with Richardson (1960). However, when the interviewer is trying to maintain focus on a particular phenomenon, all questions, in some respect, are leading. In addition, it is possible for confirming questions to be leading if I had misunderstood the

interviewee. However, it is not possible to lead interviewees to what they don't know or have not experienced.

Of these eight questions types, questions types 1 to 5 are mutually exclusive. Question types 6 to 8 are additional classifications that co-occur with the first five question types.

I also used affirming noises, such as "mm", "yes", and "good", and sometimes I remained silent to encourage the interviewee to continue talking.

Table 5.3 shows, the proportions of question types 1 to 5 (above) that I used across all interviews. On average, probing questions were 56% of the questions asked, with half of the interviews having between 53% and 60% of this type of question. On average, awareness questions were 19% of the questions of asked, with half of the interviews having between 16% and 22% of this type of question. Some interviews had no future questions because the interviewees provided that information without prompting. The minimum of 0% for confirming questions is of concern, except that this applies only to interview 11. I perceived interviewee 11 to have the least sophisticated experience (see Figure 5.1). During interview 11, I sensed confirming questions were not necessary. Whether these proportions for the types of questions asked are appropriate is unknown, as I am unaware of any phenomenographic literature that discusses this issue. I did find a similar analysis, but only for probing questions in a non-phenomenographic study (Richardson 1960). Richardson found the relative frequency with which interviewers used probes was 67% for experienced interviewers and 59% for student interviewers. I speculate that a ratio of 56% probes : 19% awareness : 25% other questions is satisfactory for an unstructured phenomenographic interview.

Table 5.3: The proportion of the question types 1–5 used across all interviews.

Type of question	Background	Awareness	Future	Probing	Confirming	Total
Average	10%	19%	3%	56%	11%	100%
Minimum	2%	10%	0%	46%	0%	
First quartile	5%	16%	1%	53%	8%	
Median	9%	17%	3%	54%	11%	
Third quartile	14%	22%	4%	60%	14%	
Maximum	24%	31%	8%	72%	24%	

Table 5.4 shows the number of questions for question types 1 to 5 (above) for all the interviews. The average length of interview is 67 minutes and the average number of questions per interview was 69. While approximately one question per minute, at first,

seems excessive, most questions were short. Half of the word count of my utterances in each interview was between 11% and 31%, that is, an interviewee spoke 69% to 89% of the words in half of the interviews. Again, whether the values in Table 5.4 are appropriate is unknown. I did not find a similar analysis for any other phenomenographic study. In his non-phenomenographic study of designers' conceptions of their practice, Stolterman (1991), asked "about 80" (p. 140) questions per 90 minute interview (E Stolterman 2012, pers. comm., 13 March). Thus, Stolterman and I asked questions at approximately the same rate.

Table 5.4: The number of questions for the question types 1–5 for all interviews.

	Number of questions for all interviews
Total number of questions coded	1374
Average	69
Minimum	21
First quartile	51
Median	71
Third quartile	84
Maximum	112

Of the 1,374 questions asked, I classified 40 as leading. I classified leading questions only for awareness, probes, and confirming question types. I classified a maximum of 9% of questions as leading for one interview. This percentage is inconsistent with Richardson's (1960) finding where a minimum use of leading probes was 21%. The difference in interview type, or other factors, may account for this inconsistency. Resolving this inconsistency is out of the scope of this study.

The first question of the first interview was an awareness question that the interviewee hesitated to answer. From that point, whenever possible, I used background questions to start the interview. Asking background questions put the interviewee at ease and allowed me to gauge and match the language of the interviewee. An awareness question started interviews in cases where the interviewees, prompted by the information sheet or consent form, had begun talking about analysis/design before recording commenced.

Once the interviewee provided a response to the first question, probing followed. A probe usually took the form of a question incorporating an interesting word or phrase provided in a previous answer. Probes could cascade through the interview. For instance, having provided a response to the opening question, I probed a word or phrase in the answer, which provided another word or phrase, which I also probed and so on.

When an interview had reached the point that was not eliciting anything new about the interviewee's experience, I introduced topics that were of interest to my study. Other interviewees may have mentioned these topics. For instance, an interviewee mentioned using particular methods, tools, or techniques without mentioning use cases; I sensed it was appropriate to ask if the interviewee was familiar with use cases.

Before interviews started, I prepared by discussing my interview technique with my supervisors and other researchers. I had previous experience of interviewing as an analyst/designer, academic, and student. I have dealt with poor performing students of analysis/design as an academic and I am aware that it is possible for a student of analysis/design not to be aware of the naïvety of his/her experience. My concern was that my judgement would show in my countenance during interviews as I, when teaching, had so often shown it to my students. I followed the recommendation to adopt a neutral stance. All of the interviews were conducted with ease.

Before recording began, I informed the interviewees that the purpose of the study was to find the variation in people's understandings of BIS analysis and design. I made it clear to the interviewees that analysis and design was my label and that they should call it what they wished. When necessary, I checked with the interviewees that what they were describing related to BIS and was not what they did when actually writing a program. It sometimes took several questions to be sure this was the case.

An interviewee must want to divulge their experience and be willing to articulate the truth of their experience in their own way in the time available. I sense that this was the case in all interviews.

Prior to commencing my interviews, I was troubled by a question: If it took one hour to get a complete picture of the least sophisticated experience of analysis/design, how was I to elicit the most sophisticated experience in the same amount of time? As it transpired, this was not a problem. An hour with the least sophisticated experience was spent probing until no new depths or insights arose. The responses were limited and the interview was circular. It was a courtesy to the interviewee with the more sophisticated experience to set the limit of one hour for an interview. I did not think I was going to find interviewees if I informed potential interviewees their interview were to have an indefinite length. As it happened, when I mentioned during an interview that an hour had passed, none of the interviewees stopped the interview. In addition, each response to a question provided insight; a breadth and depth of experience was noticeable. There was little in an interview of a more complex experience that was not relevant in some way.

5.3 The Transcripts

A transcription service transcribed the 20 interviews. My initial instructions were to transcribe the interviews verbatim. After reading the first two interviews, I modified my instructions to eliminate my affirmative noises, which interrupted the transcribed responses. I corrected eight transcripts against the audio recordings. Since I returned to the audio recordings each time to verify an illustration of a constituent, I did not find it necessary to correct the remainder of the transcripts. I prepared and entered the 20 transcripts into the qualitative data analysis tool, NVivo.

The transcripts were the data that underwent analysis in this study. I returned to the audio recordings before inserting a quote into a category of description. I checked the illustrative quote against the recording and made corrections for emotional response, emphasis, punctuation, and accuracy.

I chose a written style more formal than the spoken word for the illustrative quotes used in the results. I aimed for easier reading while maintaining the meaning of what was uttered. The emphasis by intonation, emotional expressions, and pauses are included, In most places I changed colloquialisms such as “gonna” to “going to” for readability. I captured the change of voice when interviewees made utterances as if in a conversation with another person by punctuating with quote marks.

5.4 The Data Analysis and Interpretation

The demands of data analysis are to “keep a lot of ideas active at the same time” (Trigwell 2000, p. 69). The ideas I kept active, with increasing confidence, were:

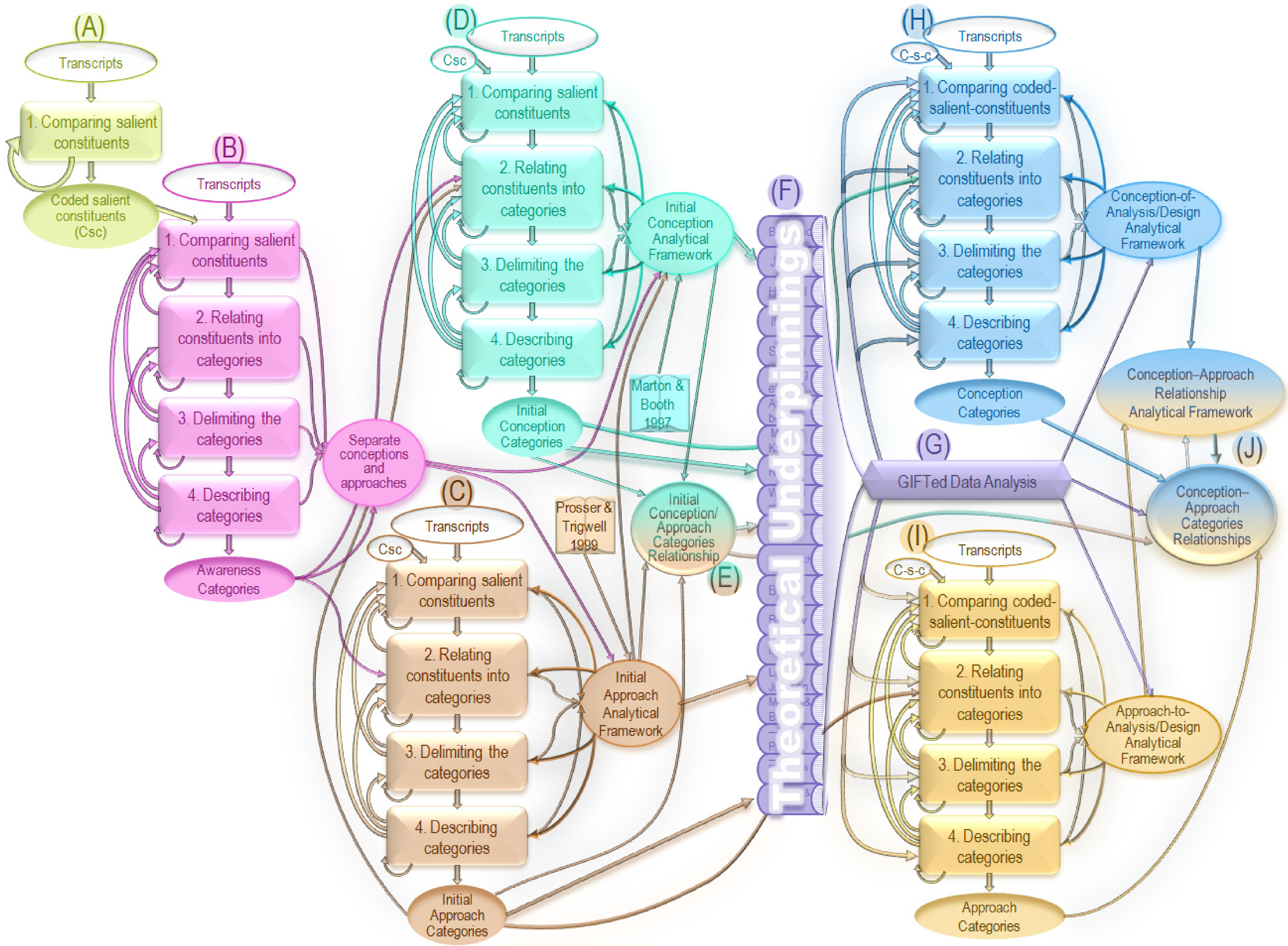
- the content of 20 interview transcripts (Bowden 2005)
- my phenomenographic research method
- my place in the phenomenographic research process
- the analytical framework(s)
- how I was to write up the results
- the theoretical underpinnings of my research.

As well as keeping the above ideas active, I found phenomenographic data analysis and interpretation was the “tedious, time-consuming, labour-intensive, interactive” (Marton 1994a, p. 43), complex, and repetitious. These characteristics can be inferred from the overview of the data analysis and interpretation for this study shown in Figure 5.2 (foldout)[3]. Each part from (A) to (J), in Figure 5.2, represents a period in the data analysis and interpretation process. The initial analysis, parts (A) to (E), is described in this chapter. Each part from (A) to (E) culminated in a presentation of a (initial) result. Parts (F) to (J) are described in Chapters 6 to 9.

Figure 5.2: Overview of the data analysis and interpretation process for this study. (Overleaf)

[3] The time taken for data analysis was approximately six and a half years of part-time study, which includes the final drafting of this thesis.

Overview of the Data Analysis and Interpretation Process for this Study



Throughout the data analysis and interpretation process, I sought the intended meaning (Anderberg 2000) of the interviewee. I used my phenomenographic constant comparison method, described in the previous chapter (s. 4.5.1), during the period represented by parts (A) to (D), (H), and (I) in Figure 5.2. During each of these periods of using my phenomenographic constant comparison method, I sought the most probable intended meaning by comparing my interpretation of a segment of transcript with: the audio recording, the surrounding text within the response, preceding and succeeding responses, the entire interview, and other interviews. I avoided taking quotes out of context. Ensuring the context of a quote was part of my interpretive awareness. For example:

I12 flows into analysis and design, from there into development, to testing, to release.

This excerpt from interview 12 gives the impression the analyst/designer experiences a linear set of phases. However, in the context of the whole interview, the interviewee was summarising when he made the above utterance. The interviewee's experience was dominated by simultaneity of the phases; the term "flows" expresses a quality of the experience, which is in the nuance of this interview. My attention to the nuance of all the interviews aided interpretations, similar to my interpretation of I12's utterance.

5.4.1 Data Analysis and Interpretation Part (A): Initial Interpretation of Salient Constituents

In terms of the overview of the data analysis and interpretation process (Figure 5.2), part (A) of the data analysis and interpretation process, shown in Figure 5.3, encapsulates the first move of data analysis and initial interpretation of salient constituents. Part (A) culminated in a presentation of the initial coded salient constituents.

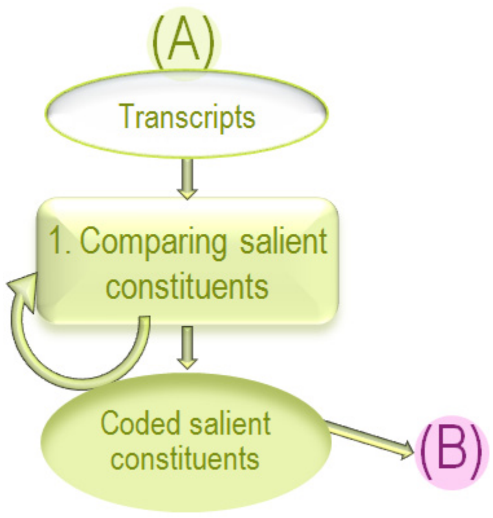


Figure 5.3: Part (A) of the data analysis and interpretation process

Earlier, I stated that data analysis starts with a guess (s. 4.4). However, how to start with a *good* guess is not prescribed (Hirsch 1967; Ricoeur 1979), and so I sought assistance from an experienced phenomenographer. When six interviews had been transcribed, Prof S. Booth provided advice on an initial direction I could take in the analysis of these six transcripts. Her advice was to "look for the salient constituents" by identifying what was interesting and varied in the data (S. Booth 2004, pers. comm., 13–14 September).

During part (A) of the data analysis and interpretation process, my focus was on stage 1 of my phenomenographic constant comparison method. I identified and coded, using NVivo, quotes of interest and relevance to ways of experiencing BIS analysis/design. My initial judgement was whether the interviewees' utterances were about the phenomenon or about something else. I coded what my initial impression was of the interviewees' ways of experiencing analysis/design. I grouped the quotes into salient constituents as I interpreted them from the data. I did not start with the salient constituents before I analysed the data. During the initial coding of salient constituents, interviews 1–6, 10, 14, and 16 were analysed. I chose interview 10, 14, and 16, in addition to interviews 1–6, as I had sensed that this set of interviews had an interesting variation from the lower to upper range of experience (see Figure 5.1). The initial salient constituents identified and coded from these nine interviews were: traits, process, product, interpersonal relationships and communication, theory and practice, levels of abstraction, ethics, and change (Figure 5.4).

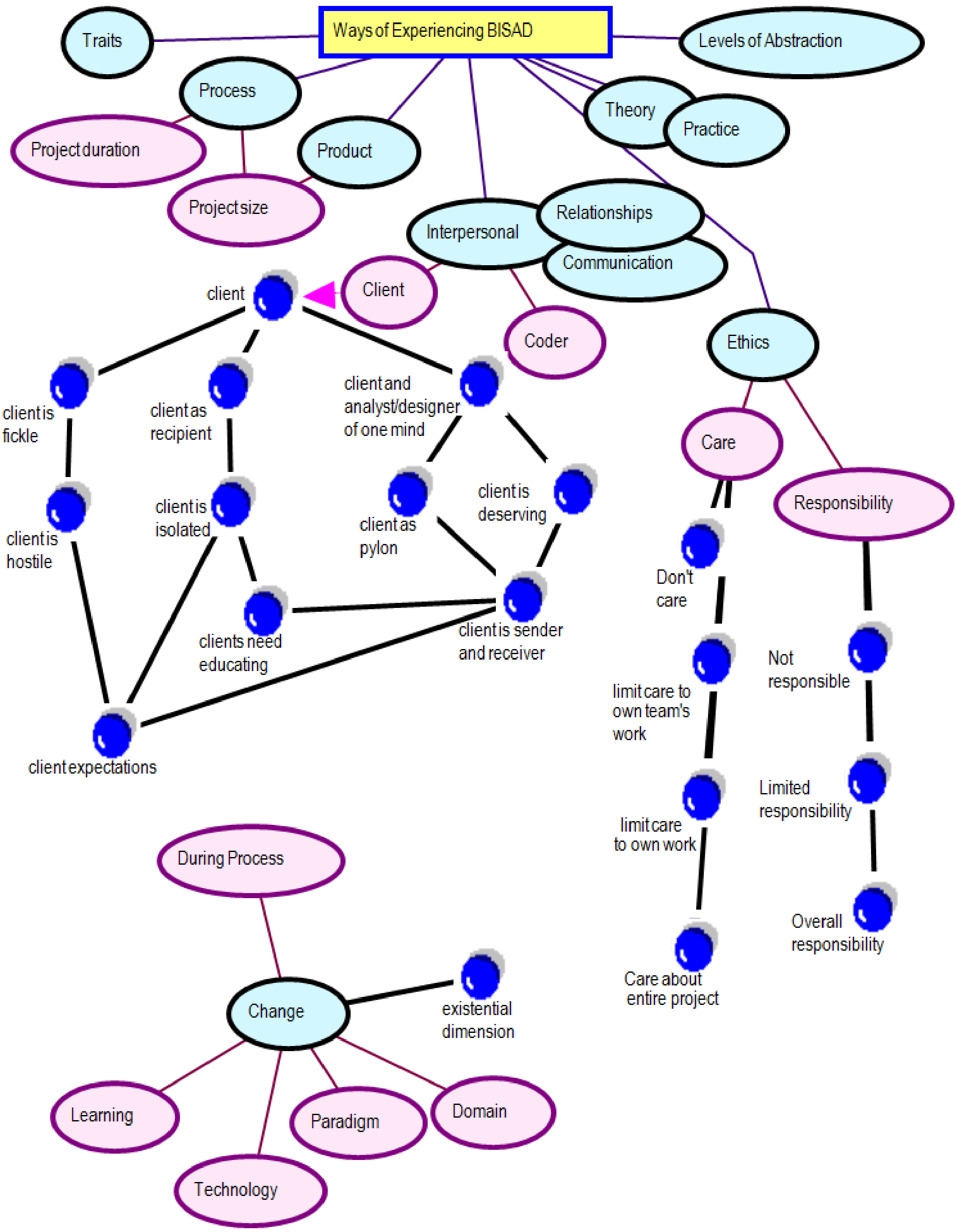


Figure 5.4: The initial salient constituents coded during part (A) of the data analysis and interpretation process.

Note. Presented as "A Phenomenographic Study of the Variation in the Understanding Software Developers have of Business Information System Analysis & Design", 2005, Doctoral Assessment Presentation, slide 18. Shapes and colours indicate the same level in a hierarchy.

During the interviews, I sensed there were recurring patterns (Bertaux & Bertaux-Wiame 1981) of experiences in the interviews (see ss. 4.1 & 5.1). These recurring patterns were also in the transcripts. I coded to the same constituent the portions of the transcripts where the recurring patterns were about the same thing. I annotated the salient constituents and noted my impressions as I coded. I used the annotations to help me judge what the values were of a salient constituent, thus identifying the range of variation. For example, the salient constituent interpersonal–relationships was identified as being between the analyst/designer and the client and the analyst/designer and the coder. As an example of the values of a salient constituent, the client constituent is expanded further. Figure 5.4 shows that within the client constituent there was a range of values:

- The analyst/designer views the client as fickle. When the analyst/designer has this view, the client is also seen as hostile.
- The analyst/designer views the client as the recipient, which leads to the client being isolated.
- The analyst/designer views the relationship with the client as one where they are of one mind. When the analyst/designer and client are of one mind, the client is deserving of communication from the analyst/designer, or is seen as a pylon, supporting half of a communication bridge. The role of the client in the relationship is seen as both a sender and receiver.
- When the analyst/designer viewed the client as isolated or as a sender/receiver, the analyst/designer's view of clients included that they needed educating.
- The analyst/designer related to the client in a particular way depending on the client's expectations.

The set of coded salient constituents went through major changes as I added the remaining 11 interview transcripts to the data analysis. Major changes in the set of constituents also occurred as I understood more about phenomenographic research.

5.4.2 Data Analysis and Interpretation Part (B): The Awareness of Analysis/Design Categories

In terms of the overview of the data analysis and interpretation process (Figure 5.2), part (B) of the data analysis and interpretation process, as shown in Figure 5.5, encapsulates the first full set of iterations of my phenomenographic constant comparison method.

Part (B) culminated in a presentation of the awareness of analysis/design categories of description and outcome space.

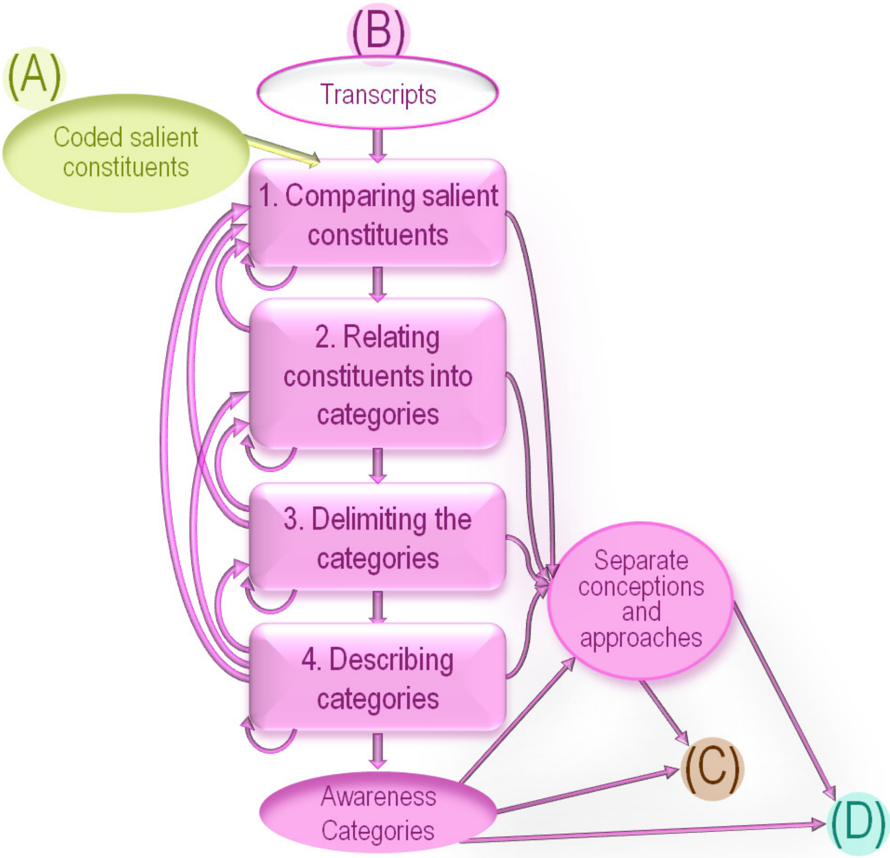


Figure 5.5: Part (B) of the data analysis and interpretation process

I began this study with a single research question: what is the variation in *awareness* analyst/designers have of analysis/design. During part (B), I went through a period of using all stages of the phenomenographic constant comparison method to answer that research question. The coded salient constituents (i.e., the outcome from part (A)) and the transcripts were the input to part (B). Figure 5.6 shows the culmination of part (B): the awareness categories of description and outcome space.

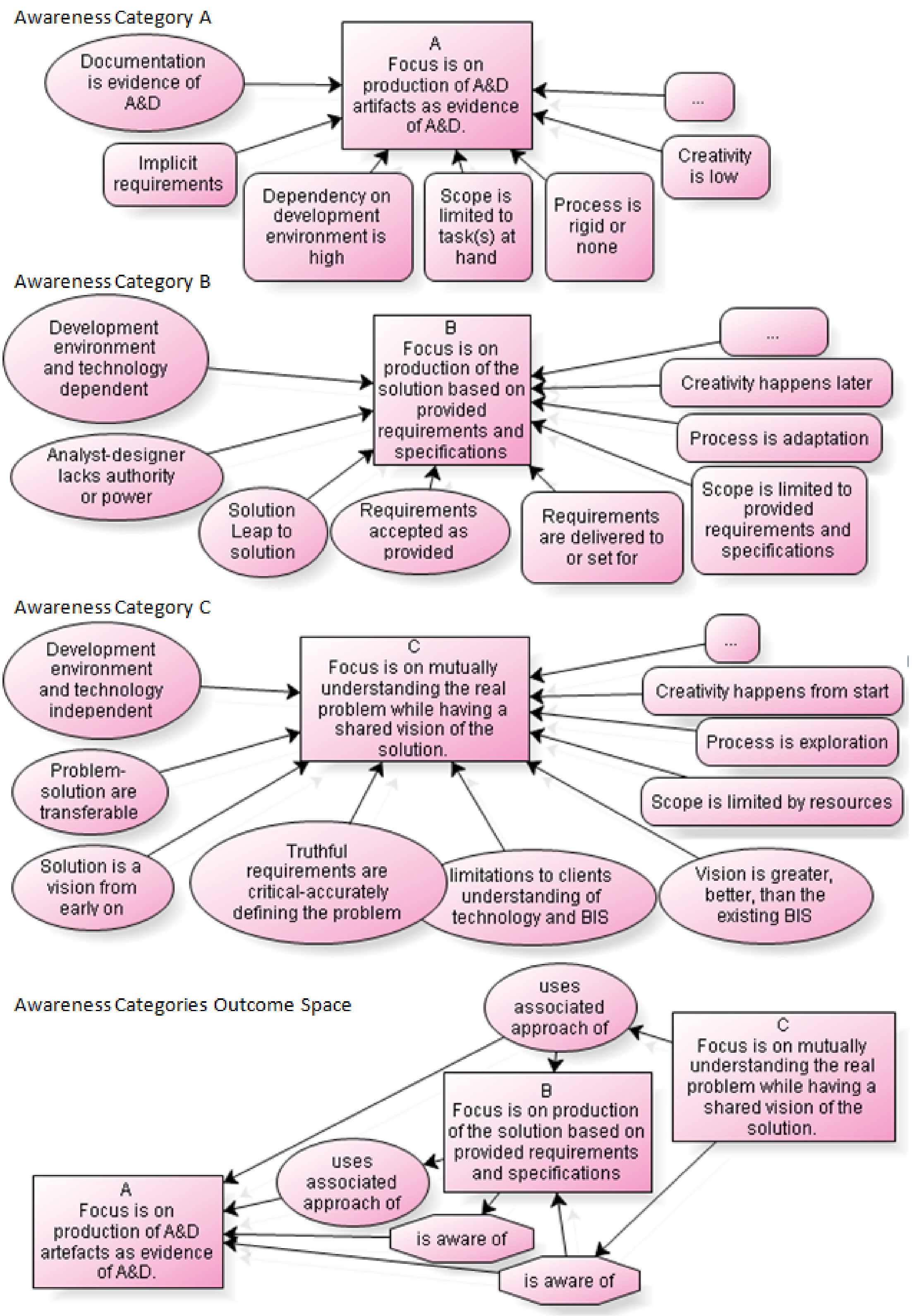


Figure 5.6: The awareness of analysis/design categories of description and outcome space

Note. Presented as "Professionals' Ways of Experiencing Analysis & Design: Ph. D. in Progress", 2007, The First Australasian Workshop on Applications of Phenomenography in Engineering, Computing and Science Education, slides 6, 7, 8, and 9.

Awareness categories of description were constituted using NVivo to relate constituents (the ovals attached to the awareness categories in Figure 5.6) into categories. At this early stage of analysis, the categories needed further comparison of salient constituents as I sensed I had not reached the limits of each category. I had interpreted more constituents (the rounded rectangles in Figure 5.6), from the data, which needed coding in NVivo. In addition, I sensed that there were more constituents than I had interpreted thus far (the rounded rectangles containing only ellipses in Figure 5.6).

Section 4.5 of this thesis describes data analysis and interpretation as a non-linear process. I had not completed constituting the three awareness categories of description before I began relating these three categories to form the awareness categories outcome space. I also began developing analytical frameworks for this study. Through the four stages of the phenomenographic constant comparison method, I struggled with judging which part of the way of experiencing analysis/design the interviewee was focused on. I separated the relationships between the awareness categories in the outcome space into "is aware of" (the octagons in Figure 5.6) and "uses associated approach of" (the ovals in the awareness categories outcome space in Figure 5.6). My interpretation was that the interviewees were expressing *variation in* the ways of *conceiving* analysis/design *and* variation in the *approaches* taken to do analysis/design. My first step in developing analytical frameworks was to separate conceptions and approaches.

In the context of this study:

A conception is what an analyst/designer thinks analysis/design is.

An approach is what an analyst/designer does when doing analysis/design.

The separation of awareness into conceptions and approaches changed the research question for this study from being a single question to being three questions:

1. *What is the variation in analyst/designers' qualitatively different conceptions of analysis/design?*

2. *What is the variation in analyst/designers' qualitatively different approaches to analysis/design?*

3. *How are the qualitatively different conceptions of, and approaches to, analysis/design related?*

5.4.3 Data Analysis and Interpretation Part (C): The Initial Approach Categories

After making the judgement that the data allowed me to distinguish between the conceptions of analysis/design and the approaches to analysis/design, I turned first to analysing the data for the approaches that the interviewees reported they or others used. It is important to note that this study was not an observational study. Therefore, it was what the interviewees *reported* as what they do that is interpreted from the data.

In terms of the overview of the data analysis and interpretation process (Figure 5.2), part (C) of the data analysis and interpretation process, as shown in Figure 5.7, encapsulates the second set of iterations of the phenomenographic constant comparison method. Part (C) saw the first development of an analytical framework and culminated in a presentation of the initial approach categories of description and outcome space.

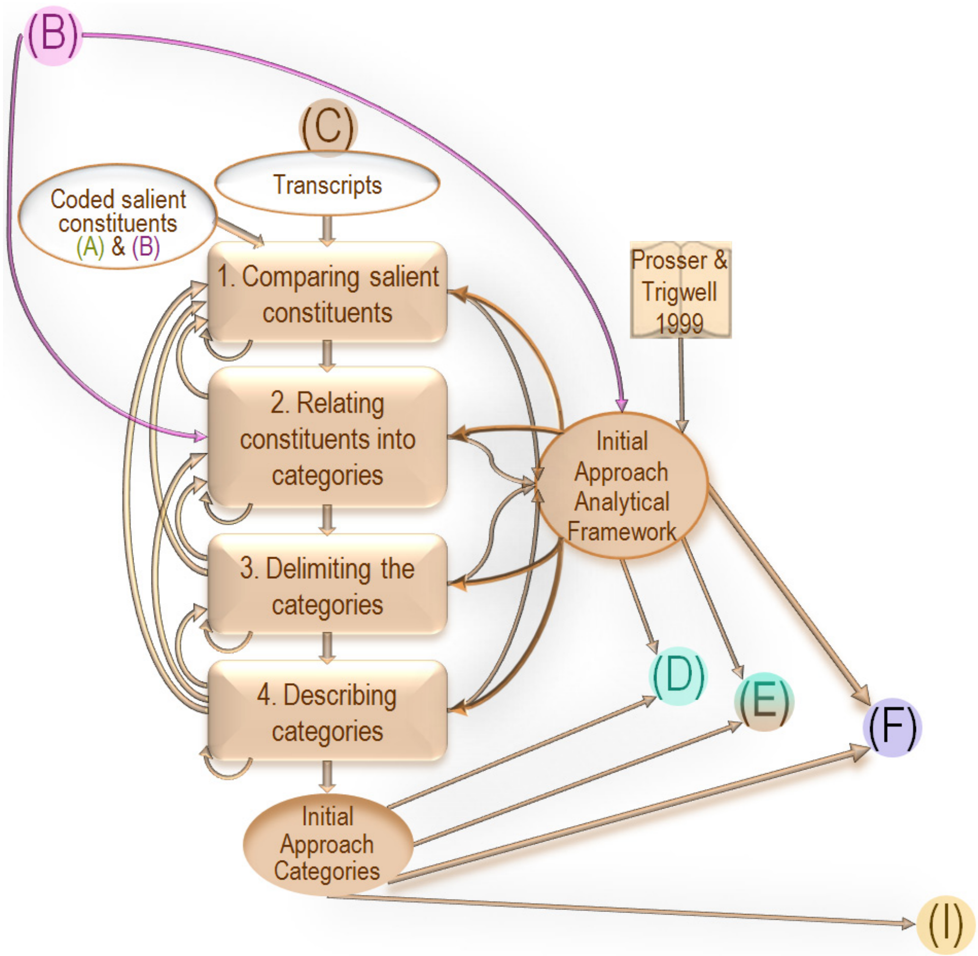


Figure 5.7: Part (C) of the data analysis and interpretation process

To constitute the initial approach categories, I sought inspiration from a recognized phenomenographic study of approaches to learning. A well-known phenomenographic outcome space of approaches to a phenomenon is the deep and surface approaches students take to learning. In taking a deep approach, the intent of the student is to understand what is to be learned and to act accordingly (Entwistle 1997, pp. 215–6). In taking a surface approach, the intent of the student is to "cope with course requirements" (p. 215) and to act accordingly, such as memorising facts for later regurgitation, (pp. 215–6). Deep and surface approaches are described as having intentions and actions or strategies (Entwistle 1997; Prosser & Trigwell 1999).

Prosser and Trigwell's (1999) strategies and intentions for learning approaches were elements that I perceived could be adapted for the initial approaches to analysis/design analytical framework. To develop this initial framework, shown in Figure 5.8, I blended:

1) my interpretations of the data thus far, which included the coded salient constituents from parts (A) and (B) and the awareness categories from part (B)
2) my way of experiencing phenomenography at that point of the study
3) the description of strategy and intention from Prosser and Trigwell (1999).

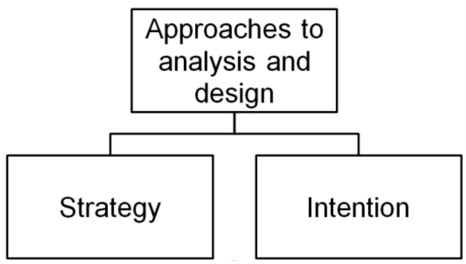


Figure 5.8: The analytical framework for the initial approaches to analysis/design categories

I defined strategy as the ways the interviewees reported doing analysis/design. I defined intention as what the interviewees reported happening as they used a strategy. I incorporated these definitions into my data analysis and interpretation process. I described the strategy and intention for each initial approach category. I used a category label template of "focus is on an *x* strategy with the intention to *y*". Within each category, I chose “critical aspects”, rather than salient constituents, to identify the components that differentiated each approach category.

At this point of the study, though I could not decide if there was a semantic difference between critical aspects and salient constituents, I did think it prudent to distinguish what I called the elements in the initial approach categories from what I called the elements in the initial conception categories. I expected this distinction between the elements of the initial approach and conception categories might be useful when relating the approach categories with the conception categories. However, after I had re-examined the theoretical underpinnings for this study and devised GIFTed data analysis (i.e., completed data analysis and interpretation process parts (F) & (G)), it became unnecessary to distinguish between what I called the elements of the approach categories from what I called the elements of the conception categories. (Constituent is the term I employ in the final results. See Ch. 6 to 9)

At this stage of my research, I published a paper which described these initial results (Box 2009). Table 5.5 shows the four initial approaches to analysis/design categories of description, adapted from Box (2009). In retrospect, the initial approach categories are acceptable phenomenographic results. Upon reflection, my criticism would be that I reported results applying anecdotal comparisons (Glaser & Strauss 1967, p. 67) as well as my phenomenographic constant comparison method. The anecdotal comparison shows up in the description of what the category is not, rather than the foci of the interviewees’ experiences. For example, in Category 1, I describe the approach as working “without a method” and “that there is not a process” (Box 2009, p. 97).

Table 5.5: The initial approach categories of description (Adapted from Box 2009)

Initial Approach Categories of Description	
Category 1:	Focus is on an ad hoc strategy with the intention to deliver the project as quickly as possible
Category 2:	Focus is on a strategy of producing atomistic analysis and design artefacts with the intention of proving analysis/design has taken place
Category 3:	Focus is on a strategy of adhering to a method with the intention of the producing a better solution
Category 4:	Focus is on a strategy of adapting and scaling a method with the intent to define the problem accurately while sharing a vision of the project

I made anecdotal comparisons when I compared what is in the data with my own experience of the phenomenon. Anecdotal comparison is useful at the beginning of data analysis, as it sensitises the researcher to what might be relevant (Glaser & Strauss 1967, p. 67). However, anecdotal comparison is in conflict with the hermeneutic rules (see s. 4.2). The quality of the initial approach categories would have improved had I avoided including the results of anecdotal comparison in the descriptions of categories (see Box 2009).

Table 5.6 shows the outcome space of the relational structure between the initial approach categories of description, adapted from Box (2009). The blank cells in the outcome space indicate an absence of that aspect from the category. Reflecting on this outcome space, I could see that I had not yet found the boundaries of the categories in a way that instilled confidence. For instance, I think there is incongruence between the strategy of the Category 3: adhering to a method, and the communication–with–the–client/company aspect: delivering the solution creatively.

Table 5.6: The outcome space for the initial approach categories (Adapted from Box 2009)

	Aspects				
Approach Categories of Description Strategy (S) & Intention (I)	**Requirements**	**Documentation**	**Method & process**	**Solution**	**Communication with the client/company**
Category 1 S=Ad hoc I=Deliver project as quickly as possible	To be met, is to deliver solution	Not produced, or not used		Deliver as quickly as possible	
Category 2 S=Produce analysis/design artefacts I=Proving analysis/design has taken place	May be shown in the documentation	Evidence of analysis and design	Used to source document templates		
Category 3 S=Adhering to a method I=Producing a better solution	Accepted as provided	Part of the method	Is critical to intention	Deliver the best solution	Deliver solution as creatively as can within constraints
Category 4 S=Adapting and scaling a method I=Accurately define problem while sharing vision of project	To be thoroughly explored	Produced as needed as a two-way communication tool	Is adapted and scaled to suit context	Driven by the method	Iterative negotiation aimed at having a shared vision and being comfortable.

5.4.4 Data Analysis and Interpretation Part (D): The Initial Conception Categories

In terms of the overview of the data analysis and interpretation process (Figure 5.2), part (D) of the data analysis and interpretation process, as shown in Figure 5.9, encapsulates the third set of iterations of the phenomenographic constant comparison method. Part

(D) saw the development of the initial conception analytical framework and culminated in a presentation of the initial conception categories of description and outcome space.

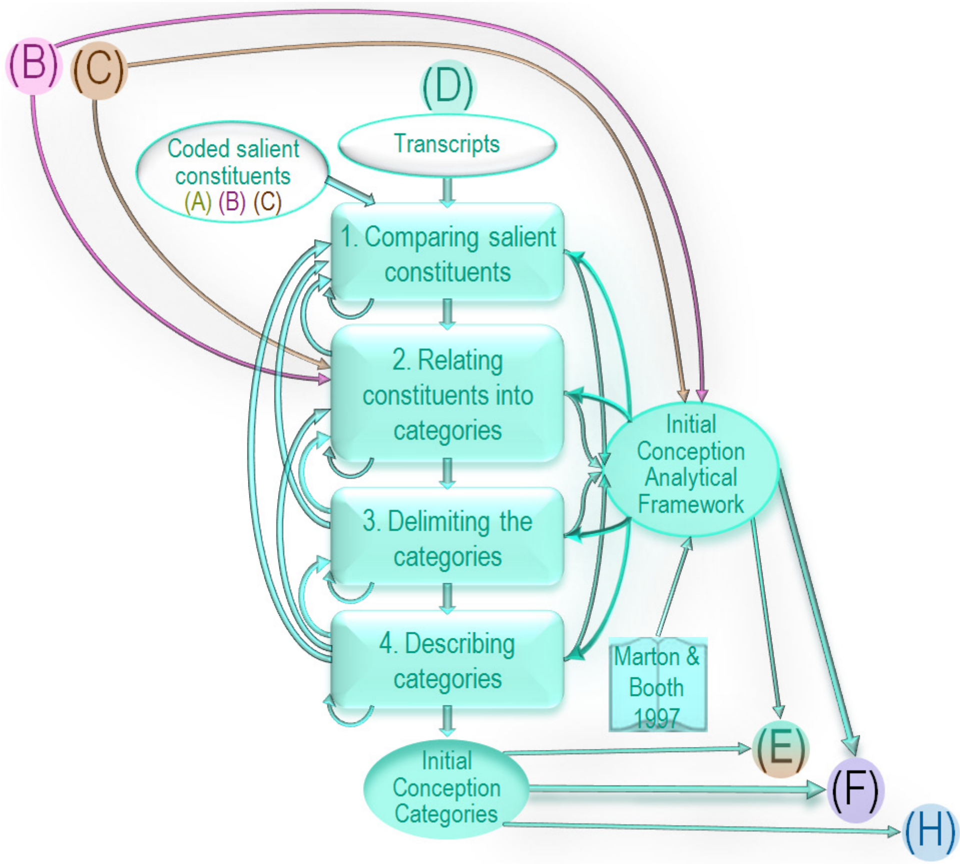


Figure 5.9: Part (D) of the data analysis and interpretation process

The term "conception" is sometimes misused in phenomenographic literature (Bowden 2000, p. 17). A conception in the context of this study is what an analyst/designer thinks analysis/design is. A conception of analysis/design attaches a specific meaning to analysis/design, which then mediates an analyst/designer's response to situations involving analysis/design (Pratt 1992). Conceptions of analysis/design are integral to analyst/designers' knowledge, beliefs, and paradigms, which act as filters through which they experience the world and guide their actions. The way they work is confined or constrained by their conceptions. There is a relationship between approaches and conceptions, which they would not consciously separate in their everyday lives. As a researcher, I saw in the data that a separation of approaches and conceptions was possible. Separating approaches and conceptions during data analysis and interpretation required a more detailed analytical framework for conceptions than I had developed, thus far.

Figure 5.10 (foldout) shows my *initial* conception analytical framework. I based the framework on learning as a metaphor for analysis/design. "The essence of metaphor is understanding and experiencing one kind of thing in terms of another" (Lakoff & Johnson 2003, p. 5). I saw that the conceptions of analysis/design could be structured and understood in terms of learning: learning and analysis/design are about change, analysis/design is a learning task for analyst/designers, analyst/designers are learning about the BIS and their self-improvement, and analysis/design involves teaching others. The number of phenomenographic studies of learning makes it a conceptual domain that can be regarded as concrete, well used, and established; desirable characteristics of the source of a metaphor (Lakoff & Johnson 2003). In contrast, the lack of phenomenographic studies of analysis/design makes it a conceptual domain that is abstract, unfamiliar, and not established; these characteristics are typical of the target of a metaphor (Lakoff & Johnson 2003). I mapped the Marton and Booth (1997) conceptual apparatus for learning (Figure 4.3), as a metaphor, onto an analytical framework for conceptions of analysis/design.

Figure 5.10: The initial analytical framework for the conceptions of analysis/design categories (Overleaf)

The Initial Conceptions of Analysis/Design Categories of Description Analytical Framework

Conception of Analysis/Design

Analysis/design is conceived of as x ◆ What is x directed towards? ◆ What is x conceived as?

How

How analysis/design is conceived as x.

How is the 'what' or direct object of x achieved?

Act

The act *of* conceiving analysis/design as x.

How is analysis/design conceived as an act that is a disembodied abstracted idea?

What is involved in achieving what analysis/design is?

What variation is there in the act of conceiving x?

Structural Aspect

What is the structure of the act of x?

What are the parts that form the whole of the act of x?

Referential Aspect

What meaning does the act of x have?

External Horizon

What makes the act of x distinct from everything else in the analyst/designer's life-world?

What separates the act of x from all else?

Internal Horizon

What components/parts are in focus in the act of x?

How are the parts (socio-temporal-spacial) related in the act of x?

How do the parts and their relation make up the whole that is the act of x?

Indirect Object

The consequence of conceiving analysis/design as x

That which we do *in* analysing/designing as x

What are the consequences of conceiving analysis/design as x?

What is the point of analysis/design when conceived as x?

What is the aim or goal of achieving the outcome of analysis/design when conceived as x?

What is the aim of analysis/design when conceived as x?

Structural Aspect

What is the structure of the indirect object of x?

What are the parts that form the whole of the indirect object of x?

Referential Aspect

What meaning does the indirect object of x have?

External Horizon

What makes the indirect object of x distinct from everything else in the analyst/designer's life-world?

What separates the indirect object of x from all else?

Internal Horizon

What components/parts are in focus for the indirect object of x?

How are the parts (socio-temporal-spacial) related in the indirect object of x?

How do the parts and their relation make up the whole that is the indirect object of x?

What

What x is the analysis/design of?

What is analysis/design?

What is thought to be analysis/design?

What is the outcome of analysis/design?

What results from going about analysis/design?

Why do we do analysis/design?

What is achieved by doing analysis/design?

Direct Object

The content of the conception of analysis/design as x

That which we do *by* analysing/designing as x

What is analysis/design when conceived as x directed toward?

Structural Aspect

What is the structure of the direct object in x?

What are the parts that form the whole of the direct object of x?

Referential Aspect

What meaning does the direct object of x have?

External Horizon

What makes the direct object of x distinct from everything else in the analyst/designer's life-world?

What separates the direct object of x from all else?

Internal Horizon

What components/parts are in focus for the direct object of x?

How are the parts (socio-temporal-spacial) related in the direct object of x?

How do the parts and their relation make up the whole that is the direct object of x?

To create the initial conception of analysis/design analytical framework, I divided it into the same elements as those that are in Marton and Booth's conceptual apparatus of learning (Figure 4.3). Based on the examination of each element of their apparatus, I created multifarious questions to guide consistent data analysis for each element in the initial conception analytical framework. These questions reflected my then understanding of Marton and Booth's apparatus, as well as my then understanding of their basic unit of a way of experiencing framework (Figure 4.6). I attempted to resolve the difference between the how element as: (1) an approach to learning, and (2) how the content of learning is thought about (i.e., conceived). That attempt is illustrated in Figure 5.10 by the how, act, and indirect object elements in my initial conception framework.

When analysing my data, I found that I could keep in mind only some of the questions for each element of the initial conception analytical framework. I had to refer frequently to the framework as my focus of analysis changed from element to element. Table 5.7 shows the five initial conception categories I constituted.

Table 5.7: The initial conception categories of description

Note. Presented as "Variation in the conceptions analyst/designers have of analysis/design (PhD work in progress phenomenographic study results)", 2009, University of British Columbia, Management Information Systems seminar, 21 November, slides 22–26.

Initial Conception Categories of Description
Conception Category 1: Analysis/design is a thinking activity focused on more than just programming. *I18* *A software developer to me thinks outside of the box, outside of just being "Here's your task go and program it, come back.", you don't think of the whole design of it, the whole … the whole extra bit, it's not* ***just*** *[I18's emphasis] doing the programming.*
Conception Category 2: Analysis/design is a writing activity focused on producing documents. *I14* *you know if it's not written down it's too much reliance on like doing it in your head* *I11* *I think documentation also proves the existence of the system*
Conception Category 3: Analysis/design is following a method focused on [something not yet constituted from the data]. *I19* *Oh we have a methodology here that we* ***shall*** *[I19's emphasis] follow…through from getting project proposal, business case, initiation report, then requirements and functional spec, design specifications, test building, test planning, test results and implementing and training and doing the post implementation review.* *I4* *[When doing a university] software assignment where it says here's a problem, do ten diagrams we talked about in class.* *I14* *The documentation is evidence that the process has been followed correctly*
Conception Category 4: Analysis/design is adapting and scaling the process to suit the situation. *I4* *that's the idea…of these processes is that, they have been researched and studied and although they may not be ideal and they need to be adapted to different circumstances at least there's something there for you to base your thinking on* *I4* *it's fine to have a process and a way of doing things but you need to if you get given a problem or a situation that demands some alternative way of thinking about it then the piece of paper that's got the 20 steps about what you should do may not be the best way to do it*
Conception Category 5: Analysis/design is building a holistic understanding of the BIS focused on doing the best in the given situation. *Int* *What is analysis work for you, what does that entail?* *I12* *(sigh) getting inside the heads of the people who will be using the software, understanding the processes the software is designed to either enhance or replace, learning what the business rules are that the software is going to have to conform to, learning about the, the exceptions and the what sort of data is coming in and how that is going to, what the variations within that data are, what those variations imply in terms of processing, working through that process to have thorough understanding of the chunk of business where the software is going to be used.*

As can be seen in the initial Conception Category 3, in Table 5.7, when I presented the initial conception categories, the categories were incomplete. Subsequently, during parts (F) and (G) of the data analysis and interpretation process, I was to learn that it is natural for us to readily describe what people do (i.e., their approaches) and that it is harder for us to describe what people think (i.e., their conceptions).

Table 5.8 shows the outcome space of the initial conception categories of description at the end of part (D) of the data analysis and interpretation process. The blank cells in the outcome space indicate, either, a possible absence of that aspect from the category, or, that I had not yet analysed and interpreted the data for that part of the initial conception analytical framework for that category. The outcome space for the initial conception categories shows I had made progress in the analysis and interpretation of the data.

Table 5.8: The outcome space for the initial conception categories

Note. Presented as "Variation in the conceptions analyst/designers have of analysis/design (PhD work in progress phenomenographic study results)", 2009, University of British Columbia, Management Information Systems seminar, 21 November, slide 27.

				Conception Categories				
				Category 1	**Category 2**	**Category 3**	**Category 4**	**Category 5**
				Analysis/design is a thinking activity focused on more than just programming	**Analysis/design is a writing activity focused on producing documents**	**Analysis/design is following a method focused on [something not yet constituted from the data]**	**Analysis/design is adapting and scaling the process to suit the situation**	**Analysis/design is building a holistic understanding of the BIS focused on doing the best in the given situation**
What	Direct Object	Structural	Internal horizon	One thing	Documents	Situation and system		Contextual problem
			External horizon	Programming				
		Referential			Proof of existence of the system	Method leads to solution [?]	Outcome for the situation	Best mutually understood and negotiated outcome within the constraints
How	Act	Structural	Internal horizon	Thinking	Writing Thinking	Following method	Realising process	Thinking Writing Communicating Listening Questioning
			External horizon	Source of specifications				
		Referential		Evidence of analysis/design taken place	Success through method structure			Understand context and situation
	Indirect Object	Structural	Internal horizon	Whole extra bit	Follow templates	Better at understanding method	Better at using method Better at responding to the situation	Increase quality and quantity of analysis/design knowledge and skills
			External horizon	Programming				
		Referential		More than just programming	Repeat the documenting structure Evidence to show	Better methodologist Success for self [?]	Better process to situation fit	Increase success for all Increase repeatability

There arose an opportunity to conduct an interjudge reliability test (as described in s. 4.7) when I presented my initial conception categories at a seminar at the University of British Columbia (UBC). The seminar audience comprised 14 IS researchers from outside my study (indeed, from outside phenomenography).

At the UBC seminar, I provided each researcher with the nine quotes and the five category descriptions, shown in Table 5.7. The researchers were asked to make the best match between each quote and a category. For this interjudge reliability test, where outside-researchers classify quotes into categories, 13 of the 14 researchers contributed their classifications. The results, shown in Table 5.9 and Table 5.10, were skewed to the left with an average of 70% and medians of 77% and 78%. I suggest the likely reason for the data to be skewed to the left is the lack of certainty in the description for initial conception Category 3. However, the medians of 77% and 78% of matched quotes in Table 5.9 and Table 5.10, are within the estimated satisfactory range of 75–100% (Johansson et al. 1985) and close to the 80–90% interjudge reliability nominated by Säljö (1988). The confidence intervals calculated using t-distributions have lower values (50% for Table 5.9 & 61% for Table 5.10) that fall outside these acceptable ranges.

One UBC researcher explained that when the words and phrases in a quote matched words and phrases in a conception category description it was easy to make a match between that quote and category. For example, in Table 5.7, the language of the quote from I18 (Quote 3 in Table 5.9, the first quote in Table 5.7) is echoed in the description for Category 1 (the first category in Table 5.7). In Table 5.9, Quote 3 was matched to Category 1 by all 13 IS researchers.

Table 5.9: The percentage of agreement between 13 IS researchers' and my classifications of quotes to the initial conception categories.

Quote	Percentage of the 13 IS researchers who classified the quote to the same category as me	Initial conception category I classified the quote to
1	85%	3
2	69%	4
3	100%	1
4	31%	3
5	69%	4
6	77%	2
7	92%	5
8	23%	3
9	85%	2
Average	70%	
Median	77%	
Mode	85%	
Range	23% to 100%	
Confidence interval using t-distributions	50% to 90%	

Table 5.10: The percentage of agreement between each IS researcher's and my classifications of quotes to initial conception categories.

IS Researcher	Percentage of the nine quotes classified to the same initial conception category as me
1	67%
2	56%
3	78%
4	89%
5	67%
6	78%
7	78%
8	78%
9	78%
10	78%
11	33%
12	78%
13	56%
Average	70%
Median	78%
Mode	78%
Range	33% to 89%
Confidence interval using t-distributions	61% to 79%

A second interjudge reliability test was a test to compare the IS researchers ranking of the categories with my then understanding of the relationships between categories. For this interjudge reliability test, 11 of the 14 researchers contributed their rankings. The researchers were free to rank the categories as they saw fit. Their rankings of the five categories were either from one to five, indicating each category had a separate rank, or either from one to three, or one to four, indicating some categories had the same rank. Table 5.11 shows, in the second column, the average rank for each category as ranked by the IS researchers. The first column shows my then understanding of the relationships, where Category 1 is the lowest and Category 5 is the highest ranked. The researchers ranked Category 1 second highest. The researchers stated that the phrase "thinking activity" in the description earned Category 1 this high rank. I suggest that they ranked Category 3 lowest because of my use in the description of "something not yet constituted from the data". Irrespective of the reasons, the UBC researchers (as a collective) ranked three of the five categories differently from me.

Table 5.11: The average ranks for the initial conception categories of description ranked by 11 IS researchers.

Initial Conception Category	Average Rank	Ordinal Rank
Initial Conception Category 1: Analysis/design is a thinking activity focused on more than just programming.	3.7	4th
Initial Conception Category 2: Analysis/design is a writing activity focused on producing documents.	1.9	2nd
Initial Conception Category 3: Analysis/design is following a method focused on (something not yet constituted from the data).	1.8	1st
Initial Conception Category 4: Analysis/design is adapting and scaling the process to suit the situation.	3.0	3rd
Initial Conception Category 5: Analysis/design is building a holistic understanding of the BIS focused on doing the best in the given situation.	4.9	5th

5.4.5 Data Analysis and Interpretation Part (E): The Initial Conceptions and Approaches Relationships

In terms of the overview of the data analysis and interpretation process (Figure 5.2), part (E) of the data analysis and interpretation process, as shown in Figure 5.11, encapsulates the formation of the relationships between initial conception categories and initial approach categories. Part (E) culminated in a presentation of the initial conception and approach categories of description relationships (Figure 5.12).

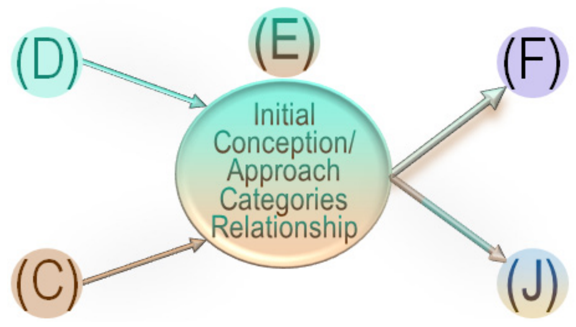


Figure 5.11: Part (E) of the data analysis and interpretation process

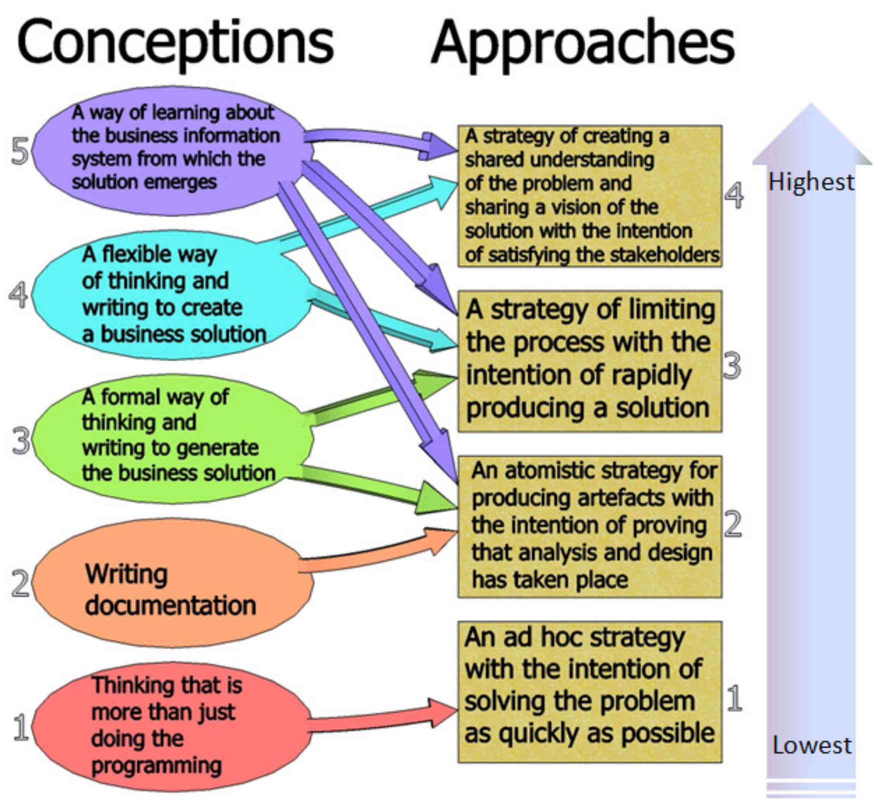


Figure 5.12: Initial conception categories and approach categories relationships
Note. Presented as "The concepts [sic] and approaches of business information system analyst/designers", 2010, University of Technology, Sydney, Sydney Phenomenography and Variation Theory Symposium, 2 December, slide 24.

The relating of conception categories and approach categories is not part of a phenomenographic research method per se. However, there are a number of ways that sets of categories resulting from phenomenographic studies have been related, for example, using:

- vignettes from individuals to illustrate patterns in ways of experiencing (McKenzie 2003)

- case studies and vignettes to illustrate an individual's fluctuation between and the coexistence of categories (Parker 2006)
- dimensions of variation that are common between conceptions and practice (Eckerdal 2009)
- a statistical distribution of individual transcripts after each transcript is matched to the highest possible category (Trigwell & Prosser 1996)
- descriptions of the relationship from the data (Trigwell & Prosser 1996)

When I first related my initial conception categories to my initial approach categories, I was influenced by the interviewees' descriptions of their situations in which they reported using a particular approach. My sense was that the interviewees' situations appeared to dominate their choice of analysis/design approach. Interviewees who had more sophisticated conceptions of analysis/design that were related to more sophisticated approaches did not report always using that more sophisticated approach. Furthermore, I did not think it made sense to relate a conception category with a low level of sophistication to an approach category with a higher level of sophistication.

In 2010, I presented my results then, including the relationships between the conception and approach categories as shown in Figure 5.12, to the Phenomenography and Variation Symposium. During the resultant discussion, an experienced phenomenographer explained my separation of conceptions and approaches to the new phenomenographers who were present by describing the conceptions as the "what" and the approaches as the "how" of Marton and Booth's (1997) conceptual apparatus (Figure 4.3). That experienced phenomenographer's explanation is one of several ways of applying Marton and Booth's conceptual apparatus (Harris 2011). However, as can be seen in Figure 5.10, I had used Marton and Booth's conceptual apparatus as a frame of reference only for the conception categories. The discussion at the symposium motivated me to clarify the theoretical underpinnings of this study.

5.5 A Critique of the Initial Data Analysis and Results

The research process up to this point is recognisable as an acceptable instance of orthodox phenomenography. Many phenomenographers would accept my process and results. For instance, the initial approach categories were peer-reviewed and published (Box 2009). However, there are phenomenographers who would question my interpretation of the phenomenographic literature, such as the experienced phenomenographer at the Phenomenography and Variation Symposium 2010.

A comparison of the initial approach and conception categories (Table 5.5 & Table 5.7) with the way these categories appear in Figure 5.12, illustrates the changes in the category descriptions due to my ongoing research process. I had questions about the trustworthiness of my data analysis, my interpretations, and my choices. I could not expect the reader to be confident in my research process (reported in s. 5.4) when I was not confident. There was congruence between the method, the process, and results presented above, but I could not say there was congruence with the theoretical basis of the work. Nor could I say I was sure of the theoretical basis. I was also aware that my process relied on references to other phenomenographers' methods; a criticism of phenomenographic studies made by others (Ashworth & Lucas 1998; Bowden 1996; Francis 1996) and with which I agree.

While reflecting on parts (A) to (E) of the data analysis and interpretation, the results of the interjudge reliability tests (s. 5.4.4) and discussions with IS researchers (s. 5.4.4) and phenomenographers (s. 5.4.5), I realised that:

1. The disparate definitions and applications of Marton and Booth's conceptual apparatus and frameworks, which I had found in the literature, and which Harris (2011) also reports, weakened their usefulness to my study. The analytical frameworks for the constituting of the conceptions of and approaches to analysis/design categories required improvement.
2. My initial analytical frameworks were not guiding consistent data analysis in a way that differentiated conception categories from approach categories. How I analytically separated conceptions and approaches needed explaining.
3. I wanted more confidence in the categories. I needed to develop a stronger relationship between the theoretical position of the research, the analytical frameworks, and the categories of description.
4. My choice to use salient constituents for the initial conception categories and critical aspects for the initial approach categories was based on the advice of Prof. S. Booth, the orthodoxy of phenomenography, and my belief that this distinction was necessary. My understanding of the language of

phenomenography needed a stronger relationship with the theoretical underpinnings of this study.

My next step in this research was to address the above concerns. In the next section, I expand on the issue of the disparate definitions and applications of Marton and Booth's conceptual apparatus and frameworks (point 1, above). Then I introduce some of the theories supporting phenomenography. In the next chapter, I describe the way these theories support this study.

5.5.1 An Evaluation of Analytical Frameworks

During parts (A) to (E) of the data analysis and interpretation process, I had made a concerted effort to understand and work with orthodox phenomenography. Despite that concerted effort, I was still trying to develop suitable analytical frameworks that would allow me to separate, analytically, the conceptions from the approaches in a consistent manner. For instance, though I had made headway, by using the learning metaphor, with structuring the analysis of conceptions of analysis/design, that metaphor was providing only a partial understanding, as metaphors do (Lakoff & Johnson 2003). I felt I needed to understand more about phenomenographic analytical frameworks and their use in phenomenographic studies.

Phenomenographers do not always make explicit the analytical framework in their descriptions of the phenomenographic research process, which hinders their fellow phenomenographers from understanding their data analysis and interpretation process. For example, Boustedt (2010), reviewed in Section 3.3.4, does not describe his analytical framework beyond stating:

> *… a professional perspective on software development was used as a guidance when interpreting the relations between the categories of description… [which] means that descriptions of "soft" qualities are valued highly… aspects such as teamwork, communication with customers and users, helping them to define what they want, the time frame, and the budget limits, are very important to understand.* (p. 4)

Even though I had established that Boustedt's (2010) categories describing IS development potentially overlap the results of this study (s. 3.3.7), I could not explain Boustedt's analytical framework.

The disparate definitions and applications of Marton and Booth's conceptual apparatus and frameworks (Figure 4.3 to Figure 4.7) can inhibit a phenomenographer's understanding and use of phenomenography. The Marton and Booth conceptual apparatus has been used mostly in part (e.g., Cope 2000; McKenzie 2003; Rose et al. 2005) and rarely in full (e.g., Irvin 2006; also the initial conception analytical framework, above). In the remainder of this section, I examine two disparate interpretations of Marton and Booth's analytical frameworks and applications of parts of those frameworks (Cope 2000; Rose et al. 2005).

Cope (2000), which I reviewed in Section 3.3.6, chose a combined what/how apparatus and structure of awareness as his analytical framework to analyse and describe undergraduate students' conceptions of an IS. Cope fashioned his what/how apparatus by melding Marton and Booth's (1997) what/how and structural/referential frameworks as shown in Figure 5.13. He defined the "what" in his what/how apparatus as what a student comes to know an IS to be and the "how" in the apparatus as the student's approach to learning about IS. (This definition is similar to the one used by the experienced phenomenographer to explain my work at the Phenomenography and Variation Symposium in 2010.) Cope (2000) melded the what/how framework's direct object element with the structural/referential framework as shown in Figure 5.13(C). (I could also describe this meld as: Cope excluded the structural/referential framework portions for the act and indirect object elements in Marton and Booth's conceptual apparatus.) To combine his what/how apparatus and a structure of awareness, he focused on the lowest level of the structural/referential framework (Figure 5.13(B)). He combined the internal and external horizons from the structural/referential framework with the theme, thematic field, and margin from the structure of awareness (Figure 4.7), as shown in Figure 5.14.

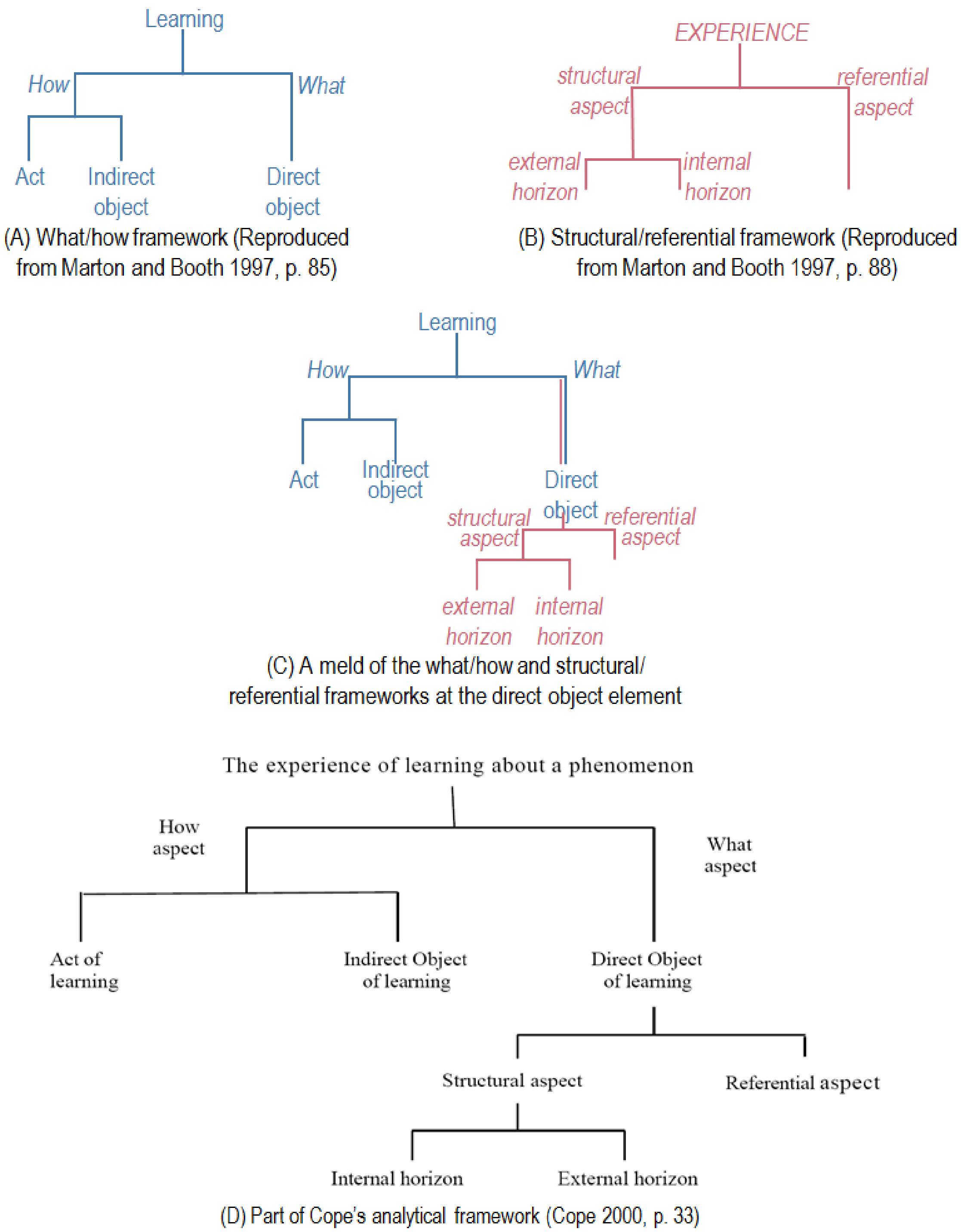


Figure 5.13: Part of Cope's (2000) analytical framework seen as a meld of the Marton and Booth (1997) what/how and structural/referential frameworks.

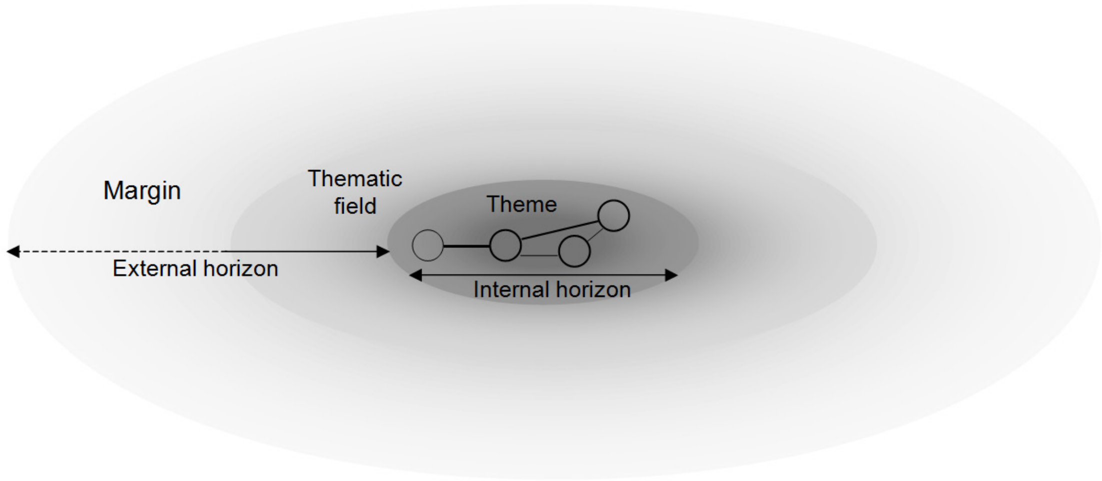


Figure 5.14: Cope's structure of awareness (Reproduced from Cope 2000, p. 16)

My second example of the disparate definitions and applications of Marton and Booth's analytical frameworks is Rose et al. (2005). There is a suggestion that they defined their what/how analytical framework in the same way as Cope's (2000) what/how apparatus. The suggestion is made in the way they stated one of their research questions: "*How* (structural aspects as internal foci and external boundaries) do the participants approach learning and *what* (referential aspects, deep/surface level) do they learn about IS design? [emphasis added]" (Rose et al. 2005, p. 184). However, the parenthetical material in this research question, and their later explanation of it, differentiates their analytical framework from Cope's (2000) what/how apparatus and makes their interpretation of Marton and Booth unclear. Shown in Figure 5.15, are the Marton and Booth what/how (A) and structural/referential (B) frameworks melded at different layers into single frameworks (C) and (D). Also shown in Figure 5.15, is the Rose et al. framework (E) coloured to show connections with the what/how and structural/referential frameworks. Rose et al. combine the how and act elements from the Marton and Booth what/how framework (Figure 5.15(A)) into one layer by excluding the indirect object. That, in isolation, is a valid application. However, the repetition of how and what elements on the lowest layer of their framework (Figure 5.15(E)) confuses their definition and application of the what/how framework in their layer above. They add to that confusion when they state "the 'how' dimension deals with structural aspects… of the perceived external boundary of the experience and the internal foci of the experience" (p. 187). Have they equated the how and structural parts of the frameworks in Figure 5.15(A) and (B) as shown in (Figure 5.15(C))? Yet, if the how and what elements on the lowest layer of their framework is ignored, have they defined their framework as in Figure 5.15(D)? If they have done the latter, their framework is then consistent with Marton and Booth (1997, p. 91), is the same as Cope's direct–object element, includes the act element in a similar way, and the indirect object element has been excluded.

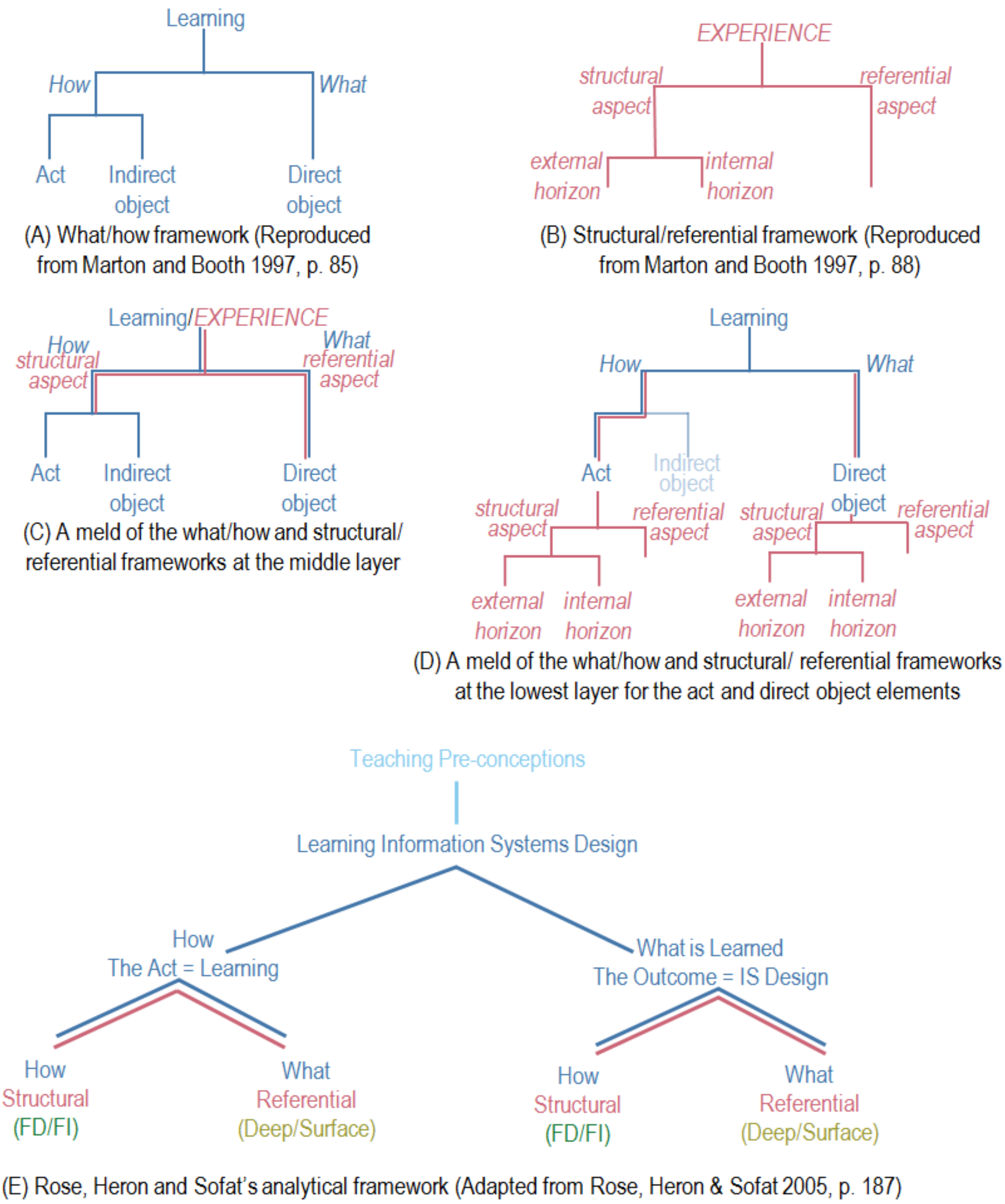
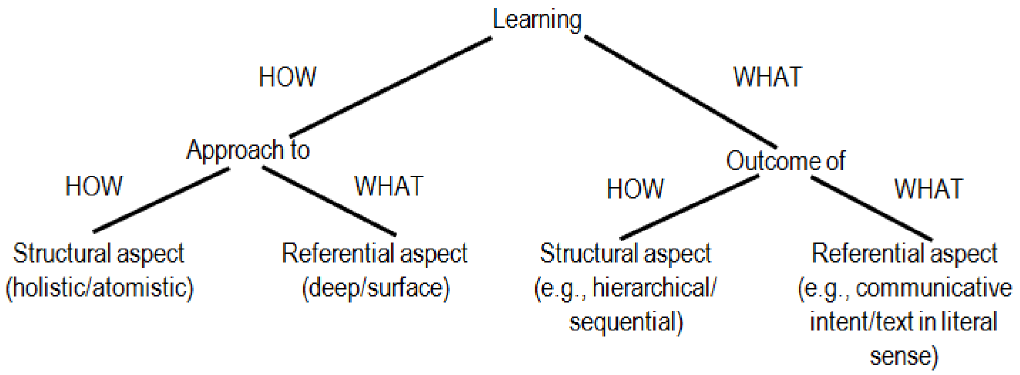


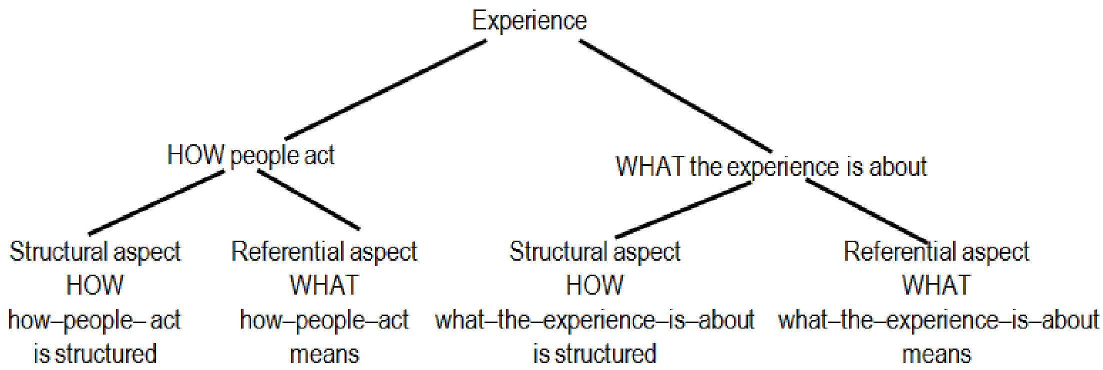
Figure 5.15: Rose et al.'s (2005) analytical framework seen as melds of the Marton and Booth (1997) what/how and structural/referential frameworks.

However, there is more to the Rose et al. analytical framework. In the lowest layer of their framework attached to the How–Structural element is FD/FI ("field-dependent/field-independent" cognitive styles, see Witkin, Moore, Goodenough & Cox 1977)); something they have added to the phenomenographic analysis for variation in students' experiences of IS design.

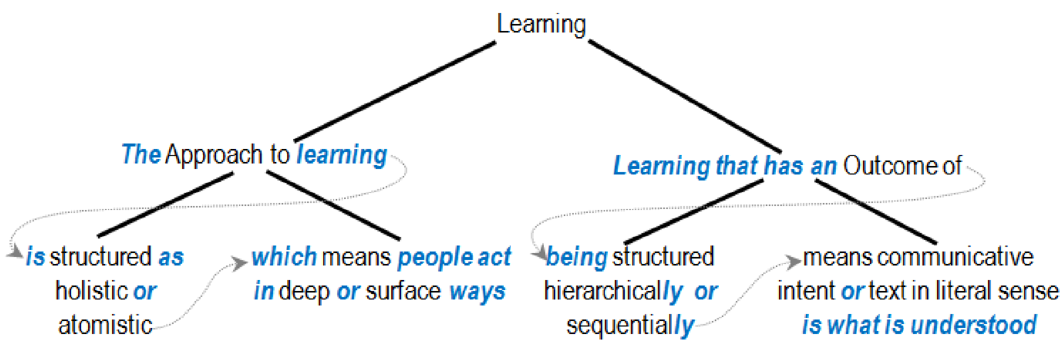
Shown in Figure 5.16(A) is what Marton (1988a) described as "the logical structure of some categories used to describe learning from an experiential perspective" (p. 66). Rose et al.'s analytical framework in some ways imitates Marton's "logical structure". For instance, their placement of Deep/surface with the What–Referential element, the clue to the derivation of their analytical framework, is similar to Marton's logical structure. Marton's 1988 paper "Describing and improving learning" sets a precedent for analytical frameworks such as Rose et al.'s. The perpetuation of what and how elements being duplicated in layers of analytical frameworks, without clarifying the difference between the layers, such as Rose et al. (2005), may be attributed to Marton's (1988a) paper.



(A) Marton's combined principles of the logical structure of the experiential perspective and an example of some categories used to describe learning (Reproduced from Marton 1988, p. 66)



(B) The principles of the logical structure of the experiential perspective (Adapted from Marton 1988, p. 66)



(C) An example of some categories used to describe learning structured based on the principles of the logical structure of the experiential perspective (Adapted from Marton 1988, p. 66)

Figure 5.16: Marton's (1988a) logical structure of the experiential perspective with an example.

Marton's (1988a) combination of the principles he was expounding with his explanatory example (Figure 5.16(A)) is a possible contributor to the subsequent disparate definitions and applications of Marton and Booth's conceptual apparatus and frameworks. For example, in Figure 5.16(B) and (C), I separate the principles from the example based on my understanding of Marton (1988a). I also draw on my understanding of Marton and Booth's (1997) conceptual apparatus and frameworks, which evolved from the principles expounded by Marton (1988a). I use repetition to deal with the duplication of the what–element and how–element across layers. The framing of the how–element in the first layer (Figure 5.16(B), HOW people act) is repeated as part of the how–element in the second layer (i.e., HOW how–people–act is structured) and as part of the what–element in the second layer (i.e., WHAT how–people–act means). The framing of the what–element in the first layer (Figure 5.16(B), WHAT the experience is about) is repeated in the second layer as part of the how–element (i.e., HOW what–the–experience–is–about is structured) and as part of the what–element (i.e., WHAT what–the–experience–is–about means). Thus, it is possible to read the example provided by Marton (1988a) and incorporate the language of the principles,. For instance, shown in Figure 5.16(C) is one way of reading Marton's (1988a) example that includes the principles without the complexity of duplicate what–elements and how–elements. If phenomenographers regarded Marton and Booth's (1997) conceptual apparatus and frameworks as an evolution of the logical structure of Marton (1988a), then they could ignore the what and how labels in the lowest layer of Marton's logical structure.

5.5.2 Theories Used to Support Phenomenographic Research

Phenomenographic research evolved along three lines. Two lines have an educational research focus. The first is an interest in the general aspects of learning and the second is content oriented learning of basic concepts and principles (Marton 1986). The third line of phenomenographic research, referred to as "pure phenomenography" (Hasselgren 1997, p. 197; Säljö 1997, p. 177), is to take phenomenography away from an educational research focus and apply it to describe ways of experiencing a phenomenon in the world in general. This third line, similar to the first and second lines, began in an educational setting (Hasselgren 1997). To understand phenomenography it is necessary to separate it from its educational research content (Dunkin 2000), such as I have done in Figure 5.16. To separate phenomenography from its educational research content, I elaborated a theoretical stance by first investigating the theories that phenomenographers have used to support phenomenographic research.

Early phenomenographic studies were based on "common-sense considerations about learning and teaching" (Marton 1986, p. 40), without "any elaborated theoretical stance" (Uljens 1996, p. 103). Early phenomenographic studies did not have explicit supporting theories (Giorgi 1986; Svensson 1997), nor was it always felt that such an explication was needed (Hasselgren 1997). As such, phenomenography, like much scientific research (Kuhn 1970), developed from fact gathering and the articulation of the understandings of those facts before the explication of supporting theories.

In 1979, Marton affixed the name “phenomenography” to the work he and his colleagues were doing at the Department of Education and Educational Research, University of Göteborg (Marton 1986). In the 1980s, the theoretical stance of phenomenography began to be articulated (e.g.,Marton 1981a, 1981b). Development of theory supporting phenomenography has continued (e.g., Harris 2011; Marton 1988a; Marton & Booth 1997; Pang 2003; Säljö 1996; Svensson 1994; Uljens 1996).

Since 1997, Marton and Booth provided the keystone for the theoretical stance that supports most phenomenographic research; whether the research is of learning phenomena or is beyond education. For instance, Isomäki’s (2002) study of IS professionals and humans as IS users (reviewed in s. 3.3.1) relies on Marton and Booth (1997, pp. 86–88) to make the connection between different levels of understanding and the structural/referential analytical framework (Isomäki 2002, pp. 63–5). Other researchers cite other phenomenographic works for theoretical support of their research as well as drawing from Marton and Booth (1997). For instance, Cope (2000) cites Booth (1994, 1997), Marton (1998), and Marton and Booth (1996) as well as Marton and Booth (1997) as the sources of the theoretical basis for his interpretation of phenomenography (Cope 2000, p. 6).

Theories from outside phenomenography are appropriated to support phenomenography. I have mentioned some above. For example, the non-dualistic–experiential–interpretivist/descriptivist position I took for this phenomenographic study is an appropriation of several theories. The hermeneutic rules (s. 4.2) stem from phenomenology. Marton and Booth (1997) appropriated language from phenomenology. Theories used to support phenomenography include:

- Brentano’s intentionality
- Gestalt theory
- Gurwitsch’s field theory of consciousness

5.5.2.1 Brentano's Intentionality

Brentano's intentionality states that we always direct our mental activity toward something (1874/1973, 1874/1995):

> *Every mental phenomenon is characterized by what the Scholastics of the Middle Ages called the intentional (or mental) inexistence of an object, and what we might call, though not wholly unambiguously, reference to a content, direction toward an object (which is not to be understood here as meaning a thing), or immanent objectivity. Every mental phenomenon includes something as object within itself, although they do not all do so in the same way. In presentation something is presented, in judgement something is affirmed or denied, in love loved, in hate hated, in desire desired and so on.* (1874/1995, p. 68)

Marton and Booth (1997) state the basic unit of learning, the what/how framework, as a "special case" (p. 84) of Brentano's intentionality. What Marton and Booth mean by a special case is not clear. A possible explanation may be found in Marton (1988a):

> *Both experience and conceptualisation (which constitutes the kind of learning we have mostly been studying) are, however, of an intentional nature; experience is always the experience of* something*, and conceptualisation is always the conceptualisation of* something [emphasis in original] (p. 67)

Perhaps, Marton and Booth (1997) are arguing that experience and conceptualisation are special cases of activity, which may be either mental or something else. Their what aspect of the what/how framework then refers to the something experienced or conceptualised; that something to which we are directed toward. Their how aspect then refers to the experiencing or conceptualising, the activity (mental or otherwise), which is different from the how being an approach to learning. The ambiguity in Marton and Booth's application of Brentano's intentionality prompted me to explore theories of intentionality further (see s. 6.3).

5.5.2.2 Gestalt Theory

Gestalt theory influenced the evolution of phenomenography (Åkerlind 2003; Marton 1981a, 1986, 1988a; Svensson 1997; Uljens 1996). Gestalt theory is about organised forms. The character of the organised forms that support phenomenography are twofold: the Gestalt whole-part relation and the figure-ground structure (Åkerlind 2003). The fundamental tenet of the Gestalt whole-part relation is that the whole is not determined by the individual parts. Instead, parts and whole are determined by the nature of the whole (Köhler 1959; Wertheimer 1925/1938). The influence of the Gestalt whole-part relation is manifested in phenomenographic studies as a connection to the basic unit of experience (Figure 4.6). For instance, Isomäki (2002) explains: qualitatively different levels of understanding are interpreted as the whole, the parts, and the relationship amongst the parts, and parts with the whole of the phenomenon, as the structural aspect and the meaning of the phenomenon as the referential aspect (pp. 63–65). Her explanation is an example of the way phenomenographers bring together the structural and referential aspects from Marton and Booth's basic unit of experience (Figure 4.6) with the Gestalt whole-part relation.

The second feature of Gestalt theory that influences phenomenography is the figure-ground structure. In Gestalt theory, the figure-ground structure relates to perception relying on visual sensory-data, such as Rubin's figure (Figure 5.17), to explain and support its suppositions. The term figure-ground as used in phenomenography is metaphorical (Marton 1988a). The individual, such as the interviewee, is unlikely to be conscious of the figure-ground relation. The figure and ground are the researcher's interpretation of what is to the fore of the interviewee's experience and what lies in the ground (Marton 1988a).

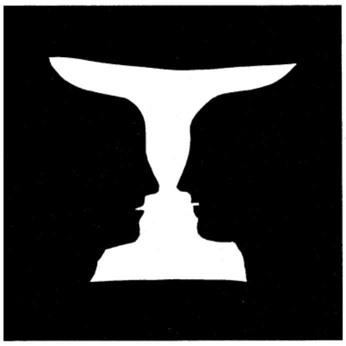


Figure 5.17: Rubin's figure (Rubin 1915)

5.5.2.3 Gurwitsch's Field Theory of Consciousness

The Gestalt figure-ground structure prompted Gurwitsch to explicate the principles of the figure-ground organised form in finer detail as a field theory of consciousness (Zaner 2010). The structure of awareness (Figure 4.7) is a characterisation of a generalised figure-ground structure (Pang 2003) drawn from Gurwitsch's (1964/2010) field theory of consciousness. In phenomenography, Gurwitsch's (1964/2010) field theory of consciousness has been mostly posited in relation to the individual's awareness (i.e., the person in the person–phenomenon relation) (e.g., Booth 1992; Marton & Booth 1997; Marton 1992 cited in Uljens 1996). Few phenomenographers have posited Gurwitsch's field theory of consciousness as an analytical tool for the researcher. One exception is Cope (2000, 2002b), who acknowledged that Marton and Booth (1997) based their structure of awareness on Gurwitsch's field theory of consciousness, but did not discuss Gurwitsch any further. Cope presented a structure of awareness based on other phenomenographers' descriptions (Booth (1992, 1997), Bowden and Marton (1999), Marton (1998) and Marton and Booth (1997) cited in Cope 2002b). He posited that such a structure of awareness could guide data analysis to constitute the internal and external horizons of the structural element in the structural/referential framework (Figure 5.13 & Figure 5.14). He also recognised that a change in structure of awareness changes the meaning of the phenomenon (Cope 2000, p. 18), though whether Cope perceived that the structure of awareness could guide the analysis of the referential element is unclear.

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Brentano's intentionality, Gestalt theory, Gurwitsch's field theory of consciousness, as well as theories of non-dualism, experientialism, interpretivism, and descriptivism, mentioned earlier (s. 1.3), provided some of the theoretical underpinnings for this phenomenographic study. The illumination of these theories, and other theories, addressed my concerns about the trustworthiness of my data analysis, my interpretations, and my choices (as described in points (1) to (4) presented in the introduction to Section 5.5). I present my description of the theoretical underpinnings of this study in the next chapter.

6 Research Process (2): Theoretical Underpinnings and GIFTed Data Analysis

The research process for this study began in a conventional sequence for phenomenography: a topic, the research question, interviews, and some data analysis (Figure 1.2). However, during the initial data analysis, that is, parts (A) to (E) of the data analysis and interpretation process, I had concerns about the data analysis, interpretations, and choices I had made. I felt I needed to understand better the analytical frameworks and the theories supporting this study.

In terms of the overview of the data analysis and interpretation process (Figure 5.2), part (F) encapsulates an articulation of the underlying theoretical stance used to constitute the final categories of description for this study (Figure 6.1). The way I came to understand the various theories, which are part of this underlying theoretical stance, converged into a form of data analysis that I developed and called GIFTed (Gestalt, Intentionality, and Field Theory of consciousness) data analysis, part (G) in Figure 6.1.

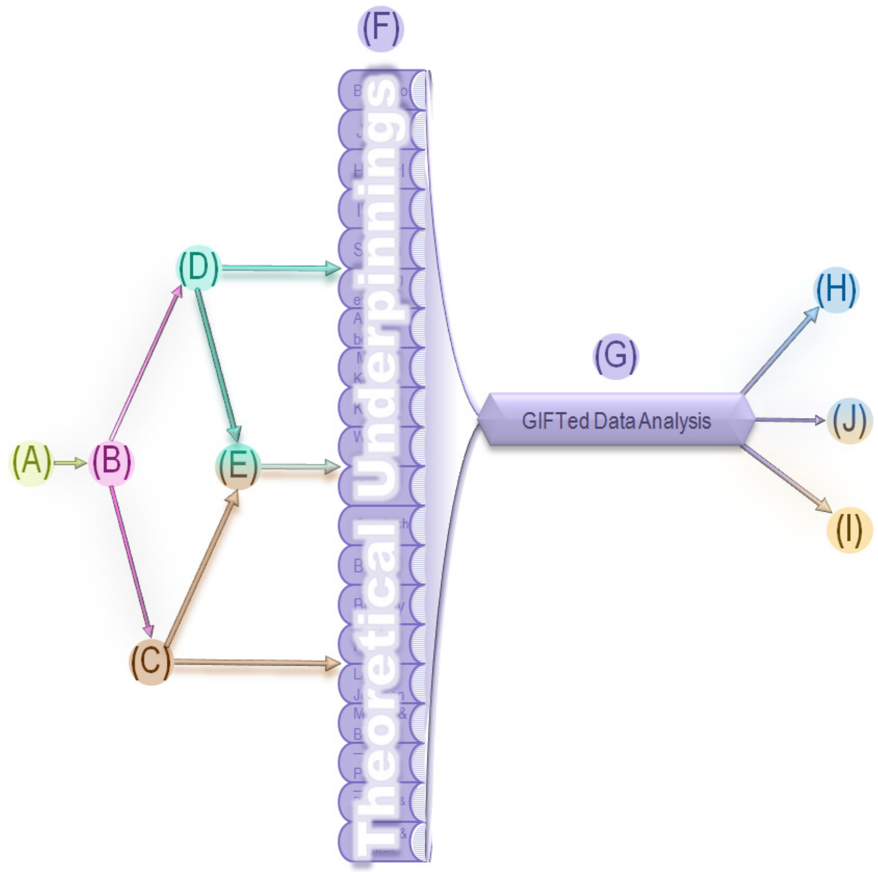


Figure 6.1: Parts (F) and (G) of the data analysis and interpretation process

All research has a theoretical underpinning. In many cases, individual researchers do not make explicit those underpinnings, as that is already shared implicit knowledge within many research communities. When those underpinnings are not shared and implicit across a research community, as is the case with phenomenography, researchers should explain their theoretical stance and how that stance is embodied in the enacted research process and results. Phenomenographic studies tend to lack an articulation of an underlying theoretical stance and there is a need for this lack to be addressed (Bowden 2000; Bruce 2003; Dall'Alba 1996; Dunkin 2000; Harris 2011; Hasselgren 1997; Säljö 1997; Sandberg 2005; Uljens 1996). The theoretical underpinnings of this study are articulated in response to the initial data analysis and results (parts (A) to (E) described in the previous chapter), as well as to assuage any criticism of a lack of underpinning theory. The criticisms of my study, and which are also made of other phenomenographic studies, that are addressed in this chapter are:

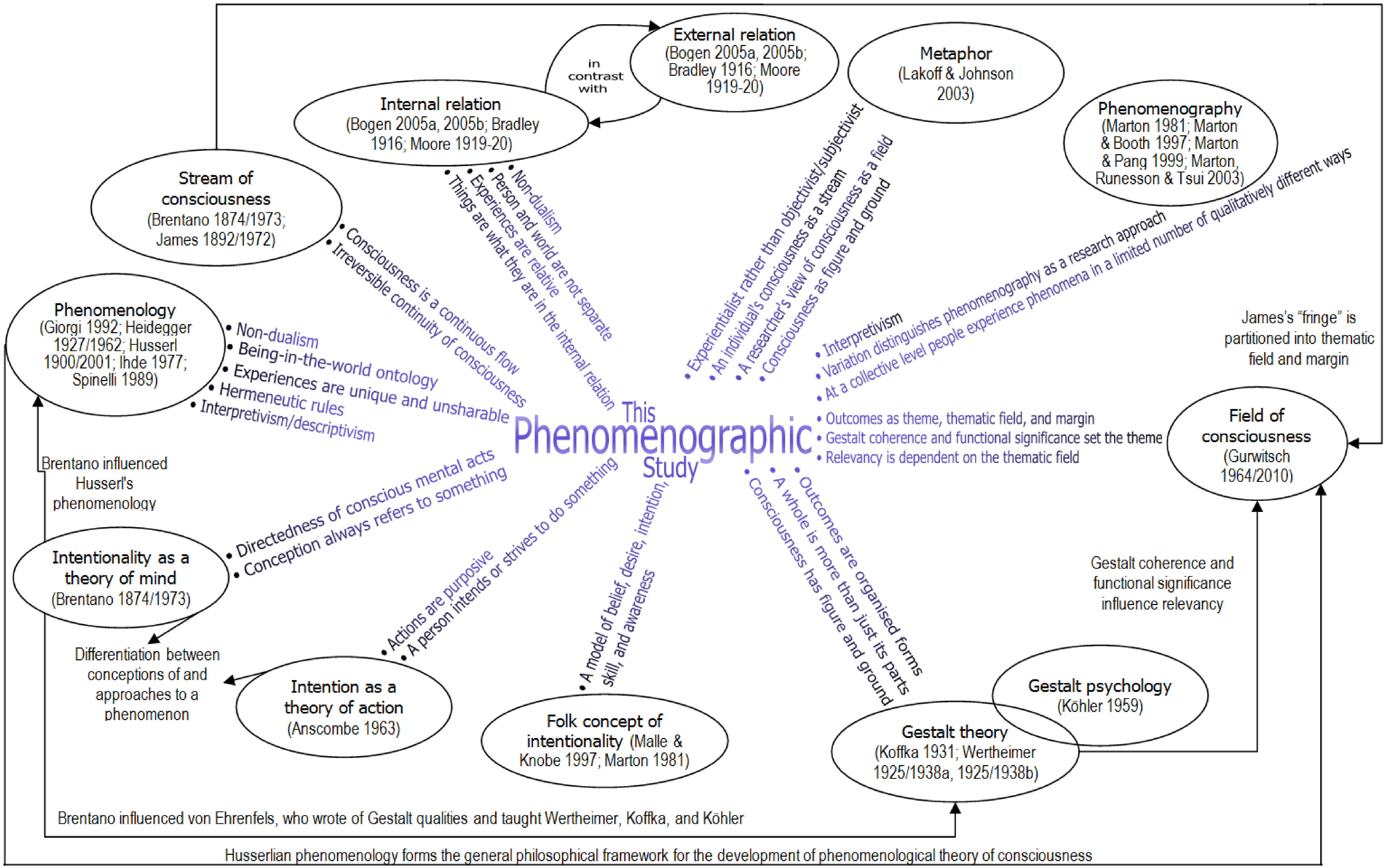
- the interpretation and relevance of the underpinning theories used for this study

- how those theories underpinning this study may align or deviate from other phenomenographic works
- how to apply those theories in the research process and reporting of results
- the clarification of ideas, terms, and concepts such as experience, intentionality, conception, approach, context, aspect, and analytical frameworks

Figure 6.2 (foldout) shows an overview of the theoretical underpinnings of phenomenography as used in this study. I drew from several philosophical, ontological, epistemological, and theoretical fields of study or theories. The details of the theories are selective in that a full exposition of the source of the ideas is outside the scope of this study and is limited by my knowledge of philosophy. I used entries from encyclopaedias and dictionaries of philosophy and the mind as introductions to the underpinning theories. Once I had an understanding of the key ideas of the field of study from which the theory originated, I read the original writings that are cited in those encyclopaedias and dictionaries. I also found metaphors useful to understand the theories.

Figure 6.2: An overview of the theoretical underpinnings of phenomenography as used in this study (Overleaf)
Note: In the ovals are the philosophical, ontological, epistemological, and theoretical fields of study or theories. The radial arms of text are the elements from these theories that underpinned and influenced this study. The arrows refer to the links of interest between the fields of study.

Overview of the Theoretical Underpinnings of Phenomenography as Used in this Study



As stated in Chapter 1, I took a non-dualistic–experiential–interpretivist/descriptivist position for this phenomenographic study that challenged my previously taken for granted dualistic–objectivist–positivistic based education. I took a pluralist philosophical position to prevail over this challenge. Beginning with the non-dualism, I draw on Heidegger's *being-in-the-world ontology* to establish the ontological nature of experience in relation to phenomenography (s. 6.1). I explore non-dualism further to connect the being-in-the-world ontology to the experiential epistemology. In Section 6.2, I explore the way we experience parts of the world as *an internal relation* to make this ontological–epistemological connection.

Internal relations, the relations between individuals and a phenomenon, are intentional. In Section 5.5.2.1, Brentano's intentionality is introduced as a special case of intentionality (Marton & Booth 1997, p. 84). In Section 6.3 I present a new consideration of *intentionality* in phenomenography: different types of intentionality affected how I analysed, interpreted, and described the variation in the ways analyst/designers experience analysis/design.

I use a metaphor of a continuous stream to describe an individual's consciousness (s. 6.4.1). I extend this metaphor to explain how it is possible that the researcher can describe the ways of experiencing a phenomenon when the individual's consciousness is a continuous stream. The Gestalt whole-part and figure-ground organised forms, introduced in Section 5.5.2.2, are explored further (s. 6.4.3). I further describe Gurwitsch's field theory of consciousness, introduced in Section 5.5.2.3, as an expansion of the Gestalt figure-ground structure. I connect Gurwitsch's theory to the extended stream metaphor (s. 6.4.4).

6.1 Being-in-the-World Ontology

The non-dualistic philosophy, part of my research position, is a statement about the ontology of this phenomenographic study. Ontology "is concerned with… the nature of existence, with the structure of reality as such" (Crotty 1998, p. 10). The ontological footing of phenomenography is that "we are all similar in the sense that we are all beings-in-the-world [but] each of us *experiences* being-in-the-world in a unique and unsharable way. [emphasis in original]" (Spinelli 1989, p. 26). This footing, for my study, rests on Heidegger's phenomenological theory of "being-in-the-world" (Heidegger 1927/1962, p. 78). This differs from the Husserlian phenomenological ontological base that is popular in the phenomenographic literature[4]. Heidegger is mentioned in the literature, though less often (e.g., Bond 2000; Degen 2010; Hitchcock 2006; Sandberg 2005). Heidegger criticised Husserl for being dominated by theory over lived experience (Moran 1996; Sheehan 1997). As it is our experiences of being-in-the-world that are of interest to phenomenographers (Marton 1994b) the ontological stance of the lived experience of being-in-the-world is appropriate for my study.

Some theorists separate the being-in-the-world ontology into two parts: "being-in" and "the-world". Our being-in is our experience of the world; some regard being-in as a subjective experience of the world. "The-world" is a world that exists; some regard the-world as an objective world. However, as stated by several authors, this subjective/objective duality is not the being-in-the-world ontology of phenomenography (Marton 1981a; Marton & Booth 1997; Neuman 1997; Svensson 1997). The totality of being-in-the-world is the ontology of phenomenography. The non-dualistic philosophy of the being-in-the-world ontology applicable to this study regards us as a whole with the rest of the world. The being-in-the-world ontology of phenomenography structures reality as one world that exists with us in and of that one world.

We, as humans, are confined to human ways of conceptualising and, for most of us, our educations are likely to be dominated by a dualistic philosophy. Therefore, it is difficult to grasp what the whole of being-in-the-world means. Marton and Booth (1997) reject the philosophical position that the mental *re*-presentations of the world are in our head as the storehouse of our experiences. Their alternative is that: there are no mental *re*-presentations, only continuous acts of constitution; the world as experienced is part of the world in general; the world as experienced is not in our head but lies between us and the world in "the totality of [our] relatedness to the world" (p. 163).

The Marton and Booth philosophical position presents a dilemma. (This is not to say that other ontologies do not have problems.) Where does the relatedness lie when phenomenographers access the nature or description of the relatedness by, most commonly, interviewing people (Svensson 1989) and analysing their utterances. A constituent part of the relatedness appears to be in the minds of the people interviewed. Minds are regarded by some theorists as being confined to the head (e.g., Place 1956)

[4] (e.g., Bond 2000; Dall'Alba & Sandberg 1996; Larsson 2004; Marton 1986; McKenzie 2003; Richardson 1999; Sandberg 2000, 2005; Stoodley 2009; Svensson & Theman 1983; Uljens 1996; Webb 1997)

and by others to be in the world beyond the limits of the body (e.g., Noë 2006). This is the mind-body problem, which I am not going to solve here. The position I took was that our minds are constituent parts of the being-in-the-world whole and are inseparable from that whole, which is in keeping with non-dualism. Furthermore, the consciousness of those minds is available, in a partial way, in the utterances of a person with whom the mind and consciousness is associated. Consequently, describing the consciousness as mental states (see s. 6.3) does not negate or confirm the limits of the mind, confine experience to the mind, nor does it refer to cognitive structures or schema.

6.2 The Internal Relation

The internal relation makes the ontological–epistemological connection from the being-in-the-world ontology to the experiential epistemology. To explain how I understand this connection, I need to present more of phenomenography's history. The theoretical beginnings of phenomenography were evolutionary rather than revolutionary. At the inception of phenomenography, the Göteborg group changed research focus from the quantity learned to the quality of what was learned. They changed the research question from "How much is learned?", where learning is defined as knowledge acquisition, retention, and recall, to "What is and how is it learned?". Thus, they moved the research focus to learning as an understanding of something in the real world (Booth 1992; Dall'Alba 1996; Svensson 1994). However, this evolutionary step took a non-dualistic stance. There was a change in the view of the relationship between the learner and what is being learned. The relation changed from being an external relation to an internal relation.

The external relation is a theory that may be stated simply: all things are what they are *independent* of other things (Bogen 2005a, 2005b; Bradley 1916; Moore 1919-20). That statement is recognisable as dualism. For example, the learner-knowledge external relation shown in Figure 6.3(A) is that which is to be learned (a piece of knowledge) is related (experienced or learned) as the same (piece of knowledge) by all learners (independent of who is learning). The piece of knowledge has a "sameness of knowing" independent of the learner.

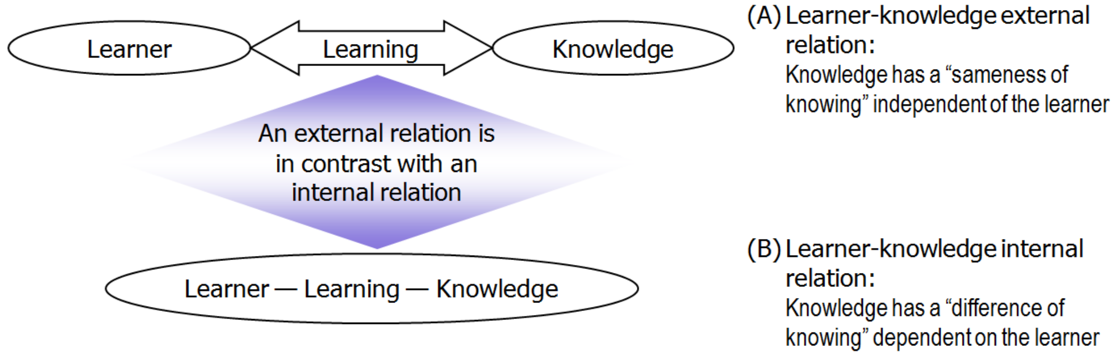


Figure 6.3: The external relation in contrast with the internal relation

The internal relation is a theory that may be stated simply: what all things are is *dependent* on their relation with other things (Bogen 2005a, 2005b; Bradley 1916; Moore 1919-20). For example, the learner-knowledge internal relation shown in Figure 6.3(B) is that which is to be learned (a piece of knowledge) is related (experienced or learned) as different by all learners (dependent on who is learning). Here the piece of knowledge has a "difference of knowing" dependent on who is doing the learning. Marton and Svensson's (1979) experiential description of the learner-knowledge internal relation is that the learner's experience *is* a relation between the learner and the learner's world.

After the inception of phenomenography within the education discipline, as reflected in the learner-knowledge internal relation (Figure 6.3(B) and Figure 6.4(A)), phenomenography has gone on to be used in different disciplines. The phenomenographic investigation of other internal relations is possible because the learner-knowledge internal relation is a member of the set of internal relations, that is, the person-thing internal relation, shown in Figure 6.4(B). Identifying the person-thing internal relation is one part of separating phenomenography from its educational research content (see s. 5.5.1).

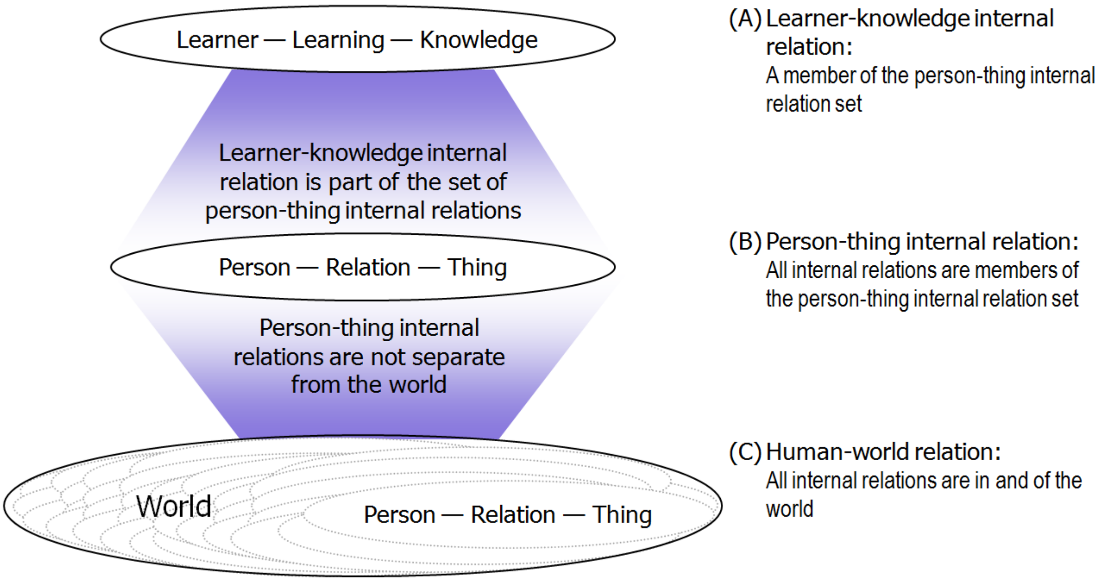


Figure 6.4: Internal relations are in the person-thing internal relation set, which is in and of the world.

A thing in the person-thing internal relation may be concrete or abstract, universal or particular (Cargile 2005), that is, a thing may be a phenomenon that is an object or idea. A relation may be thought or action (mental or physical acts), that is to say, a relation may be thinking acts or doing acts. A relation is the experiencing of a thing. A person has a relation with a thing. A person, through mind and/or body, experiences a thing. An individual's experience with a phenomenon may be considered unique. Each individual's reasoning and judgements resulting from experiencing the phenomenon are relative to socio-cultural and spacio-temporal variables (Marton & Booth 1997; Spinelli 1989).

Thus, we return to the ontological position: the individual is present in the world; the world is present to the individual, as experience.

Philosophically, phenomenography does not separate the world, that is, what is "out there" from the person, as in the learner-knowledge external relation (Figure 6.3(A)). The person is in and of the world. The internal relation is the same as the "human-world relation" (Marton & Booth 1997, p. 138). The human-world relation (Figure 6.4(C)) does not separate person and world, "... the world experienced by a person and the world in general are not separate. The former is part of the latter." (p. 138).

The human-world internal relation is an expression of our being-in-the-world, an ontological position, and also an expression of experientialism (Lakoff & Johnson

2003), an epistemological position. As mentioned in Chapter 1, the experiential epistemological position is one where we gain knowledge through experience (Lakoff & Johnson 2003).

By grouping the internal relation as an ontological and epistemological expression, I came to understand that it is through our ways of being-in-the-world that we gain knowledge about the world and our "being-in" or existence; our way of being-in-the-world changes when we experience variation. Our experiences of the world are present to each one of us in our consciousness. Each of us can come to know more about the world or understand better what we know by "directing" our consciousness, by varying the way we give attention to a phenomenon, or experiencing a phenomenon in different ways. What we are doing is changing the structural and referential character (see Figure 4.6) of the internal relation between the phenomenon and ourselves. To illustrate, Isomäki (2002) framed Marton and Booth's (1997) argument "that we *are* aware of everything at the same time, albeit not in the same way [emphasis in original]" (p. 123) as a "value choice" (Isomäki 2002, p. 68). Her argument is that we are not aware of everything in the same way because we value some things more than others; we value some phenomena over others; we value some parts of a phenomenon more than other parts; what we value is our value orientation. Our value orientation "directs" our consciousness.

6.3 Intentionality

The internal relations between an individual and a phenomenon are intentional. What this means exactly to phenomenography is not clear. The issue is that "intentionality has two quite different meanings" (Malle, Moses & Baldwin 2001b, p. 3): technical and practical (Caston 2008).

The technical treatment of intentionality stems from intentionality as stated in Brentano's third thesis (Jacob 2010). In Section 5.5.2.1, Brentano's intentionality was introduced as a supporting theory of phenomenography. In the next section, I explore the technical treatment of intentionality, including Brentano's intentionality.

The practical treatment of intentionality is more familiar to us. Intention is when we strive or intend to do something (Caston 2008). The intention is the mental state that presents the intentional action. I explore this in Section 6.3.2.

The treatments of intentionality in Sections 6.3.1 and 6.3.2 are philosophical in relation to consciousness. A third treatment of intentionality, described in Section 6.3.3, is the folk concept of intentionality. I found the folk concept of intentionality useful to understanding intentionality in phenomenography. I also used this type of intentionality to relate the conceptions of, and approaches to, analysis/design categories.

Intentionality is important to phenomenography, though the interpretation and use of intentionality is marbled through the different meanings of intention and its cognates. The fourth section on intentionality, Section 6.3.4, describes some of the definitions and manifestations of intentionality in phenomenography. A contrast can be seen between intentionality presented in phenomenographic literature and as it is presented here. Intentionality as I applied it to this study is an original contribution to the theoretical underpinnings of phenomenography.

6.3.1 Intentionality as a Theory of Mind

Intentionality, treated in the technical sense, is aboutness (Dennett & Haugeland 1987). When we are conscious, we are conscious *of* something. Our conscious mental states have content; they are *about* something. Our conscious mental states refer to or are directed toward something (Malle et al. 2001b). Our conscious mental states cannot be empty, devoid of all, they must have content (Chisholm 1987). Brentano (1874/1973, 1874/1995) described this property of our conscious mental states, this intentionality, as "a mental reference to *a content of consciousness* [emphasis added]" (1874/1995, p. 187).

Brentano wrote of the reference and content being parts of the conscious act, not, as is often the phenomenographic interpretation, beyond an individual's conscious act to a thing in the world. For instance, "a thought of a dog refers to an object, a dog, that is beyond the thought itself" (Marton & Booth 1997, p. 84). If the phenomenographer takes Brentano's meaning of intentionality, then she must refer to the dog that is the content of consciousness. She must not refer to the dog that exists independently of an individual's experience of it, that is, in the external relation. The phenomenographer must take the following position: once an individual has perceived an entity that exists in the world, such as a dog, the individual accepts that the dog exists even at those times the individual does not directly perceive it. As individuals, they accept: the dog existed before, exists, and will continue to exist even when they are not in the presence of the dog. The being-in-the-world internal relations with the dog, present in their conscious acts, are that they experience the dog in particular ways. For instance, my neighbour may perceive the dog only as a “yapping contrivance”. I see the dog as cute, black, long-haired, small, and wet. I hear the dog’s bark. I smell that the dog is wet. I feel the dog is soft. I know the dog is demanding, has expensive vet bills, and likes to chase squirrels. I love the dog. I fear for the dog’s safety and well-being. The two different ways of experiencing the dog, for my neighbour and for me are the conscious acts that are part of the internal relations of my neighbour–the dog and me–the dog. It is the relations my neighbour–the dog and me–the dog that the phenomenographer investigates, not the dog nor my neighbour or me.

There is also intentionality in our conscious acts about things that do not exist. We can imagine, come up with an idea, or believe in something that does not exist independently of the world, such as believing that phlogiston exists, wanting a two tonne diamond (Dennett & Haugeland 1987), or a new way of solving a BIS problem. Though these objects may not exist, they too are represented in our conscious mental states in a particular way. For instance, a new way of solving a BIS problem may be represented in one’s conscious act as a 3D graphical user interface projected from a flat surface. To another, the new solution may be a double helix hologram wrapped around the user of the BIS.

Whether an object exists or not, the totality of the way each of us experiences the object is unique and unsharable (see s. 6.1). These characteristics of our experiences are perhaps why intentionality remains a contentious and a variously understood concept in philosophy (Caston 2008; Dennett & Haugeland 1987; Dreyfus 1993; Lyons 1995; Moran 1996; Tye 1995).

Intentionality, as a property of conscious activity means “nothing can be judged, desired, hoped or feared, unless one has a presentation of that thing”[5] (Brentano

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[5] This quote from Brentano is the closest to Spiegelberg’s (1994) “no hearing without something heard, no believing without something believed, no hoping without something hoped, no striving without something striven for, no joy without something we are joyous about, etc.” (p. 37) (W. Baumgartner, personal communication, 4 June, 2011). Spiegelberg’s text is attributed to Brentano in phenomenographic literature (Gustavsson 2008; Isomäki 2002; Lindquist 2006; Marton 1994b; Marton & Booth 1997; Marton, Dall'Alba & Beaty 1993). I have been unable to find any evidence to support this attribution. Brentano (1874/1995) used will and striving synonymously. Striving, in a practical sense, is associated with action and intention. This distinction is important to my study. Hearing, believing,

1874/1995, p. 61). Presentation in this context is not that the thing is present, as in here, before us, “that which is presented” (p. 61), rather it is the present to mind, in my thoughts, of my consciousness, “the presenting of it” (p. 61).

A characteristic of intentionality is that it is perspectival (Caston 2008; Lyons 1995). Marton (1996) expressed this as “we cannot be aware of everything at the same time in the same way” (p. 179). In the examples above of perceiving a dog and a new way of solving a BIS problem, two different perspectives or aspects of the dog and BIS solution were described. The examples show how intentionality of consciousness can vary from one person to another. It is also possible, depending on the attitudes a person has, for one person to have different perspectives of the same thing. For instance, a new way of solving a BIS problem may first appear as a 3D projection of a graphical user interface. While then contemplating this idea, the double helix hologram becomes what is present in the conscious act. The variation in the perspectives of a phenomenon between one individual and another, as well as the variation in perspectives of a phenomenon one individual may have, are the focus of a phenomenographer’s investigation. In addition, the variation in perspectives of a phenomenon one individual may have is why phenomenographers claim that a category of description is not a description of an individual.

That we, as individuals, can focus selectively on different aspects or perspectives of the same thing while not knowing of other aspects, or ignoring those other aspects is peculiar to intentionality. We can come to know other aspects by learning. We can direct our attention to, or choose to focus on other aspects by changing our attitude. We can change: *what* intentional content, or aspect, of consciousness we focus on and *how* we focus on that content or aspect.

These interpretations of the what and how of intentionality as a theory of mind are the focus of the analysis and interpretation of data for the constitution of the categories describing people’s conceptions of a phenomenon. When a phenomenographer is investigating conceptions, she can frame her interpretivist/descriptivist theoretical perspective with an interpretation of intentionality as a theory of mind. This frame

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hoping, and joy are conscious acts with intentionality, I have relegated striving to intention (see s. 6.3.2). Moreover, striving is not part of the quote from Brentano.

contains what and how as two elements in a conception–of analytical framework (Figure 6.5).

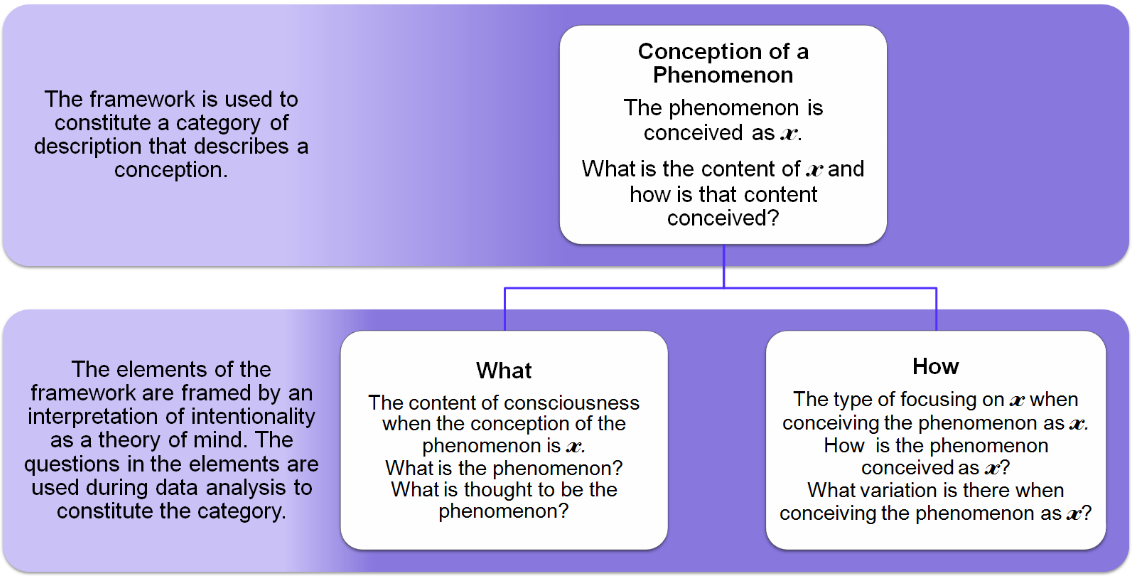


Figure 6.5: The conception–of analytical framework based on intentionality as theory of mind

The what–element and how–element in the conception-of analytical framework (Figure 6.5) are the focus for the phenomenographic investigation of conceptions. The what–element of a conception of a phenomenon, which is described in a category, is the interpretation of what the content of consciousness is for that particular conception of the phenomenon. The focus of analysis and interpretation of the what–element is on: "What is the phenomenon?", or "What is the phenomenon thought to be?".

The how–element of a conception of a phenomenon, which is described in a category, is an interpretation of the type of focusing on the particular conception of the phenomenon. The focus of the analysis and interpretation of the how–element is on: "How is the phenomenon conceived as this particular conception?", or "What variation is there when conceiving the phenomenon as this conception?". The how-element is described in a category as the way the content of the conscious act is brought to mind.

The how–element in the analytical framework shown in Figure 6.5 is distinct from the "how" as an approach in analytical frameworks, such as several interpretations of Marton and Booth's analytical frameworks containing what and how elements, or Cope's (2000) framework shown in Figure 5.13. The type of focusing on the particular conception of the phenomenon is not how people act or how they report they act. The type of focusing is the way people represent their conception. The phenomenographer interprets the data to constitute the how–element of the category. The phenomenographer's interpretation is possible because the manner in which we express ourselves reveals the intentionality of our conscious acts (Dennett & Haugeland 1987). The phenomenographer describes her interpretation in a way that captures the character of how the conception of the phenomenon is represented in the consciousness of people.

6.3.2 Intention as a Theory of Action

Intentionality, treated in the practical sense, is a property of actions: actions that we would commonly call meant, purposeful, deliberate, or done intentionally (Astington 2001; Caston 2008; Dennett & Haugeland 1987; Malle et al. 2001b).

In the philosophy of action, the word "do" is treated in a technical sense as equivalent to the expression "bring it about that something occurs" (Lowe 1980). If intentionality is a property of actions, then it is intention that is a property of the conscious act or state preceding or associated with the action. Hence, there is an intention to bring about the occurrence of something. Alternatively stated: we intend or strive to *do* something (Caston 2008).

When we have an intention and take action, there is a material intention to do things (Malle, Moses & Baldwin 2001a). For instance, I intend to go outside. To go outside I need to do something: get up out of the chair, walk to the door, open the door, and walk outside.

It is also possible to have intentions and not to take or be able to succeed in taking action. For instance, I intend to open the door and attempt to do so but the door is locked. Then again, I intend to go outside but my chair, which, on rising, I notice is not positioned how I would like, so I adjust it, and then sit down again.

Whether an intention results in action and whether that action is successful or not is still a subject of argument among philosophers. This argument includes the topics of 'pure intending' (when no action of any kind is taken), intentional action, intending for the future, and the intention with which someone acts (Anscombe 1957/2000; Astington 2001; Setiya 2010). Contributing to this philosophical argument is beyond the scope of this thesis.

Brentano's early work on intentionality influenced continental philosophers including Husserl and von Ehrenfels (see Figure 6.2) who were two of his students (Hedwig 1979; Huemer 2010). In the 1960s and 70s, analytical philosophers took up intentionality in derivative representations, such as sentences and questions, arguing that the manner in which we express ourselves reveals the intentionality of our conscious acts (Dennett & Haugeland 1987). Intention in philosophy of action emerged from analytical philosophers who were trying to address the problem of intentionality by analysing utterances rather than consciousness (Moran 1996). Philosophy of action appears in ancient philosophy, particularly Aristotle (2010), but it was the work by Anscombe (1957/2000) that established analytic philosophy of action as a field of enquiry separate from philosophy of mind and language (Ford, Hornsby & Stoutland 2011). Anscombe (1957/2000) described the concept of intention in expressions of intention, intentional actions, and intention in doing. The distinction Anscombe made between intentionality as a theory of mind as expressed by continental and analytical philosophers and intention as a theory of action is useful to the development of analytical frameworks.

The concept of intention used here is in the tradition of analytic philosophy of action; that intention is a conscious act that presents an action as something that can be done. Intention of pure intending presents possible action without action being taken. Intention as a conscious act precedes intentional action. Intention when intending for the future is to make plans for action. The intention with which someone acts is the purpose of taking action now in such a way to be able to do subsequent actions, thus achieving a desired outcome. (Anscombe 1957/2000; Astington 2001; Setiya 2010)

Intention can be characterised as an all-things-considered decision (Malle & Knobe 2001; Setiya 2010), which can be framed as: "by taking this intended action, I will achieve my desired outcome and it will have the desired consequences". This interpretation of intention is my focus for the analysis and interpretation of data for the constitution of the categories describing people's approaches to a phenomenon, that is, the approaches to doing something. When I am investigating approaches, I frame my interpretivist/descriptivist theoretical perspective with an interpretation of intentionality as intention as a theory of action. This frame contains intended action and purpose as elements on the same level and the purpose element contains outcome and consequence elements in an approach–to analytical framework (Figure 6.6).

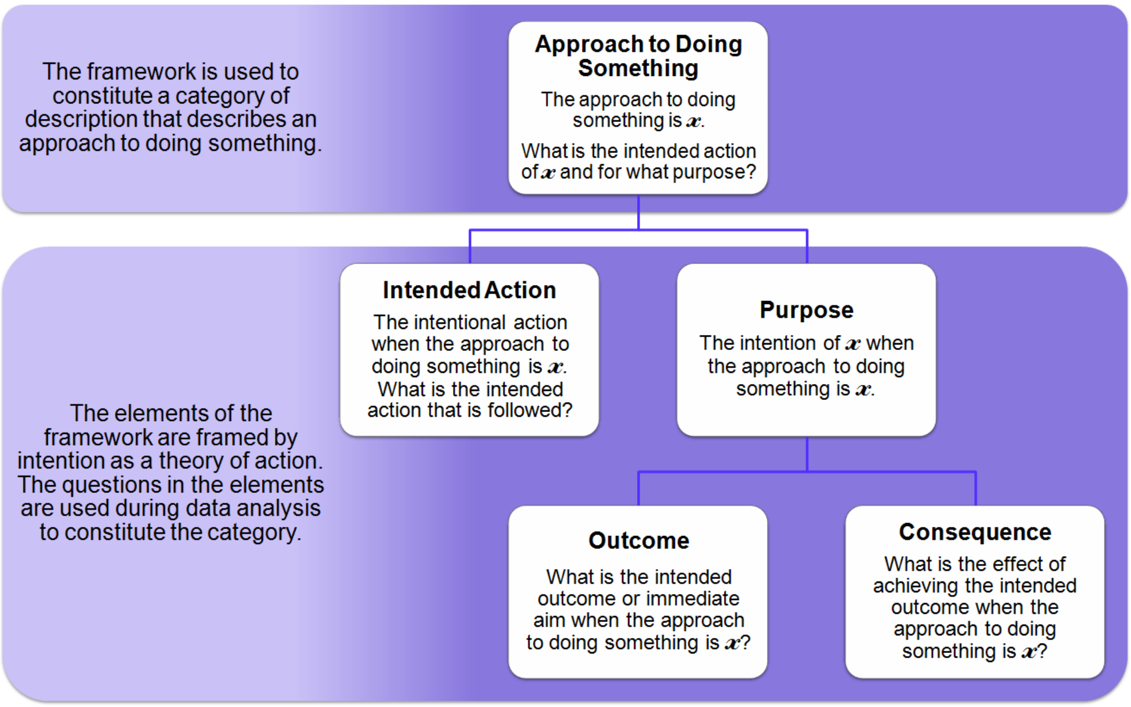


Figure 6.6: The approach–to analytical framework based on intention as theory of action

The intended–action–element, outcome–element, and consequence–element (Figure 6.6) are my focus for the phenomenographic investigation of approaches to doing something. The intended–action–element of an approach to a phenomenon, which is described in a category, is the interpretation of what the (reported) intentional action is for that particular approach to doing something. The focus of analysis and interpretation of the intended–action–element is on: "What is the intended action that is followed?".

The purpose–element of an approach to doing something, which is described in a category, is the interpretation of the (reported) intention of doing something when a particular approach is taken. The purpose–element of an approach to doing something entails the outcome–element and the consequence–element. The focus of the analysis and interpretation of the outcome–element is on: "What is the intended outcome or immediate aim when the particular approach to doing something is taken?". The focus of the analysis and interpretation of the consequence–element is on: "What is the effect of achieving the intended outcome when the particular approach to doing something is taken?".

6.3.3 Folk Concept of Intentionality

Figure 6.7 shows Malle and Knobe's (1997) folk concept of intentionality model. They describe a folk concept of intentionality as a hierarchical model of people's understandings of someone performing an action intentionally (i.e., an observer's understanding of an actor's action). Their model contains five elements: "a *desire* for an outcome; *belief*s about an action that leads to that outcome; an *intention* to perform the action; *skill* to perform the action; and *awareness* of fulfilling the intention while performing the action [emphasis added]" (p. 111). Belief and desire are necessary for there to be intention; given that there is intention, then skill and awareness are necessary for actions to have intentionality. When an observer observes that an actor has the belief and desire to perform an action then the observer understands that the actor has an intention to perform the action. When the observer understands that the actor has an intention to perform an action, then the observer must also observe that the actor has the skill and awareness to perform the action, for the observer to understand that the actor performs the action intentionally.

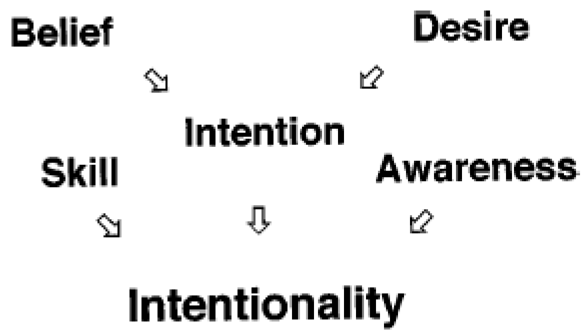


Figure 6.7: A model of the folk concept of intentionality (Reproduced from Malle & Knobe 1997, p. 112)

Malle and Knobe's folk concept of intentionality requires all five elements to be present for there to be intentionality. I will use one of their examples to illustrate. While playing a game of darts, a player hits triple 20. On being challenged to repeat the throw, the player tries again. Those who challenged the player do not regard the first throw as intentional when the second throw misses. The challengers accept the player may have believed and desired a repeat of the triple 20 hit, the player had intention, but the challengers see that the player lacked the skill, though the player was aware of what he was trying to do. Let us assume the player did hit the triple 20 the second time. Those who challenged the player would then regard both throws as intentional because there was intention (belief and desire) combined with skill and awareness. The first and second hits are understood to have intentionality.

The folk concept of intentionality model stems from Malle's (1995) work. He drew on the work of Anscombe and other analytical philosophers, the philosophy and psychology of action, and the results of experiments to create the model (Malle 1995; Malle & Knobe 1997). Mele (2001) criticised the Malle and Knobe folk concept of intentionality model (1997) as needing refinement, adding that although the five elements are necessary for intentional action, they would not necessarily be sufficient. Despite the criticism, the model is useful to this study and phenomenography in general.

The folk concept of intentionality is from the position of observers of the actions of other people (the challengers, in the example above) and explains how we attribute intention to others (such as the player, in the example above). The Malle and Knobe model does not take into account the observed people's own beliefs in their own skills or abilities. The model clarifies that from a folk perspective:

- intention applies to people intending to do something
- intentional and intentionality applies to actions performed intentionally
- intended action, where belief and desire are present as intention, is not necessarily intentional if awareness or skill are missing (Malle & Knobe 1997).

The model necessitates belief and desire to form an intention, and intention with skill and awareness results in intentional action.

The application of the Malle and Knobe folk concept of intentionality model is detailed in Chapter 9.

6.3.4 Intentionality in Phenomenography

The distinction between the continental and analytical philosophical stances on intentionality, intention in philosophy of action, and the folk concept of intentionality is not so clear that phenomenographers can adopt or call any one stance their only philosophical position on intentionality. (Phenomenography, in general, would likely benefit from further examination of this issue.) Phenomenography is grounded in Brentano's thesis of intentionality (Pang 2003, p. 145) and this type of intentionality, as an underpinning theory, is important to phenomenography (Anderberg 2000; Marton & Booth 1997; Marton & Pang 1999; Pang 2003; Sandberg 1997; Uljens 1996). Yet, phenomenographers appear to be making different assumptions about the nature of intentionality. Intentionality as expressed or implied in phenomenographic studies is used to underpin some studies as theory of mind, as Brentano or analytical philosophers wrote about it, or theory of action from a philosophical or folk posture. What intentionality means to phenomenographers, stated implicitly or explicitly in their work, varies.

Phenomenographers define intentionality, if they define it at all, as:

- Brentano's thesis of intentionality without further explanation (Ballantyne 1995; Barnard & Gerber 1999; Linder & Marshall 2003; Lindquist 2006; Marton & Pang 1999);
- Brentano's thesis of intentionality with further explanation:
  - that it is what a person is directed toward (Johansson et al. 1985; McKenzie 2003);
  - that a mental act, that, or which, is psychic, psychological, or conscious refers to something beyond itself (Irvin 2006; Kaapu et al. 2006; Marton 1986; Marton et al. 1993; McKenzie 2003);
  - that thinking is always about something (Anderberg 2000);
  - comprehensively, incorporating the three previous explanations (Isomäki 2002; Uljens 1996);
- as Husserl's view of intentionality (Dall'Alba 2000; Sandberg 1997, 2005);
- other philosophers' views of intentionality (Bond 2000);
- in the intentionality of text and other derivative representations (Hasselgren 1997).

As well as the variation in how phenomenographers define intentionality, how intentionality is manifested in the results of phenomenographic studies also varies. In studies where intentionality is explicitly defined and in those where it is not, it is possible to identify the types of intentionality manifested. For example, in Table 6.1, I have described the manifestation of intentionality based on my understanding of intentionality as described in Sections 6.3.1 to 6.3.3. In the studies listed in Table 6.1, I have quoted the definition of intentionality by the authors of each study in cases where those authors have is given it. The table is a small sample of the hundreds of phenomenographic studies that have been published (Alexandersson 1994). Table 6.1 shows, according to my interpretation, that some studies used a brief or simplified form of Brentano's thesis to define intentionality and manifest a different type of intentionality in their results. Where I identified intention as a theory of action as the type of intentionality, it is possible that these results manifest part of the Malle and Knobe folk concept of intentionality model; intention (belief and desire) may be the intention in action. In each case, the lack of congruence between a definition and manifestation is perhaps a reflection of the author's interpretation of the special case of intentionality (see s. 5.5.2.1), which, until now, has not been dealt with.

Table 6.1: Examples of how intentionality is manifested in the results of some phenomenographic studies and, where available, how intentionality is defined.

Type of intentionality manifested in results	Description of the manifestation of intentionality in the results	Definition of intentionality	Study
Intentionality as theory of mind	Unvarying mental acts of how content is focused upon with varied content of what is in focus.	Not defined	(Marton & Säljö 1976)
Linguistic, analytical intentionality as theory of mind	In the description of results, there is mention of: the intentional content of what the author of the text used in the study intends by his argument, and; the linguistic terms of sign, and what is signified.	Not defined	(Marton & Säljö 1976)
	The character of how content is focused upon is understood as acts of intention and the relation with the expressed meaning of utterances.	"… thinking is always about something, an object referred to." (p. 91)	(Anderberg 2000)
Intention as theory of action	A strategy of taking surface or deep learning actions with the intention to focus on the sign or what is signified.	Not defined	(Marton & Säljö 1976)
	Aiming to achieve something, such as, aiming to know the literature, improving teaching, transferring information to students, and producing an outcome.	Not defined	(Åkerlind 2003)
	What is in focus, that is, student engagement, is identified as non-perspectival. The manner of student engagement is described as actions, for example, purposefully learning, aimed at achieving outcomes, such as obeying rules, and having desired consequences, such as having fun.	"… psychological phenomena refer to objects beyond themselves" (p. 106)	(Irvin 2006)
	An intention (what is taught) and by taking particular actions (way of teaching) has the desired consequences (beyond the teaching event)	"… phenomena… are directed at something beyond themselves." (p. 39)	(McKenzie 2003)
Folk concept of intentionality	A combination of knowledge and abilities constituting structures of competence.	Implied in "a conception signifies the indissoluble relation between what is conceived (the conceived meaning of reality) and how it is conceived (the conceiving acts in which the conceived meaning appears)." (p. 12)	(Sandberg 2000)

In phenomenographic literature, the notion of intentionality as a special case (see s. 5.5.2.1) is not explained (Harris 2011) in a way that is readily comprehensible. As previously stated, phenomenography has the internal relation as an underpinning theory. In terms of intentionality, a person cannot be in an internal relation without relating to a thing (Figure 6.4(C)). There must always be a person *and* a thing in the same way that Brentano stated that there is never only consciousness; we are always conscious of something. However, intentionality can be of different types depending on the way it is treated, that is, technical, practical, or as a folk concept. Marton (1982 as cited in Marton 1986) alludes to the differing treatments of intentionality. He stated that phenomenographers try to describe relations between the individual and a phenomenon, whether of immediate experience, conceptual thought, and physical behaviour. He then provided the allusion when he acknowledged these forms of manifested relationships, that is, immediate experience, conceptual thought, and physical behaviour, may be different from each other on a psychological level. I add to that allusion that not only is it possible to treat intentionality in different ways on a psychological level, But it is also possible to treat intentionality differently on theoretical and philosophical levels. Marton went on to state that the differences in the psychological level of experience, thought, or behaviour do not affect the structure of the experience, thought, or behaviour that phenomenographers aim to describe. However, I claim that the theoretical treatment of intentionality can affect how the structure is described, as illustrated in the following three points:

1. Intentionality as theory of mind has a structure of *what* is the intentional content of consciousness and *how* we focus on that content.
2. Intention as theory of action has a structure of *intended action* achieving an intended *outcome* that will have the intended *consequences*.
3. The folk concept of intentionality has a structure that necessitates *belief* and *desire* to form an *intention*, and intention with *skill* and *awareness* results in intentional action.

Intentionality in phenomenography is not a special case of Brentano's intentionality. Rather, intentionality in phenomenography requires clarification by researchers as to the type of intentionality they are using , which is likely to emerge during data analysis. For instance, when referring to acts, as in the mental acts to which Brentano refers, these acts should not be confused with action as in "piece of conduct" (Sellars 1964, p. 655). The technical and practical treatments of intentionality, including and beyond those mentioned here, are available to phenomenographers as theoretical perspectives. A pluralist philosophical position allows phenomenographers to select ontologies, epistemologies, and theories, including types of intentionality, that suit their research questions and data. By taking up how philosophers have presented one or more treatments of intentionality, it is possible to interpret and describe the data with this type of intentionality as part of the theoretical perspective and analytical framework.

6.4 The Nature of Experience

Experience is the object of research in phenomenography (Marton & Booth 1997). During the evolution of phenomenography, the vocabulary used to describe the object of research has changed. In 1981, "the phenomenography of a [phenomenon]… would refer to anything that can be said about how people perceive, experience and conceptualise [that phenomenon]" (Marton 1981a, ¶ 12). In 1985, the research object was "ways of thinking" (Johansson et al. 1985, p. 247) from the student's perspective. By 1986, "understand" (Marton 1986, p. 31) was included. In 1996, Marton announced he preferred "'ways of experiencing' as a generic term" (Marton 1996, p. 173) though he recommended "we use the [most] appropriate term" (p. 173). In 2003, these terms included "'ways of conceptualising', 'ways of experiencing', 'ways of seeing', 'ways of apprehending', [and] 'ways of understanding'" (Marton & Pong 2005, p. 336) and conceptualising had been distinguished from experiencing via the senses.

Philosophically, experience can mean the content of consciousness as described earlier, in Section 6.3.1, or the product of coming to know something via the senses (*experience* 2008; Moore 1997; Thinès 1987). Experiences are our ways of being-in-the-world and it is by our words and behaviour that we publicly manifest our ways of being-in-the-world. Phenomenographers investigate our ways of being-in-the-world as internal relations. They have investigated but a few of those innumerable internal relations.

A phenomenographic investigation of experience aims to reveal the researcher's interpretation of part of the individuals' streams of consciousness as categories of description and an outcome space. In my study, I revealed part of 20 analyst/designers' streams of consciousness based on:

- A being-in-the-world ontology of internal relations and intentionality of mind, action, and as a folk concept, described above.
- Supporting theories of the temporality of discourse and the use of metaphor, Gestalt theory, and Gurwitsch's field theory of consciousness, described below.

6.4.1 Experience as a Stream of Consciousness

Our experiences are present to us as a stream of consciousness (James 1892/1972). The metaphor of the stream indicates a continuous flow rather than separate or compartmentalised thoughts or ideas suggested by the metaphor of a train of thought. Consciousness, regarded metaphorically as a stream, places us in a lived experience that is ongoing while we are conscious. It is, according to Brentano, an “irreversible continuity” (as stated in Allen 1972, p. xvi). (To grasp the irreversible continuity of consciousness consider the metaphor of a stream in the light of Heraclitus’ flux thesis stated as “you cannot step twice into the same stream” (Plato trans. 1921, 402a)). For phenomenography, this presents a problem of how it is possible to describe that part of consciousness of interest when it is never at rest, it is never possible for it to be paused, nor is it possible to take a snapshot of an instance of consciousness. The solution found for this study rests on the importance of the metaphor of a stream of consciousness, and consciousness having a continuous flow.

In phenomenography, consciousness and awareness are regarded as synonyms. The content of our consciousness is our experiences. Our experiences are a combination of memory traces, perceptions, and expectations. Exactly how experience appears as our consciousness is not certain. Three suggestions are cinematic, retentional, and extensional as temporal models of consciousness (Dainton 2010). These models are problematic for phenomenographers as these models are brief, perhaps only as much as a few seconds. How are individuals able to give an account of a moment of consciousness that happens in a few seconds?

For the individual, the moment of consciousness when a phenomenon is in focus may feel like the complete experience of that phenomenon (Zahavi 2005). (Consider the post-traumatic stress disorder symptom of flashbacks. The entire experience, which may have lasted for minutes or longer, can flash through consciousness in seconds.) The researcher wants the individual to hold on to that moment of consciousness and then describe it. The researcher wants the individual to engage in a discourse to reveal the content of consciousness in that moment. If the researcher repeatedly draws the individual’s attention to the phenomenon over a period, then, via such a discourse, an individual can account for the content of the conscious act of a moment.

6.4.2 The Temporal Nature of Discourse

Earlier, the point was made that phenomenographers access the nature of the relatedness between people and phenomena by talking to the people (s. 6.1). The talking commonly takes place in interviews (s. 4.2).

An interview is typically about an hour. It is impossible to capture a stream of consciousness of an instant; therefore, there is an imposed temporality on the interviewee's utterances. The researcher needs to direct each individual's stream of consciousness to the phenomenon of interest with the aim of capturing, over the time of the interview, what the experience of the phenomenon is, as presented in each individual's consciousness and publicly manifested in each individual's utterances. In Section 4.2, this was expressed as the interviewer questioning in a way that prompts the interviewees to "call to mind" the linguistic representation of their experience of the phenomenon of interest and then to express their linguistic representations so that the researcher has data. The advantage of about an hour for an interview is there can be reflection by the interviewee on their experience and their articulation of that experience. The disadvantage is that experiences may pass so rapidly along the interviewee's stream of consciousness that they are forgotten before words about the experience can be uttered or even thoughts gathered to be articulated. However, since the researcher's questioning prompts the individual's utterances, the temporality of discourse should not significantly hinder the total set of data from being a representative sample of ways of experiencing a phenomenon.

6.4.3 Gestalt Theory

Gestalt theory is introduced in Section 5.5.2.2 as influential on phenomenography (Åkerlind 2003; Marton 1981a, 1986; Svensson 1997; Uljens 1996). Gestalt theory can be used in psychology as an explanatory theory of consciousness (Gurwitsch 1964/2010). In phenomenography, a philosophical interpretation of Gestalt theory, such as that taken here, entails a descriptive orientation. I employed the Gestalt organised forms of the whole-part relation and figure-ground structure (s. 5.5.2.2) to interpret and describe the conceptions of and approaches to analysis/design categories. To enable the employment of the Gestalt organised forms of the whole-part relation and figure-ground structure, I understand these forms as follows.

As stated in Section 5.5.2.2, the fundamental tenet of the Gestalt whole-part relation is that the whole is not determined by the individual parts; parts and whole are determined by the nature of the whole (Köhler 1959; Wertheimer 1925/1938). Furthermore, each part is the constituent of the whole, what the part is and how it behaves as a part process "[is]… intrinsic [to the] nature of the whole" (Wertheimer 1925/1938, ¶ 6). There are wholes within wholes forming a hierarchy of internal relations (Marton 1988a). The researcher sets the level of hierarchy by setting the topic of interest to investigate. The individuals reveal their experiences as words or behaviour. The researcher interprets the words and/or behaviour and describes the parts and the wholes in the results. The parts in the results are *constituents*. The constituents within categories, and the categories within the outcome space, are not parts that build up a whole, each part independent of the other parts. The parts are considered with and as the whole, each part contributing to the structure and meaning of the whole. To consider a part isolated from the whole is to consider it as a phenomenon, experienced as a Gestalt in its own right. The identity of each part is integral with the whole and the whole is integral with its parts. A category is the organised form of constituents; it is a Gestalt. The outcome space, the logical relation of categories, is a Gestalt on the next level up of the hierarchy (Figure 6.8).

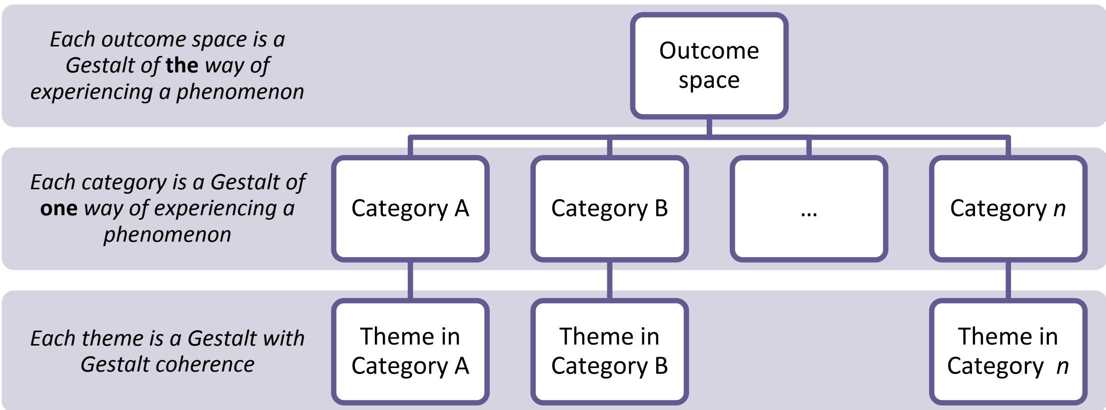


Figure 6.8: The outcome space, categories, and themes form a hierarchy of Gestalts.

As introduced in Section 5.5.2.2, the second feature of Gestalt theory that influences phenomenography is the figure-ground structure. During the research process, when the researcher is interpreting what is figure and what is ground (Marton 1988a), she steps into the world of the interviewee. She has in mind the hermeneutic rules, yet she takes along enough of her language about the phenomenon to understand what the interviewee utters. The researcher also develops and has, as a guide, analytical frameworks that she uses to draw attention to what is in focus or figural.

The figure has Gestalt cohesion. The figural parts have a bond. This bond makes the parts, or constituents, in the figure interdependent and interdeterminant. Each constituent appears as it does because of the relationship it has with the other constituents in the figure. All constituents to the fore are such that each one's functional significance is given by and taken from the other constituents, and they codependently qualify one another. The functional significance of a constituent, not all the details of the constituent, defines and accounts for the existence of that constituent in the figure structure (Gurwitsch 1964/2010). During the phenomenographic constant comparison method of data analysis (s. 4.5.1), the figure-ground structure is formed by:

- judging the weight of the functional significance of a constituent which places the constituent in figure or ground
- relating the constituent to other constituents
- deciding on the Gestalt cohesion of the constituent with other constituents based on the weight of the functional significance
- forming the Gestalt of the figure and the Gestalt of figure *and* ground.

In the figure-ground structure, the figure is in focus. Constituents may coalesce and become a larger more complex figure. The ground is the remainder from which constituents may emerge to coalesce with the constituents in the figure or to reorganise the figure. It is unity of relevancy that characterises the Gestalt nature of the whole figure-ground structure (Gurwitsch 1964/2010).

Gestalt theory is useful to the researcher's perspective of phenomenography. Gestalt theory underpins the interpretivist/descriptivist theoretical perspective. The whole-part relation helps the researcher see the results as part of the Gestalt hierarchy. The figure-ground structure helps the researcher to interpret what is figural and what is ground. When it came to the phenomenographic results of this study, I interpreted and described the part of the interviewees' streams of consciousness captured in the data that represented their ways of experiencing analysis/design. I constituted each category as a Gestalt, which I refer to as the field of a category.

6.4.4 Gurwitsch's Field Theory of Consciousness

As introduced in Section 5.5.2.3, Gurwitsch (1964/2010) expanded the figure-ground structure into a field theory of consciousness. His expansion of the figure-ground structure as a field included a theme as figure and thematic field as ground.

Gurwitsch made an analysis of consciousness and presented a field theory of the stream of consciousness of an individual. He used his field theory of consciousness to describe an individual's stream of consciousness, presenting his theory as a formal theory of organisation. I co-opted his theory as a means to describe a way of experiencing at a level away from the individual. I took the theoretical position that individual *streams* of consciousness are the ultimate source of data and my aim was to describe a segment of that stream as a *field*. What follows is a description of Gurwitsch's field theory of consciousness as I have interpreted the theory to achieve that aim.

The portion of Gurwitsch's field theory of consciousness that is applicable describes the "phase of achievement" (p. 31). This phase of achievement is an individual's discernment of salient and thematic constituents that emerge from the stream of consciousness as an organised whole or Gestalt of a phenomenon. The moment in an individual's stream of consciousness, when the individual calls to mind the phenomenon, is a phase of achievement. The moment in an individual's way of experiencing a phenomenon that allows them to talk about what *is* that phenomenon is a phase of achievement. A phase of achievement is what the researcher tries to capture during an interview. A phase of achievement for the phenomenon of interest is the portion of the individual's entire stream of consciousness in which the researcher is most interested. As the researcher, I think of interviews as transecting the stream of consciousness (Figure 6.9). I then investigate the cross-section of the stream. I look for the whole-part relations and the figure-ground structures, as described in Section 6.4.3. I analytically reduce the cross-sections of the streams I have captured, that is, the data, based on Gurwitsch's field theory of consciousness. The reduction of the data is constituted as Gestalts or fields. These Gestalts or fields are the categories of description.

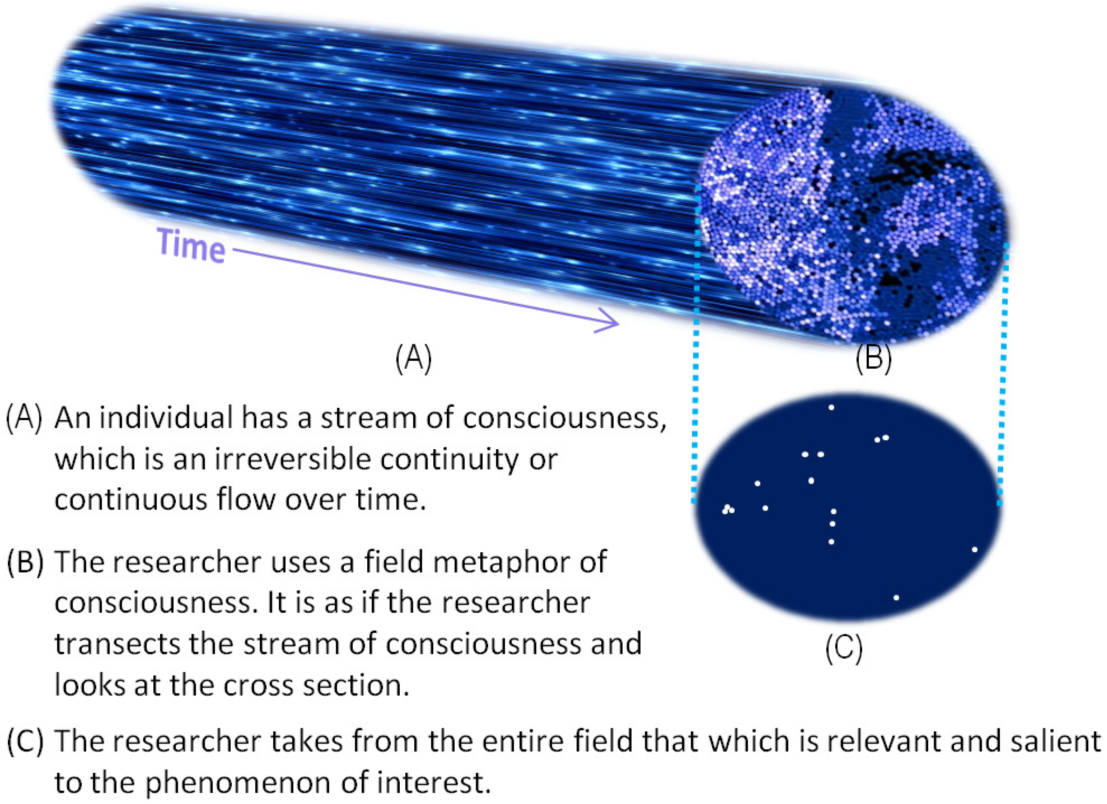


Figure 6.9: The metaphor of a stream of consciousness extended to the researcher transecting the stream. (Image sources: (a) Curtis 2011; (b) Dohrn 2011)

Describing the cross-section of the stream of consciousness with a field metaphor gives the researcher a static point of view of the dynamic person-phenomenon internal relation (Figure 6.9). This static point of view is analysed for constituents. The constituents are parts in the field (Figure 6.10). The salient constituents are parts in the theme. Together, the salient constituents form the theme. The thematic constituents are parts in the thematic field. At the margin are other items, which are not salient and have no relevancy to, bearing on, or concern to the theme. The description of the field is a category of description.

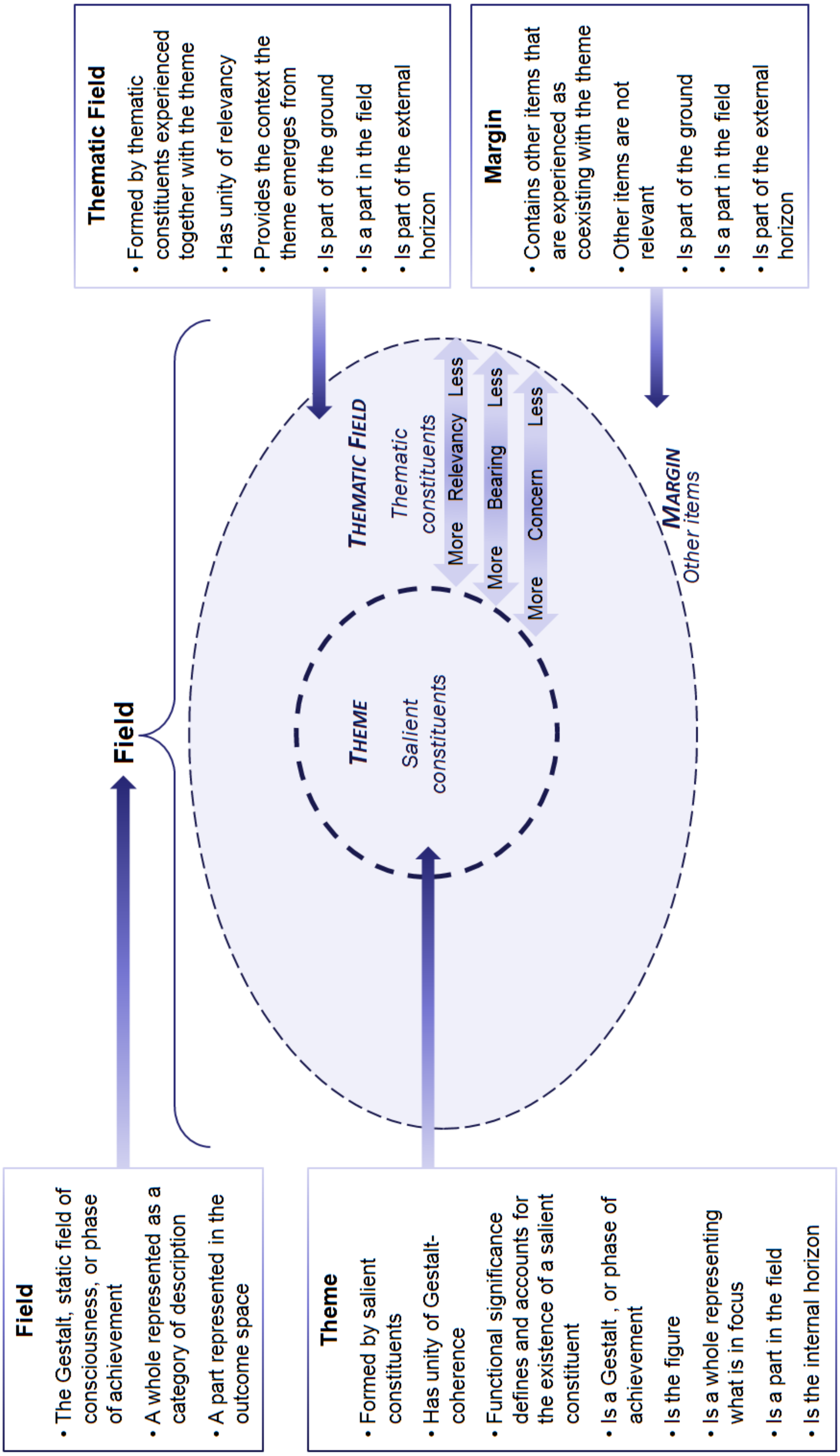


Figure 6.10: The Gestalt or field that is the static point of view of the dynamic person-phenomenon internal relation

The theme is what stands out from the field. The theme is the figure. The theme has unity of Gestalt-coherence; it is a whole formed from parts, or salient constituents. Salient constituents are the focus of the experience as described in a category. Each salient constituent is part of the theme because in relation to other constituents, the researcher judged that constituent to have greater functional significance. Functional significance is the importance of the role the constituent plays in the identity of the phenomenon as presented in a category of description. Each salient constituent is part of the theme because without the constituent, the theme would not have Gestalt cohesion. Gestalt cohesion is the bond a salient constituent has with other salient constituents as parts of the theme. Gestalt-coherence is a characteristic of the theme that gives it a presence as self-contained and unified. The theme and its salient constituents have a meaning that is central to the category of description.

The thematic field contains the thematic constituents. The thematic field has unity by relevancy. What is relevant to the theme, but not of great enough functional significance to the Gestalt-cohesion of the theme, is part of the thematic field. The thematic constituents are experienced together with the theme rather than having a mere coexistence with the theme. For there to be a unity by relevancy, the thematic constituents must appear in context (see below) and be pertinent to the category of description.

The thematic constituents are experienced simultaneously or in quick succession. Thematic constituents are not part of the figure. Thematic constituents are in the ground. There is an awareness of a thematic constituent as it has a relevancy to the theme, though it is not an awareness that makes the thematic constituent focal or part of the theme. The degree of relevancy locates the thematic constituent in the thematic field. A higher relevancy locates the thematic constituent close to the theme. Where the thematic constituent is determined, differentiated, and articulated, it is located in zones close to the theme. A low relevancy locates the thematic constituent in the remote zone of the thematic field. The thematic constituents in remote zones are vague and indistinct but still exhibit a tinge of relevancy to the theme.

Gurwitsch's (1964/2010) field theory of consciousness is used here to describe categories. Most previous connections of this theory to phenomenography have been made by applying the theory to describe the individual's awareness of a phenomenon (e.g., Booth 1992; Marton & Booth 1997; Marton 1992 cited in Uljens 1996). I make a similar connection between Gurwitsch's (1964/2010) field theory of consciousness as I have interpreted it and an individual's awareness by connecting a category of description to a hypothetical individual. For a hypothetical individual, the theme remains the same because of the unity of Gestalt coherence even though the thematic field may change. For instance, a theme of salient constituents, such as, working as an individual and focused on the technical issues, remains the same even though the thematic field may change. The theme may point and refer to documentation, a thematic constituent which is located in the remote zone of the thematic field as it has little relevancy to the theme. While the hypothetical individual holds the theme in focus (the salient constituents of working as an individual and technical issues), documentation is considered, however briefly, as more determined, defined, and distinct yet not part of the theme. Documentation may adjoin the theme, becoming an immediate concern to the theme, or having a bearing on the theme, but not bonding with the theme. This might be the case when the hypothetical individual decides whether to do documentation or not, if there is time to do documentation, and if documentation is relevant to the technical issues.

For the individual and the researcher, the relationship between theme and thematic field need not be completely articulated and distinct. It may be blurry or obscure with little or no differentiation of structure. Individuals' are most likely not aware of themes or thematic fields, just as they are not aware of the figure-ground relation (s. 5.5.2.2). For the researcher, the relationship between theme and thematic field is a judgement. The researcher judges what is a salient constituent and therefore part of the theme. The researcher judges what is a thematic constituent and therefore part of the thematic field. The researcher also judges what lies at the margin.

The margin lies outside the thematic field. The margin contains other items not relevant to the theme. The other items do not have a bearing on the theme. The researcher is interested in other items only as potential constituents in other categories. The identification of other items gives completeness to the category of description and helps form the outcome space. This differs from the typical categories of description, where other items at the margin are not included. When constituents appear in the more complex categories, it is helpful to be able to identify where the constituents may have been in less complex categories. However, this is possible only where there is supporting data.

Context as Gurwitsch defines it is the "experienced context, that is, as that which presents itself to the experiencing subjects mind" (Gurwitsch 1964/2010, p. 3). This definition does not suit my appropriation of his field theory as it addresses context for the individual. Context, for the purposes of co-opting the field theory and in the spirit of Gurwitsch's definition, is that which presents itself to the researcher as belonging in a category of description at the collective level. Context is the extent of the constituents relevant to the phenomenon. The theme emerges from the context. The context gives the theme its place in the field.

6.5 GIFTed Data Analysis

In the introduction to this chapter I identified, part (F) of the research process as encapsulating an articulation of the underlying theoretical stance used for this study (Figure 6.1). I then stated that the way I came to understand the various theories, which I have described above, converged into a form of data analysis that I developed and called GIFTed (Gestalt, Intentionality, and Field Theory of consciousness) data analysis, part (G) in Figure 6.1, which I describe in this section.

GIFTed data analysis is supported by the non-dualistic–experiential–interpretivist/descriptivist research position. I illuminated this position with a being-in-the-world ontology, internal relation theory, metaphors of a stream to describe consciousness, a field to describe a category, as well as types of intentionality, Gestalt theory, and Gurwitsch's field theory of consciousness. GIFTed data analysis is a combination of intentionality, Gestalt theory, and Gurwitsch's field theory of consciousness.

In Section 6.3, I described types of intentionality that lead to the development of analytical frameworks. The conception–of and approach–to analytical frameworks (Figure 6.5 & Figure 6.6) are part of the GIFTed data analysis technique. These frameworks are an evolution of Marton and Booth's (1997) basic and elaborated structures of learning (Figure 4.4 & Figure 4.5). I separated phenomenography from the education research content of these structures (e.g., Figure 5.16) in an attempt to understand these structures. This separation did not shed much light on how I could consistently apply these structures to the conceptions of and approaches to analysis/design. Marton and Booth (1997) present the what/how structure of learning as a special case of intentionality. I reasoned that this presentation of intentionality also needed separating from the education research content. Consequently, I presented interpretations of types of intentionality that are new to phenomenography (s. 6.3). I used those interpretations to develop the conception–of and approach–to analytical frameworks.

For a researcher to use the intentionality component of GIFTed data analysis, I would recommend doing some data analysis and then deciding on a type of intentionality appropriate to her study. For example, if the researcher were studying conceptions, I would recommend a type of intentionality as a theory of mind. If the researcher is studying approaches then intentionality as a theory of action may be appropriate. The researcher could then frame her theoretical perspective with an interpretation of her chosen type of intentionality. She would develop that frame to contain the elements in the analytical framework, or possibly adapt the conception–of and approach–to analytical frameworks.

In Section 6.4.3, I described my understanding of the Gestalt organised forms of the whole-part relation and the figure-ground structure. Being focally aware of these forms from Gestalt theory is part of the GIFTed data analysis process. When it came to the phenomenographic results of this study, a Gestalt was the field of consciousness that I constituted by interpreting and describing the interviewees' streams of consciousness represented in the data. For the researcher, having the Gestalt whole-part relation in mind during data analysis, interpretation, and description is critical to the research process that uses GIFTed data analysis. For the reader, an appreciation of the Gestalt whole-part relation is crucial to the reader's confidence in the study.

The co-opted field theory of consciousness, as described in Section 6.4.4, is part of the GIFTed data analysis technique. My interpretation of Gurwitsch's expansion of the Gestalt figure-ground structure into a field theory of consciousness supplements the analytical frameworks by providing a descriptive structure for the categories of description. As shown in the following chapters, I described categories of description as fields with themes containing salient constituents, thematic fields containing thematic constituents, and margins with other items.

In my phenomenographic constant comparison method, described in Section 4.5.1, the term salient constituent is used. This use of salient constituents confuses the meaning of the term salient constituents as parts in the theme. I can separate these two uses of the term by clarifying what I now regard as a salient constituent in the phenomenographic constant comparison method. During the initial data analysis, I used the phenomenographic constant comparison method to code salient constituents. Salient constituents at that time were anything in the data that were regarded as important and interesting in terms of the variation in the articulated ways of experiencing a phenomenon. I continued to use the phenomenographic constant comparison method following parts (F) and (G) of the research process. During the data analysis and interpretation process parts (H) and (I), I was doing less coding of coded-salient-constituents and more describing of constituents as either salient or thematic. What I had coded as salient constituents during the initial data analysis became coded-salient-constituents. The addition of "coded" to the name was a reminder that those constituents belonged to the analysis and interpretation process, not the descriptive process. Coded-salient-constituents were what I worked with in NVivo. Salient constituents were what I described as part of the theme. The GIFTed data analysis technique influenced my judgements as to whether the coded-salient-constituents were to be described as salient constituents as parts in a theme or thematic constituents as parts in the thematic field. Until I had made such a judgement, coded-salient-constituents were potentially salient constituents belonging in the theme. Coded-salient-constituents identified parts of the data as belonging within my interpretation of the context of analysis/design. Describing constituents as either salient or thematic determined where I positioned the constituents in the field.

6.6 Phenomenography and GIFTed Data Analysis

The GIFTed data analysis technique is new to phenomenography. GIFTed data analysis rests on my interpretation of some of the theories that have had varying influence on the evolution of phenomenography. My interpretation of several of these theories, which I describe above, changed my understanding of phenomenography. The following describes my understanding of elements of phenomenography as influenced by my interpretations of these several theories.

6.6.1 The Field and the Structure of Awareness

The field, that is, the static point of view of the dynamic person-phenomenon internal relation (Figure 6.10) is similar in appearance to Marton and Booth's (1997) structure of awareness (Figure 4.7) and Cope's (2000) structure of awareness (Figure 5.14). Where the Marton and Booth (1997) structure of awareness has been used, its use has been explanatory. Booth (1992) used a structure of awareness, based on Gurwitsch, to explain her results about learning to program. Marton and Booth (1997) also included the essence of Booth's work to explain an individual's awareness. Cope (2000), as identified in Section 5.5.2.3, used a similar structure of awareness to Marton and Booth's to constitute only the structural element, from the basic unit of a way of experiencing a phenomenon (Figure 4.6).

Unlike Cope's data analysis technique, GIFTed data analysis can guide the analysis, interpretation, and description of the structural and referential elements of the basic unit of a way of experiencing a phenomenon (Figure 4.6). The researcher when describing the field is describing the structural and referential elements. In relation to the field, the structural element is the constituents of the theme and thematic field, the relationship of the constituents to each other, the manner in which they form the whole, and the whole. The internal horizon (the theme in Figure 6.10) and external horizon (the thematic field and margin in Figure 6.10) of the field are the same as for the structure of awareness. The structure of the field is similar to the structure of awareness. The structure of the field is related to the basic unit of a way of experiencing a phenomenon in a way that is similar to the structure of awareness. The difference is that the descriptions of the structure of the field and the meaning of the field are regarded as a Gestalt.

The meaning part of the field pertains to the meaning of the phenomenon described in a category. My understanding of Gestalt theory influenced my decision to regard the meaning element as part of the field. In Gestalt theory, the individual bestows the experienced Gestalt of the phenomenon on to the meaning of the phenomenon. Therefore, a category of description describes a Gestalt and thus the meaning is described. To regard the meanings of each constituent as discrete, separate from the Gestalt, contradicts the intent of the Gestalt whole-part relation. The meaning of each part contributes to the meaning of the whole, the meaning of the part is not to be separated and regarded outside of the Gestalt.

6.6.2 Constituent or Aspect

I made a conscious choice to use "constituents" and not "aspects" to label the parts that form a whole. This choice is contrary to what is typical in phenomenography. Constituents is not used frequently in phenomenography in the way that I have used it (e.g., Booth & Anderberg 2005).

In phenomenography, the term "aspect" is overloaded with use, which makes its meaning ambiguous. To illustrate, Marton (1996) stated "we can discern entities and aspects and we can be focally aware of a few entities or aspects simultaneously" (p. 179). Is an aspect an attribute of an entity or something that is not an entity (suggested by the "and"), or is an aspect like an entity (suggested by the "or")?

When phenomenographers use the term "aspect", do they mean "a particular part or feature of something" (*Aspect noun* 2010), such as a salient or thematic constituent, or "a particular appearance" (*Aspect noun* 2010), such as the Gestalts of a theme or field? For example, Marton and Booth (1997) refer to "aspect" as an aspect of reality, that is, a phenomenon (Marton & Booth 1997, p. 148). However, there are also aspects of a phenomenon (p. 209), and aspects of a situation (p. 206). The "what" aspect, which may mean content (p. 91), and the "how" aspect, which may mean approach (p. 149), may have an object aspect (p. 44) and an act aspect (p. 44) respectively. In the basic unit of experience there is the structural aspect and referential aspect (p. 87). There are critical aspects of awareness (p. 99), critical aspects of a phenomenon (p. 126), and educationally critical aspects of a phenomenon (p. 67 & p. 74). There are discerned aspects (p. 209), though not all discerned aspects are critical aspects; and last, but not least, an aspect is a dimension of variation (p. 207).

Brentano (1874/1995) describes an aspect as an individual's unique and entire way of experiencing a phenomenon; it is the view of the phenomenon from the individual's perspective. Gurwitsch does much the same (cf. Gurwitsch 1964/2010, p. 199). I have reserved aspect to mean a particular appearance. For instance, the theme is similar to what some phenomenographers call one or more critical aspects in that both terms refer to what is in focus or the figure of a category. The theme is the focus of a particular appearance of a phenomenon.

6.6.3 Variation

Variation was introduced in Section 1.3.2 as part of the epistemological position of phenomenography. A general principle of phenomenography is that there must be "observable variation" (Marton & Booth 1997, p. 134). Furthermore, variation is present in the experience of a phenomenon and variation is present in the accounts of the experience of a phenomenon (p. 134). The individual experiences the former variation and the researcher the latter. An individual's experiences are a combination of memory traces, perceptions, and expectations (s. 6.3.1). An individual experiences the variation by discerning differences in the experience and simultaneously being aware of those differences.

When a researcher undertakes a phenomenographic investigation, she tries to capture the variation in individuals' experiences. For instance, she may interview people to capture their accounts of their ways of experiencing a phenomenon. She then analyses and interprets what was captured and describes the variation.

In terms of the field theory of consciousness, when an individual experiences a phenomenon, the saliency of a constituent results in focus being placed on that constituent and that constituent coalescing with other salient constituents. Thus, as more and more constituents become salient, they merge into a more complex experience of a phenomenon; the organised forms of the Gestalt of the experience become more complex. For an individual, the capability to "judge" the saliency of a constituent is brought about by experiencing variation in a constituent or an aspect of the phenomenon. Something changes in the experience that directs the stream of consciousness to consider the constituent as salient (or not) to the phenomenon experienced or an aspect of the phenomenon is experienced in a different way; the individual experiences a dimension of variation. For the individual, the experience of variation may be overt or deliberate, such as learning about a phenomenon, it may be covert or accidental, a change in experience realised on reflection, or perhaps not at all, the change coalesces without notice.

In terms of the field theory of consciousness, the researcher's task is to map the variation, to describe fields as framed moments from the individuals' streams of consciousness. For the researcher, discerning variation in the accounts of ways of experiencing allows her to judge a constituent as having a particular place in the structure of the field and a particular meaning to the Gestalt. The researcher's interpretation of the variation in the focus of a way of experiencing gives rise to alterations and modifications to the field. The researcher describes the range of variation as categories.

6.6.4 The Limited Number of Ways

The limited number of ways people experience a phenomenon was introduced in Section 1.3.3 as part of the theoretical perspective of phenomenography. I now explore this position further here. The being-in-the-world ontology means we are all in and of the world. We share what we can of our experiences in the world with others by communicating; by our words and behaviour, we publicly manifest our ways of being-in-the-world. We understand what is shared by coming to know the meanings of the publicly manifested words and behaviour. The phenomenographic position is that being able to share experiences by words and behaviour is what limits the number of ways a phenomenon is experienced (Marton & Booth 1997). The position that experience is limited to a number of ways appears to contradict the being-in-the-world ontology, that is, our experiences are unique and unsharable. When we distinguish between our experiences and sharing what we can of our experiences, then the contradiction disappears. Hirsch (1967) wrote:

> *I can never know another person's intended meaning with certainty because I cannot get inside his head to compare the meaning he intends with the meaning I understand, and only by such direct comparison could I be certain that his meaning and my own are identical.* (p. 17)

However, what each human being does is constantly compare their own understanding of what someone has shared with their own experience of a phenomenon. The phenomenographic position is that the comparisons we make, our ability to understand each other, requires some commonality, such as our language and discernment of similar constituents and aspects of the phenomenon. Further, because there are limits to what can be common, there are limits to ways of experiencing when described at the collective level. Furthermore, our knowledge, what we understand, changes with time. Consequently, the results of phenomenography, categories of description and the outcome space, are attainable as a finite set, but an open set; more might be added to the categories and outcome space as our understanding changes with time.

6.6.5 The Second-Order Perspective

Phenomenography is often likened to phenomenology; however, a distinguishing characteristic of phenomenography is that it is concerned with the second-order perspective whereas phenomenology is concerned with the first-order perspective (Smith 2011). The first-order perspective is of the person. The second-order perspective is of the account of the experience given by the person in the person–thing relation (Marton 1981a; Pratt 1992). The researcher with a first-order perspective is looking at the person or the thing. The researcher with a second-order perspective interprets and describes the account of the experience, the person–thing internal relation (s. 6.2), provided by the person.

For example, when the topic of interest from some phenomenographic studies are shown as person-phenomenon internal relations (Figure 6.11), we can see that it is the relation between the person and the phenomenon that is the researcher's focus. From (A) to (E) in Figure 6.11, the conceptions of, approaches to, or ways of experiencing are the researcher's focus.

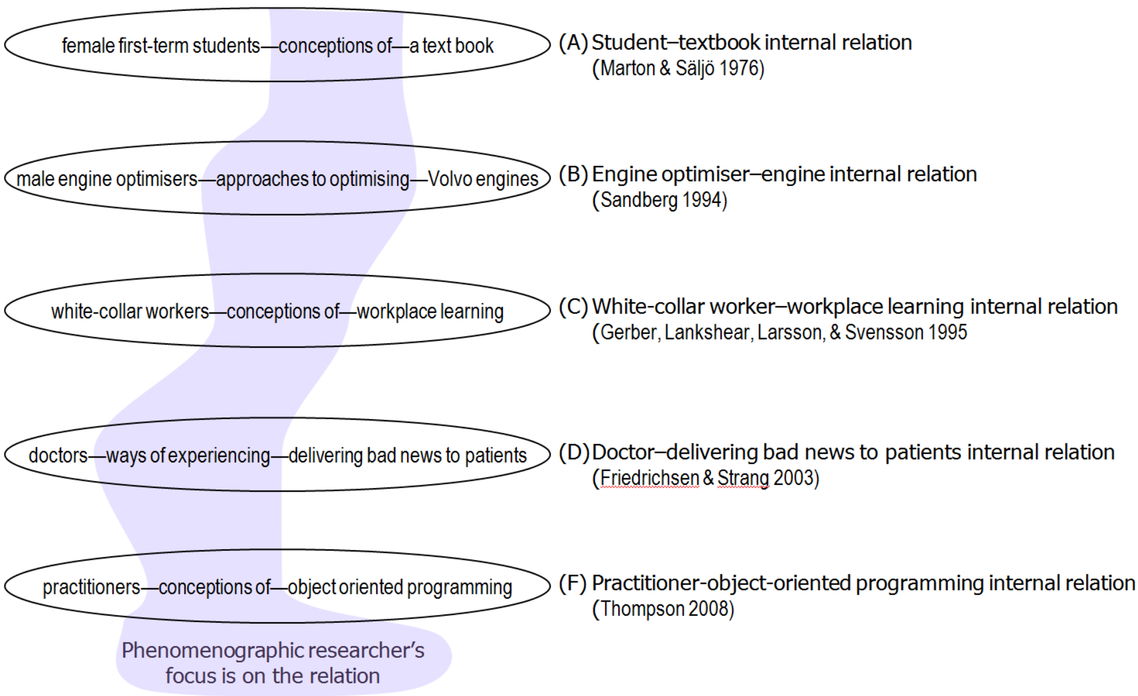


Figure 6.11: The relation is the focus of phenomenographic research.

6.6.6 Collective Level

The collective level at which the researcher interprets the data was introduced in Section 1.3.3 as part of the theoretical perspective of phenomenography. In the light of parts (F) and (G) of the research process, I have come to understand the interpretation of the data at the collective level in the following way.

In a phenomenographic study, there are potentially as many internal relations as there are interviewees, but in practice, this is not the case. Many hundreds of phenomenographic studies (Alexandersson 1994) have reported a *limited* number of qualitatively different ways because what is examined is the collective pool rather than individual instances of experiences.

An analytical philosophical treatment of the collective experience is that the collective "removes" the individual and examines the relation as it is presented. For instance, Connie believes *that* analysis/design is a creative process. To remove the individual is to treat the "that"-clause as the focus of data analysis, namely that analysis/design is a creative process. The embedded "that"-clause can be stated independently of the individual as the description of a relation that can exist between any analyst/designer and analysis/design; not to state that it does exist, just that it can exist. Thus, a category of description is a projection of an instance of the person–thing internal relation. The projection is not the entirety of the relation, but instead it is how this projection varies from other projections. As the individual is removed, a person in the internal relation captured as a category of description is a quasi-individual, non-existent, most probably, but in the collective pool, at a meta-level, not at the level of the individual.

Categories of description are not, nor are they meant to be, directly matched to one individual. Just as the categories describe the collective, without pinpointing an individual as the single source of a category of description, the intent of categories of description remains a description of the collective way of experiencing to which an individual is most likely to find that she stands not completely in one or another category.

6.6.7 Phenomenographic Outcomes

As well as coming to understand phenomenography in a particular way, I have refined my understanding of phenomenographic outcomes based on the theoretical underpinnings described in this chapter. The GIFTed data analysis technique changed how I constituted categories of description and the outcome space.

The researcher's experience of variation, at the collective level, in the ways of experiencing a phenomenon is part of the process of doing "pure" phenomenography. The other part is describing what the researcher experiences in the form of an outcome space. A phenomenographic outcome space is a set of categories and the structure showing the relationships between the categories.

For this study, a category of description is:

- a description of the intentionality based on the type of intentionality incorporated into the analytical framework (e.g., Figure 6.5 & Figure 6.6)
- a Gestalt of *a* certain way of experiencing a phenomenon

- the salient constituents within the theme, the thematic constituents within the thematic field, and possibly, though not necessarily, other items at the margin (Figure 6.10)
- different from other categories
- prose supported by illustrations from the data and describing the publicly manifested words and behaviour, from the interviews, written in accordance with the stated theoretical underpinnings of this phenomenographic research process.

The categories of description are representative of the collective. For this study, the collective, in the smallest sense, are the 20 interviewees. In a larger sense, the group of people from which the interviewees were drawn is the collective; the interviewees are a cross section of the analysis/design profession.

The outcome space is a cohesive and unitary whole about the phenomenon, though it is not the totality of the whole. Just as each category is not the totality of the whole (by being only one description of a way of experiencing a phenomenon); the outcome space is but one researcher's interpretation of one set of data and at one point in time. The outcome space is a finite, yet open set.

An outcome space is typically hierarchical, formed by considering the inclusiveness of one category to another and the sophistication and complexity of a category in regard to others (Marton 1986). An example where the outcome space is not hierarchical is the variation in interpretation and use of intentionality as described earlier (s. 6.3). Each interpretation of intentionality has its own complexity such that the interpretations are more like nodes in a network rather than being inferior or superior to any other interpretation.

6.7 Summary

Phenomenography is grounded in Brentano's thesis of intentionality (Pang 2003, p. 145). However, I established during data analysis and interpretation process part (F) that, in phenomenography, intentionality is not a special case of Brentano's intentionality. There are types of intentionality, for example, intentionality as a theory of mind, intention as theory of action, and the folk concept of intentionality. I used types of intentionality as part of the GIFTed data analysis technique.

As well as intentionality, Gestalt theory and Gurwitsch's field theory of consciousness contribute to GIFTed data analysis. The Gestalt organised forms of the whole-part relation and the figure-ground structure are part of the GIFTed data analysis technique.

By incorporating the metaphor of a field and drawing on Gurwitsch's field theory of consciousness, GIFTed data analysis guides the presentation of categories as salient constituents, which form the theme; thematic constituents as parts in the thematic field, and other items at the margin.

My combining the GIFTed data analysis technique with the phenomenographic constant comparison method resulted in a research process and outcomes in which the reader and I can be *confident*. Furthermore, for this study, the theoretical underpinnings, the research method, the research process, and the final results are *congruent*.

I continue to demonstrate my *interpretive awareness* in Chapters 7 to 9. These chapters report on how GIFTed data analysis was used to constitute conceptions of analysis/design categories, approaches to analysis/design categories, and the relationships between the conception categories and approach categories. These chapters are the presentation of the final results from this study.

7 Conceptions of Analysis/Design Categories of Description

In this chapter, the research focus is analyst/designers' understanding of analysis/design. A conception of analysis/design is to conceive analysis/design as a disembodied abstracted idea (see s. 6.3.1). Conceptions of analysis/design differ from approaches to analysis/design because conceptions are not about the execution, realisation, or physical doing of analysis/design. The initial analysis of interviews exposed difficulties in the determination of conceptions from approaches (Chapter 5).

In this chapter, I describe part (H) of the data analysis and interpretation process (Figure 7.1), in which I applied the GIFTed data analysis technique in combination with the phenomenographic constant comparison method to overcome these difficulties. I thus answer the first of my three questions about analyst/designers' ways of experiencing analysis/design:

Research study question 1 of 3:

What is the variation in analyst/designers' qualitatively different conceptions of analysis/design?

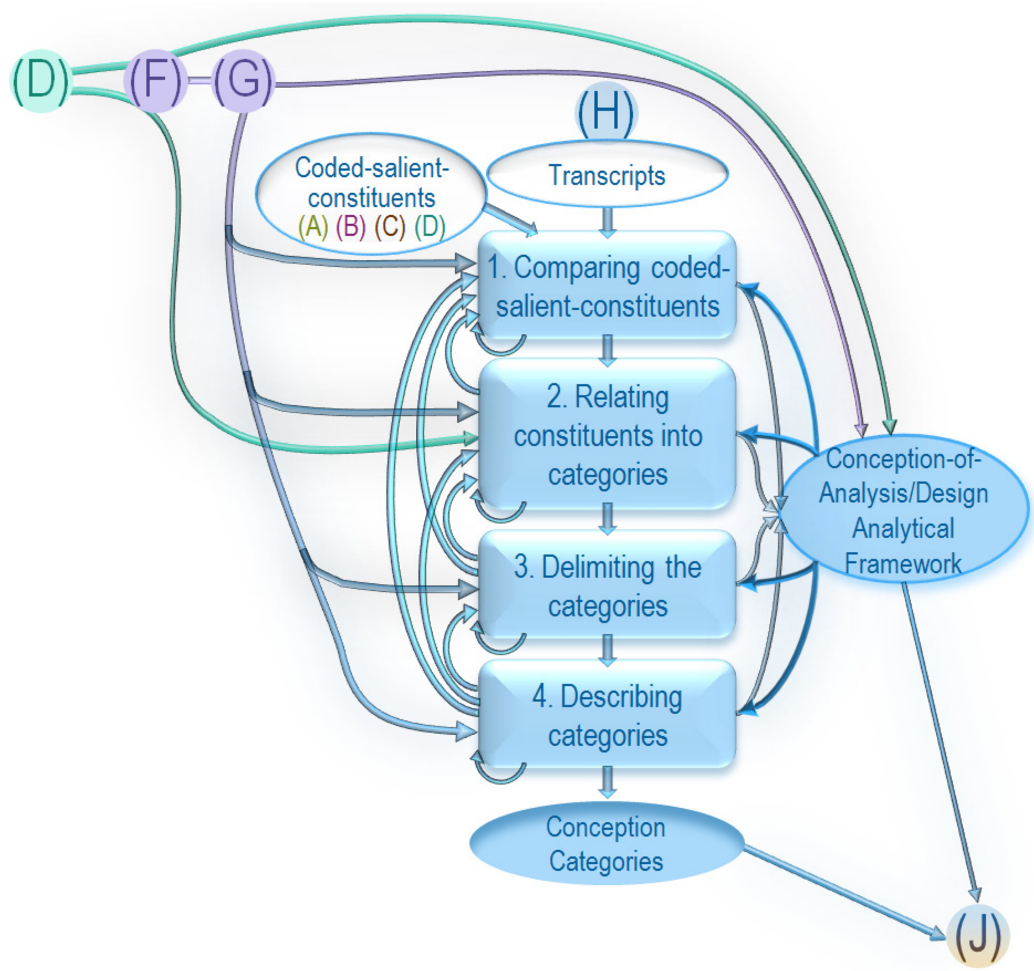


Figure 7.1: Part (H) of the data analysis and interpretation process

After the initial analysis and interpretation of the data (Figure 5.2 parts (A) to (E), I elaborated the theoretical underpinnings for this study and developed GIFTed data analysis (Figure 5.2 parts (F) & (G)). The elaboration of the supporting theories realised intentionality as a theory of mind, (i.e., “a mental reference to a content of consciousness” (Brentano 1874/1995, p. 187), see s. 6.3.1) as an aid to the interpretation and description of conceptions. My interpretation of intentionality as a theory of mind provided the frame for my interpretivist/descriptivist theoretical perspective for constituting conceptions of analysis/design. This frame contains *what* is the intentional content of consciousness, and *how* is that content focused upon, as two elements in the conception-of analytical framework (Figure 6.5). The conception-of analytical framework (s. 6.3.1 & Figure 6.5) was adapted during the constituting of the final conceptions of analysis/design categories of description. The resulting conception-of-analysis/design analytical framework (Figure 7.2) guided the data analysis and interpretation to constitute the conceptions categories.

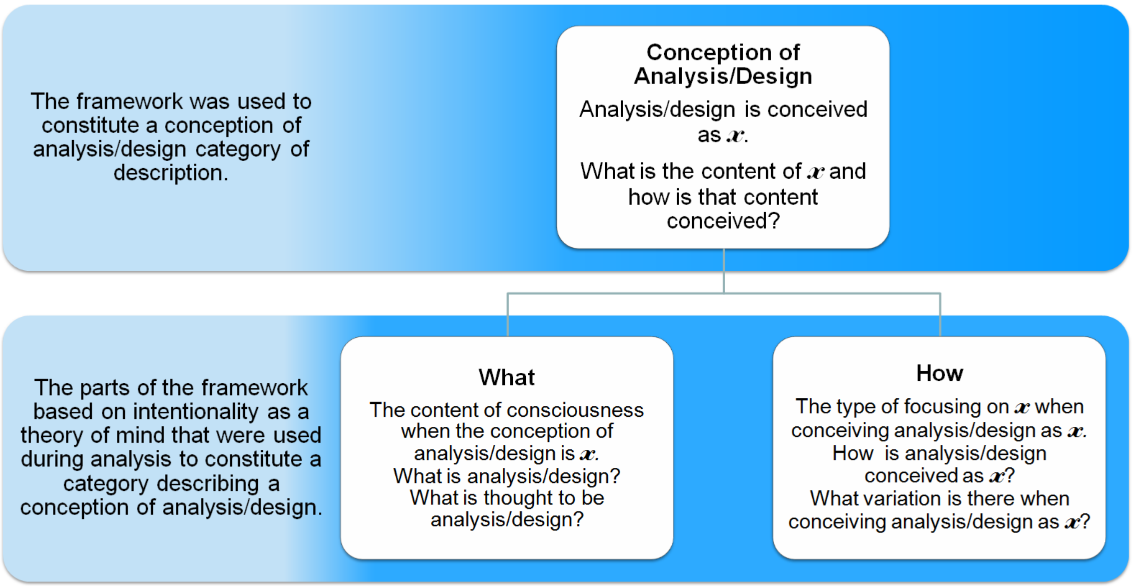


Figure 7.2: The conception-of-analysis/design analytical framework

The what–element and how–element of the conception-of-analysis/design analytical framework became the foci of the analysis and interpretation of the data for the constitution of the conceptions categories. In part (H) of the research process, when I came to analyse the data again for the variation in conceptions of analysis/design I concentrated on:

- *The what–element as the intentional content of consciousness* (as captured in the transcripts): I interpreted, for each particular conception of analysis/design, what was presented as the content of consciousness. My interpretation of the interviewees' utterances was guided by the questions in the what–element (Figure 7.2): "What is analysis/design?" and "What is thought to be analysis/design?".
- *The how–element as how that content of consciousness was focused upon*: I interpreted, for each particular conception of analysis/design, how was the content of consciousness presented. My interpretation of the interviewees' utterances was guided by the questions in the how–element (Figure 7.2): "How is analysis/design conceived as this particular conception?" or "What variation is there when conceiving analysis/design as this particular conception?".

In addition to intentionality, the Gestalt whole-part relation, the Gestalt figure-ground structure, and a field theory of consciousness are part of GIFTed data analysis. The Gestalt whole-part relation guided the interpretation of the structure and meaning of each conception category. Each category and each theme, within a category, are Gestalts. The Gestalt whole-part relation also applies to the outcome space. The outcome space is the whole and its parts are the five conception categories. The Gestalt whole-part relation applies to the parts of each category description, that is, the prose, quotes, and field diagram, which form a whole.

A field theory of consciousness, adapted from Gurwitsch (1964/2010), was used to organise the whole and parts of each category into a field with a theme of salient constituents, a thematic field of thematic constituents, and other items at the margin (Figure 6.10). The Gestalt figure-ground structure guided the interpretation of what is figural, that is, in the theme and what is ground, that is, in the thematic field and margin.

The five categories describing the variation in the qualitatively different conceptions of analysis/design were constituted from the data using GIFTed data analysis combined with the phenomenographic constant comparison method. The five conception of analysis/design categories of description are:

Conception Category 1: *Differentiate analysis/design as something other than programming.*

Conception Category 2: *Catalogue separate analysis/design tasks into a sequential and orderly activity.*

Conception Category 3: *Idealise analysis/design as how to deliver what the client wants.*

Conception Category 4: *Contrast actual and ideal analysis–what and design–how.*

Conception Category 5: *Integrate exploring the organisation and problem with creating an abstract solution.*

Each conception category is labelled using a verb, to describe how the conception is brought to mind, and a phrase following the verb, to describe what is brought to mind. In each conception category, the what, the how, and the features of significant difference from other categories are described. I have described each category as a field, distinguished the second and succeeding categories from preceding categories, and formed a logical structure of the categories as the outcome space. The conception of analysis/design categories of description are the first in three sets of results.

7.1 Conception Category 1: Differentiate analysis/design as something other than programming

In this first conception of analysis/design category of description, analysis/design is about analysis/design being something other than programming.

> *I18* *A software developer to me thinks outside of the box, outside of just being "Here's your task go and program it, come back.", [when you do that] you don't think of the whole design of it [viz. the task], the whole [...] the whole extra bit, it's not just [I18's emphasis] doing the programming [...] you decide how the functionality is going to work before you've even written or typed one letter on the keyboard. You think about all the things you have to check before you do something and all the things it [viz. doing the task] is going to effect, what else you're going to have to change, things like that—that's what I think of as design. I think [design is] just stepping back from that whole thing [viz. going and programming a task and coming back] and looking at it as a whole picture kind of thing*

In this category, the *what* of analysis/design is *something other than programming*. The something is a "whole extra" (I18) something requiring the analyst/designer to step back from just going and doing the programming needed to complete a task. The step back from "*just* doing the programming" (I18) is the analyst/designer considering the whole task. What is analysis/design is vague, other than it being something other than programming. Analysis/design appears more focused on design than analysis, though what the distinction is between the two is not clear. The focus is on analysis/design as doing the task and the effect of doing the task a particular way.

How the something other than programming is focused upon is to *differentiate* between programming and something other than programming. Differentiate, as used here, is to "recognize or ascertain what makes ([…] something) different" (*Differentiate verb* 2010). The way analysis/design is brought to mind is to differentiate analysis/design, from programming, as not-programming. How analysis/design is brought to mind in Conception Category 1 is as vague as what is brought to mind.

The field of Conception Category 1 (Figure 7.3) is minimal. The field is the least complex of the categories. There are few salient constituents within the theme. The salient constituents are something–other–than–programming and effect–of–the–task.

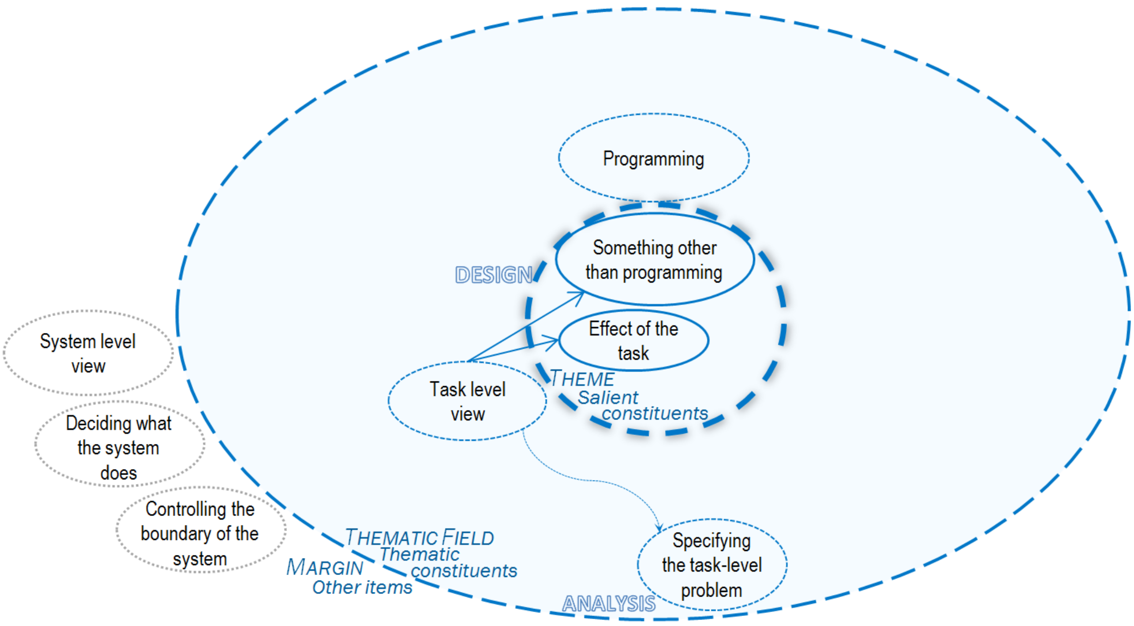


Figure 7.3: The field of Conception Category 1

The thematic field, the ground from which the theme emerges, includes few thematic constituents. A thematic constituent adjoining the theme is programming. Programming tends to push the focus away from something–other–than–programming, that is, away from the analysis/design that is not-programming. When programming pushes the focus away from the theme of analysis/design, the field of programming takes the place of the field of analysis/design.

Int What does the word design mean to you?

I18 I'm thinking like art and kind of things like that, that's what I think of in terms of design like making a piece of artwork, in terms of programming.

I treated analysis and design as analysis/design during interviews. In this first conception category, analysis and design appear separate. Analysis, in terms of specifying the problem the task is addressing, is less relevant to the theme. Consequently, specifying–the–task–level–problem is a thematic constituent in the thematic field of this conception of analysis/design category. The specifying–the–task-level–problem lies near the margin, as it has little relevance to the theme.

Int And how do you see the creation of the spec [viz. specification] fitting into, getting the spec and then creating the artwork, the program?

I18 [Pause] I don't know... I just think the creation of a spec usually comes from a client who is having trouble [...] because they're doing something very specific, ongoing, *everyday in the same area, not in multiple areas of the system [...] so they express that and then a spec will come from that, design and things like that.*

Design is more relevant to the theme and therefore placed closer to the theme. In this category, design makes programming easier.

Int *Do you see a difference between analysis and design?*

I13 *Yes, analysis is what must be done and design is how you do it, so there is a major difference. And analysis will help you to estimate how long it [viz. the task of completing a change request] would take, but design will break down the system for you, so it's easier for you to actually implement what you're trying to do anyway, so there is a major difference of course.*

A task–level–view of the project is also a constituent of the thematic field. A task–level–view has a bearing on the theme. A task–level–view does not have the functional significance to make it part of the theme. The task level is relevant rather than functionally significant to the theme because it points to the level *within* which the theme is in focus. There is not a focal awareness that the view is only at a task level. The task–level–view is not figural; the task is the extent of what is figural. Other constituents refer to the task–level–view constituent. The programming in something–other–than–programming is programming at a task level. The effect in effect–of–the–task is an effect at the task level. The level at which the problem is specified is at the task level.

The task–level–view constituent is an example of where the boundary of what is theme and thematic field is not distinct (see s. 4.5.2, s. 6.4.4, & Figure 4.7). For example, another researcher might consider that the task–level–view is part of the theme because the task level is the extent of what is figural.

The other items at the margin of the Conception Category 1 field are analysis/design elements that are not part of the conception in this category. The other items of deciding–what–the–system–does and controlling–the–boundary–of–the–system belong to someone other than the analyst/designer, such as the architect. These other items and the system–level–view are outside of what analysis/design for the analyst/designer is about.

Int *Can you tell me what is an architect, when you use that word what do you mean by it?*

I18 *The person who is designing the system, the person who has control of it.*

Int *What do you mean by designing it and what do you mean by control of it?*

I18 *Designing it is more like… more what they want the system to do, how they want the whole system to interact with each other. Controlling it is more like "yes or no". "You can't have that piece of software", "No, we can't do that functionality in [this BIS] it doesn't make any sense at all, it's not what I've [viz. the CEO] intended it for", it's things like that, that's the control of it. So design of it is more open, more think about it for a while and suggest different alternatives and come up with the right solution to a problem, whereas control is yes or no you can't have that kind of thing.*

I interpreted the other items as being at the margin: system–level–view, deciding–what–the–system-does, and controlling–the–boundary–of–the–system, as part of an internal relation between someone other than the analyst/designer and analysis/design. For this category, the other items at the margin are not part of the analyst/designer–analysis/design internal relation. Therefore, the other items at the margin are not part of the conception of analysis/design in this category. The other items at the margin for this conception of analysis/design restrict the conception to the task level.

In summary, in this first conception category, the how of analysis/design is to differentiate; what is differentiated is analysis/design from programming. The something–other–than–programming and the effect–of–the–task cohere as the theme. The analysis/design conception, in the analyst/designer–analysis/design internal relation described in this category, has a task–level–view. Design appears to have more bearing on the theme than analysis.

7.2 Conception Category 2: Catalogue separate analysis/design tasks into a sequential and orderly activity

In Conception Category 2, analysis/design is about a sequential and orderly activity made up of separate analysis/design tasks.

I11 *Software development process starts with, I have just forgotten the technical terms being used, but the whole process is: […] starts with the user telling you what he or she needs; you, the designer, taking those needs, putting it into a diagram or a design, and then, showing it back to the user, modifications being made; and then, whilst you're doing all this, you'll be documenting; and then, in the testing phase, you also make sure that each section or module is performing what it is supposed to do and you also try to test the whole system to see if it does exactly what it is* *supposed to do, and basically that's what the whole software development process is like, yeah.*

In this second category, the *what* of analysis/design is the *sequential and orderly activity of separate analysis/design tasks*. The activity is an orderly progression from one task to the next. The separate tasks or "phase[s]" (I11) are:

1) someone giving requirements to the analyst/designer
2) the analyst/designer diagramming, modelling, designing, or prototyping
3) the analyst/designer showing the diagram, model, design, or prototype to the user
4) the analyst/designer making modifications
5) the analyst/designer testing each module and the system

Documenting is part of each of these phases. The separate tasks are clearly articulated. The details of what each task entails are not clear. The focus is on analysis/design as starting with someone (e.g., the user) telling the analyst/designer what the requirements are, then progressing to the next task, and then the next, until analysis/design is complete.

How the activity made up of separate analysis/design tasks is focused upon is to *catalogue* the tasks into a sequential and orderly activity. Catalogue, as used here, is to "list (similar situations, qualities, or events) in succession" (*Catalogue verb* 2010). An alternate description of the how of Conception Category 2 is *adumbrate*, as in "represent in outline" (*Adumbrate verb* 2010). The way analysis/design is brought to mind is to list in succession analysis/design tasks, or to represent these tasks in outline.

The field of Conception Category 2 (Figure 7.4) is more complex than the previous category. The theme entails a structure where salient constituents coalesce in a nested manner. The salient constituent separate–tasks is nested inside sequential–and–orderly–activity. The salient constituent sequential–and–orderly–activity is nested inside documenting. The salient constituent testing is a task that, when in the theme, would be in the separate–tasks constituent as one of the tasks.

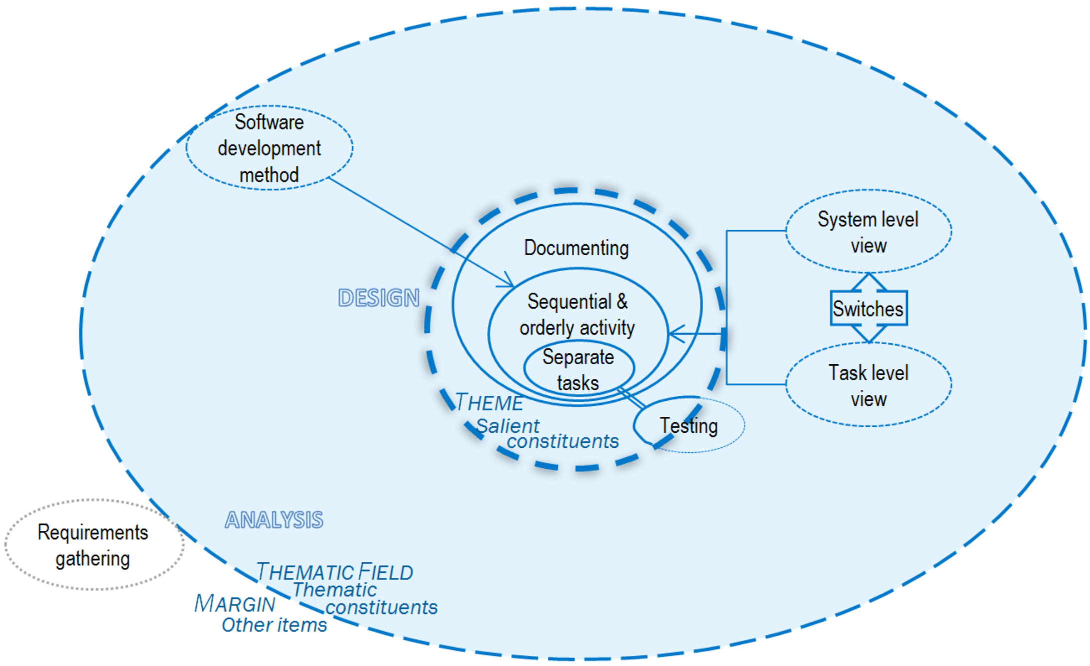


Figure 7.4: The field of Conception Category 2

The documenting of what takes place during the sequential and orderly activity is the focus rather than the details of what each separate task may entail. Documenting encloses the other salient constituents because "proper" analysis/design, in this category, is about documenting.

> I13 *to be a proper software engineer, you actually have to do all that [viz. analysis/design] properly, you actually got to document what you do and analyse, and document what you do, document the design, document the actual testing process or you have to write it down what test plan and document the actual testing process [...]*
>
> Int *[...] were you doing analysis and design then?*
>
> I13 *Yes at that stage I had to actually write the document, write some form of document to actually show it to the team leader*

In contrast to Conception Category 1, where the view was only at the task level, in Conception Category 2, the view switches between a system level and a task level. When one level of view becomes more relevant, the other view becomes less so. When describing the phases as a sequential and orderly activity, the system level is of concern more than the task level. When presenting each separate task, the task level is of concern more than the system level. Similar to Conception Category 1, where the task–level–view is in the thematic field, the system–level–view and task–level–view in this category are in the thematic field. Neither the system–level–view nor the task–level–

view has the functional significance to be part of the theme. The level of view is not figural. Each view is part of the ground from which the theme emerges. For example, a catalogue of activity is generic enough to be describing activity at a system or task level. However, the activity, such as a change request, might only be at a task level.

I13 *So first of all you read what the change request asks you to do [...] and then you analyse how long it would take and you have to tell the team leader how long it will take [...] and then write [... a] test plan*

The constituent of testing expressed as a "testing phase" (I11), "unit testing" (I14), "integration testing" (I14) or a "test plan" (I13), is a salient or thematic constituent in Conception Category 2. Testing is part of the theme as one of the separate–tasks. The emphasis on documenting the testing, rather than testing itself, puts testing as one of the tasks in the theme. Yet, testing may be associated with programming rather than analysis/design, or as something that is not one of the tasks in the analysis/design sequential and orderly activity. Therefore, testing can also be a thematic constituent.

In the thematic field, close to the margin, is software–development–method from which labels for tasks or the activity emerges. The software–development–method itemises the "forgotten […] technical terms" (I11). The software–development–method provides document templates.

Int *What [do] you think analysis and design is [...]*

I14 *After having [been given] the requirements for a particular project [...] We used to sit together, the development team, to do the analysis for what's required, do proof of concepts for some vague portions of the programme or that system, and for the design we had some design templates that we had to follow, mainly it was RUP [Rational Unified Process] documents [...] after finishing the design and analysis we used to start coding with unit testing and with integration testing and all these thing.*

As with Conception Category 1, more emphasis appears to be placed on design than analysis, positioning both in the thematic field similarly to Conception Category 1. Design is more relevant than analysis because design refers more to sequential–and–orderly–activity and documenting.

I14 *for example [...] there wasn't really studying or understanding of what is really required. Just formatted use cases [...] "Draw these ellipses, mark some arrows to them, that's it, okay, class diagram, what do we have?" It wasn't really analysis or* *design with classes, all these things. Just we have to fill in these documents, we have to produce them, give it to the project manager, and that's it.*

Requirements–gathering is not part of the theme, or thematic field, of Conception Category 2. Requirements are prepared and available before analysis/design begins. The analysis/design activity is initiated after the analyst/designer is given the requirements. The person who instructed I14: "Draw these ellipses, mark some arrows to them, that's it, okay, class diagram, what do we have?", was not aware that requirements–gathering is part of analysis/design. My interpretation of I14 recognising requirements are provided without any "understanding of what is really required", is that requirements–gathering lies at the margin.

In summary, in this second conception category, the how of analysis/design is to catalogue or adumbrate and what is catalogued is separate tasks into a sequential and orderly activity. In the theme, the documenting salient constituent encloses the sequential–and–orderly–activity salient constituent, which in turn encloses the separate–tasks salient constituent. The analysis/design conception, in the analyst/designer–analysis/design internal relation described in this category switches between a system–level–view and a task–level–view. The software–development–method has little bearing on the theme. As with the first category, design appears to have more bearing on the theme than analysis, though neither are parts in the theme.

7.3 Conception Category 3: Idealise analysis/design as how to deliver what the client wants

In Conception Category 3, analysis/design is what the client wants and how to make it happen to deliver what the client wants.

Int *Do you call it analysis and design or do you call it...*

I19 *Gathering requirements [...] we get the business requirements first, primarily what do they [viz. people from various areas of the business that are going to be affected, called stakeholders] want. Then we look at how they expect that they want it [...] then once we've got that nailed down [...] separately [...] how is it going to happen [...] How can we make the software deliver what the business wants.*

In this third conception category, the *what* of analysis/design is *what the client wants* and *how to deliver what the client wants.* Client is the term I use to mean customers, users, stakeholders, the business, or "people from various areas of the business that are going to be affected" (I19). What the client wants is conceived as the gathered requirements and getting the client to settle on those requirements in a definitive way, that is, "nail[ing] down" (I19) what the client expects the system to do. How to deliver what the client wants is the conversion of the definitive requirements into a design for the software, or a system, that will match those requirements. The focus is on idealised analysis/design, where requirements are set before the designing of the software begins, and the design is set before construction begins.

The *how* of what-the-client-wants and how-to-deliver-what-the-client-wants is focused upon is to *idealise* analysis/design. Idealise, as used here, is to "regard or represent as perfect or better than in reality" (*Idealize verb* 2010). The way the idealised analysis/design is brought to mind is to represent the settling on the requirements and the design as providing a final decision that will not be questioned or changed. The process of the idealised analysis/design is represented as methodical, proceeding from one task to the next because the requirements and design will not be questioned or changed.

The field of Conception Category 3 (Figure 7.5) has a more complex structure and content than previous categories. The structure of the theme entails two salient constituents nested within another. The nested salient constituents, what–clients–want and how–to–deliver–it, are joined to each other. The other salient constituent, idealised–analysis/design, encloses what–clients–want and how–to–deliver–it.

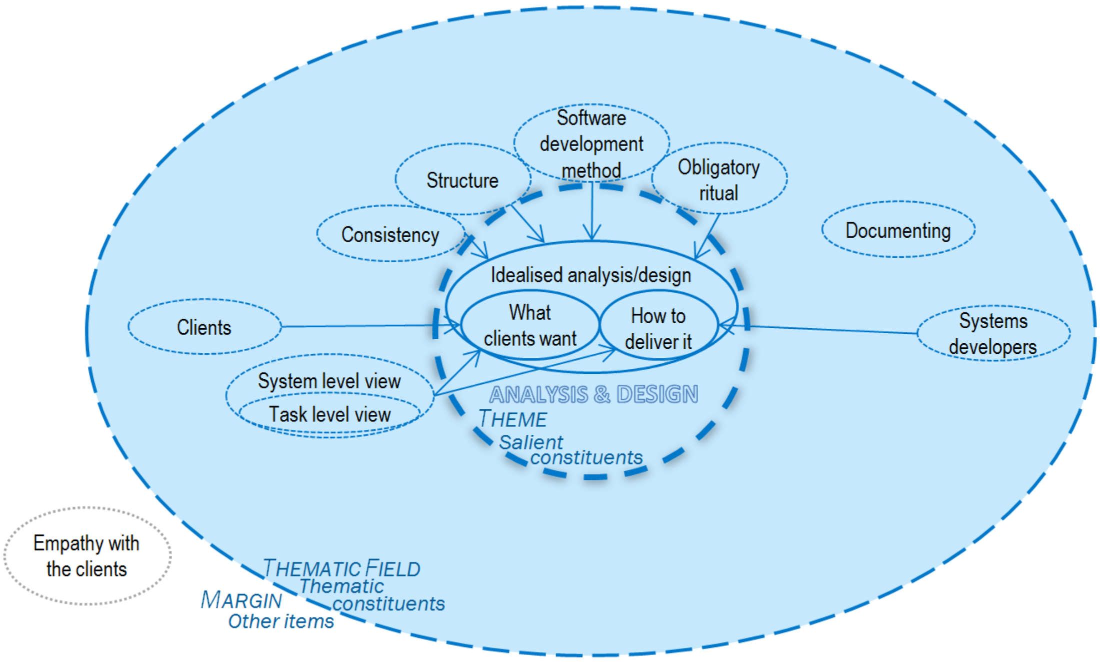


Figure 7.5: The field of Conception Category 3

In Conception Category 3, idealised–analysis/design is a focus on a perfect or ideal world without surprises. Even though there is recognition that the perfect world is usually unattainable, the perfect world stays in focus.

> I19 *we [...] work out exactly what they want and what their expectations are of a perfect world first, separately, and then say "okay, well with the existing system how do we get to that perfect world" and then usually we can't do it [...] sometimes the developers come to the workshops. It's good that the developers can come, in the ideal world [...] hopefully there's no nasty surprises at the end*

Nested in idealised–analysis/design is what–clients–want and how–to–deliver–it. In the perfect world, exactly what–clients–want is attainable. Making the clients sign off the requirements and design documents, assures exactly what–clients–want and how–to–deliver–it has been attained. Involving "all of the appropriate areas [of the business…] up front" (I19) and getting them to physically sign means presenting signed documents to the systems developers will make the development of the system happen. The clients will get what they want.

> I19 *they have to sign off that the written stuff matches what they thought they wanted and then those documents are presented to the systems developers to work from [...] so once they're [the clients] happy then I proceed to make that happen [...] all of the appropriate areas [of the business...] get involved up front [...] and we find if we get them to sign off, actually physically sign the requirements, then they take*

the time to read and get involved, 'cause otherwise they can just go "yeah, yeah, yeah".

In Conception Category 3, the view is somewhat at the system level with the task–level–view nested within the system–level–view. In contrast to Conception Category 2, where the level of view switches between system and task, in this category, the task level is nested as part of the system–level–view. Details of what a task entails and how that task–level–view fits within the system–level–view are known. For instance, the task of gathering requirements entails workshops, where questioning and drawing are used to gather the exact requirements. Specifying the design entails what the data is used for, (e.g., screens and reports), as well as when the data is to be supplied to people, who is using the data, and technical issues such as networking and security.

I19 Gathering requirements [...] primarily we use workshops [...] we take them through questioning, drawing on the board, trying to work out exactly what they want [...] that's how we work out what the requirements are or [to work out] what the design spec is we get the business requirements first, primarily what do they want, then we look at how they expect that they want it, what sort of screens, what sort of reports, what usage are they going to be making of the data, do they need management reports, how often, who's going to get it, [...] there's all of that issue with networking and security

The system–level–view is the focus on "how can we make the software deliver what the business wants" (I19). The system–level–view and task–level–view in this category are in the thematic field. Neither the system–level–view nor the task–level–view is figural. Each view is part of the ground from which the theme emerges.

The theme has what–clients–want and how–to–deliver–it as salient constituents. These two constituents might be analysis and design respectively. Analysis/design appears to be separated as analysis and design. However, there is ambiguity. Analysis could just be gathering requirements, that is, part of what–clients–want. Systems analysis could be part of both what–clients–want and how–to–deliver–it. Design is how–to–deliver–it. Systems analysis and design could be systems design and detailed design, that is, design. Despite this ambiguity, analysis and design are functionally significant and, for the first time in the conception categories, are determined to be in the theme.

Int Are analysis and getting requirements the same thing?

I19 Ah well [pause] sort of, yeah could be—depends how you want to term it, really. So we have requirements. And then from that *[I19's emphasis] then you have systems* *analysis: what are the fields, what are the tables, all of that type of thing. So that's one type of analysis and then there's analysis or requirements on what the business wants, what's the feature, what's the client going to receive, what's the management reports, all that sort of stuff. And then how is it going to happen: breaking it down into the data, what fields do you have to input, what fields can be derived, what's going to happen to those fields, that sort of thing. So the requestor, the business people, they would be involved in getting the business requirements, but not in the detailed design but you present the design* back *[I19's emphasis] to them, saying, "Okay this was your requirements", and they sign off.*

Thematic constituents placed close to the theme have immediate bearing on the theme. Idealised–analysis/design emerges from a number of the thematic constituents. A software–development–method will be followed. A software–development–method provides the task–level–view and the connections between tasks for the system–level–view.

I19 Oh we have a methodology here that we shall follow, through from getting project proposal, business case, initiation report, then requirements and functional spec, design specifications, test plan or building, test planning, test results and implementing and training and doing the post implementation review.

Also in the thematic field of concern to the theme is the thematic constituent I have interpreted as obligatory–ritual. The interpretation is that the tasks of the software–development–method are repeated for each project in a set and precise manner, like a ritual. Idealised–analysis/design is about following the software–development–method as a ritual. Following the software–development–method is about observing rules that are not questioned.

I19 No, no we don't really change the method.

For this category, abiding by the rules of the idealised–analysis/design, that is, carrying out an obligatory–ritual, places the focus on idealised–analysis/design. For instance, doing a university assignment is about practising idealised–analysis/design, without focusing on the product of analysis/design.

I4 [When doing a university] software assignment where it says here's a problem, do ten diagrams we talked about in class and you're rehashing the same thing over and over

Getting the documentation signed by everyone at the end of each phase emphasises the obligatory–ritual. Yet, not only is signing part of the ritual, signing is part of idealised–analysis/design. The signing of documents is a symbol of the attainable perfect world.

Everyone signs, which implies everyone agrees, thus confirming the conception of idealised–analysis/design.

I19 *So the requestor, the business people, they would be involved in getting the business requirements but not in the detailed design. But you present the design back to them saying "okay this was your requirements", so that's 30 pages I suppose of my last one, maybe more, and then the design you again present it back and they sign off. So, we get everyone to sign at the end of each phase.*

Structure and consistency are two thematic constituents that also have a bearing on idealised–analysis/design. Structure and consistency are needed in concert with the software–development–method and obligatory–ritual.

Int *How do you feel about using that [method]?*

I19 *I think it's good because we all need structure... you need to have something that we're all consistently using*

Clients are a thematic constituent having some relevancy to what–clients–want. The clients are the source of requirements and adjuncts to the ritual. Extracting what–clients–want from the clients is challenging. The clients are believed to know what–clients–want. That the analyst/designer can be surprised, after believing the client knew what–clients–want, is not part of this category. Being surprised disrupts the conception of idealised–analysis/design. Therefore, my interpretation is what–clients–want is a salient constituent; clients are a thematic constituent.

I19 *depending on your stakeholders I find it can be quite challenging to extract what they want. Because you believe them [...] then there are some nasty surprises for you when you change something up here and something pops out down here that you didn't know about*

The systems developers, also a thematic constituent, are relevant as the recipients of the signed off documents. The systems developers' activity follows on from the idealised–analysis/design.

I19 *usually we don't involve the developers while the business is to-ing and fro-ing on what they want [...] we get the systems developers involved in the software side of it, so how can they make the changes to the system to get what the business want.*

In Conception Category 2, documenting is part of the figure. In this category, documenting is taken for granted. Documenting has become part of the thematic field.

I19 *we just tried to get everyone involved and questioned them and then obviously we've got to write it all up*

In Conception Category 3, what–clients–want is a salient constituent in the theme and clients are a thematic constituent in the thematic field. Having empathy–with–the–clients is at the margin. Empathy–with–the–clients is about helping clients visualise the system, assisting their experience with BISD projects, helping their understanding of the repercussions of changes, and making sure they realise the importance of providing all requirements. Empathy–with–the–clients is not interpreted as part of Conception Category 3. The clients are responsible for telling the analyst/designer all of what–clients–want to the analyst/designer, without much assistance from the analyst/designer.

> *I19* *it's really hard for them to visualise... it's just difficult for them to visualise... they're not experienced in projects. They don't understand that if they change things along the way the repercussions... they don't think "How am I going to use it" until they've actually got the thing almost, and then they go "Oh, yeah, I'd probably prefer to have this"... I think that they don't deliberately not tell you, it's just that they don't understand all the things they've got to tell you*

In summary, in this third conception category, the how of analysis/design is to idealise and what is idealised is analysis/design. Idealised analysis/design is about a perfect world where what–clients–want and how–to–deliver–it is attainable. In the theme, the idealised–analysis/design salient constituent encloses the joined what–clients–want and how–to–deliver–it salient constituents. The conception of idealised analysis/design, in the analyst/designer–analysis/design internal relation described in this category takes a system–level–view of what–clients–want and how–to–deliver–it. The task–level–view is the detail within the system–level–view. The software–development–method, obligatory–ritual, structure, and consistency bear on the theme. Clients and system developers are of some relevance. Documenting is relevant, but taken for granted. Unlike the first two categories, analysis and design appear to be part of the theme.

7.4 Conception Category 4: Contrast actual and ideal analysis—what and design—how

In Conception Category 4, analysis/design is about actual analysis–what and design–how and ideal analysis–what and design–how.

> *I4* *I always look in terms of the whats and the hows: the analysis is what needs to be done and the design is telling you how [...] it's the old Kiwi number 8 fencing wire concept [viz. ingenuity and using unconventional means], it's fine to have a process*

[sic, viz. method] and a way of doing things but [...] if you get given a problem or a situation that demands some alternative way of thinking about it, then the piece of paper that's got the 20 steps about what you should do may not be the best way to do it. What I meant by that is if [...] a customer [... doesn't] have a lot of money for us to write a design document [... or] analysis we may have to forego some of that, and [...] write a combined statement of work [...] that incorporates [...] basic requirements and [...] maybe prototype it or [...] do a combination prototype and waterfall development where we're generally going to work from a list of requirements but we understand that you really don't know what you want and you don't know what it looks like [...] and, that applies to everything [...] you may have a document that's got seven sections and [...] you're given a blank version of this as a template and somebody says to go and write a design document and you say "Okay, well what for? [...] This type of job doesn't fit with this model [...] I need to adapt it"... [It's] not being limited to the ways that are prescribed and written down on paper completely. I mean overall yes, but a little bit of flexibility goes a long way.

In this fourth conception category, the *what* of analysis/design is *actual analysis–what and design–how* and *ideal analysis–what and design–how*. Actual analysis–what and design–how is sufficient analysis/design. Actual analysis–what and design–how includes a choice to sacrifice some of what is understood to be ideal–analysis/design. Similar to the previous category, ideal analysis–what and design–how is perfect analysis/design. Ideal analysis–what and design–how requires following prescribed and written down analysis/design methods. The focus is on actual analysis–what and design–how as pragmatically better than ideal analysis–what and design–how.

How the analysis–what and design–how are focused upon is to *contrast* actual and ideal analysis–what and design–how. Contrast, as used here, is to "compare in such a way as to emphasize differences" (*Contrast verb* 2010). Contrast appears at first as dissent. There is disagreement with the perceived convention that ideal analysis–what and design–how is always appropriate. Contrast then appears as being pragmatic. There is a perceived need for actual analysis–what and design–how to focus on creating things with skill, imagination, cleverness, ingeniousness, and inventiveness (i.e., "the old Kiwi number 8 fencing wire concept" (I4)). Actual analysis–what and design–how is conceived as the appropriate way to do analysis–what and design–how. Dissent and being pragmatic are together the contrast of actual and ideal analysis–what and design–how. The way analysis/design is brought to mind is to contrast actual analysis/design and ideal analysis/design.

The field of Conception Category 4 (Figure 7.6) is again more complex in structure and content than previous categories. The theme has four salient constituents: ideal–analysis–what–design–how, actual–analysis–what–design–how, analysis–what and design–how. Ideal–analysis–what–design–how is "being limited to the ways that are prescribed and written down on paper completely" (I4). Actual–analysis–what–design–how is "not being limited to the ways that are prescribed and written down on paper completely" (I4). In the theme, the actual–analysis–what–design–how and ideal–analysis–what–design–how salient constituents overlap. The ideal–analysis–what–design–how part of the overlap is the "overall" (I4) of ideal–analysis–what–design–how being part of analysis–what and design–how. The actual–analysis–what–design–how part of the overlap is the "little bit of flexibility go[ing] a long way" (I4) of actual–analysis–what–design–how, being part of analysis–what and design–how.

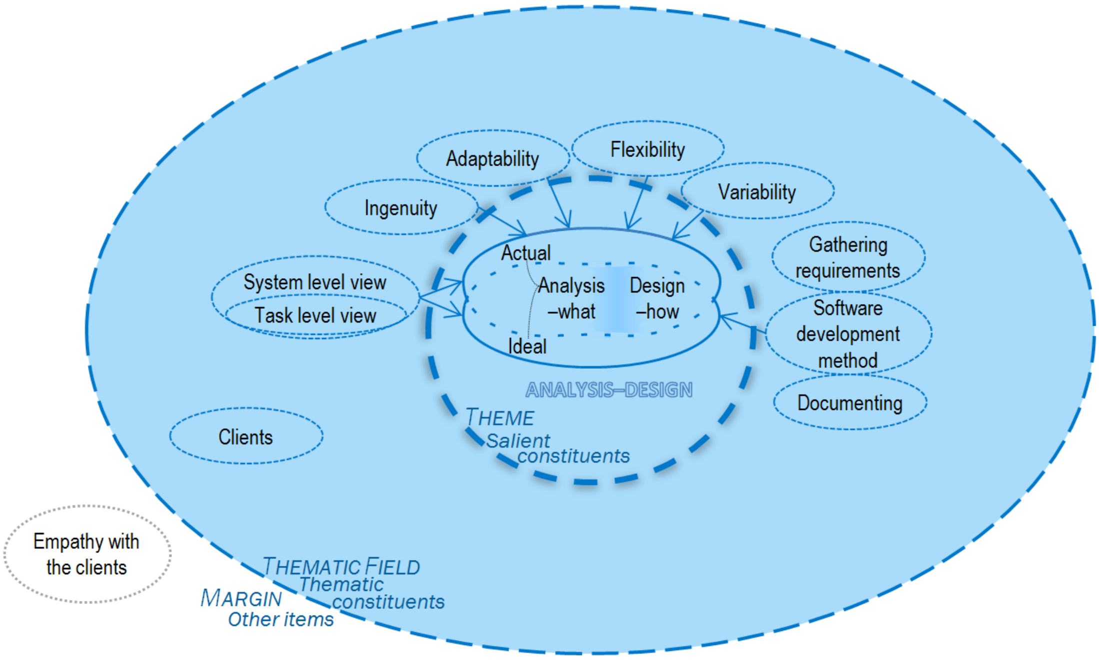


Figure 7.6: The field of Conception Category 4

In the theme of Conception Category 4, the analysis–what and design–how are separate salient constituents. Analysis is "what needs to be done" (I4) and design is "telling you how" (I4). However, there is not a clear distinction made between when analysis stops and design starts. Therefore, the boundary between the salient constituents, analysis–what and design–how, is blurred. Analysis and design are functionally significant and the bond between analysis and design is closer in Conception Category 4 than in previous categories, hence, the linked representation in the theme, that is, analysis–design.

In Conception Category 4, similarly to Conception Category 3, the system–level–view encloses the task–level–view. The level of view is expressed as the ideal–analysis–what–design–how not completely suiting the project and actual–analysis–what–design–how being needed. For instance, at the system–level–view, the ideal–analysis–what–design–how might be an ISD method, such as, "the piece of paper that's got the 20 steps about what you should do" (I4). This ISD method "may not be the best way" (I4) to develop the system. "A combination prototype and waterfall development […] work[ing] from a list of [changeable] requirements" (I4) is the actual–analysis–what–design–how as an alternate system–level–view. The contrast of the ideal–analysis–what–design–how and actual–analysis–what–design–how shown in the example above at the system–level–view "applies to everything" (I4), that is, the task–level–view as well. For instance, the ideal–analysis–what–design–how is "a document [template] that's got seven sections [… that] you're given a blank version of […] and somebody says to go and write a design document" (I4) is a task–level–view. The actual–analysis–what–design–how task–level–view response is "Okay, well what for? […] This type of job doesn't fit with this model […] I need to adapt it" (I4). The system–level–view applying to everything is interpreted as the task–level–view being nested within the system level view.

Thematic constituents that have a bearing on actual–analysis–what–design–how are ingenuity, adaptability, flexibility, and variability. These thematic constituents refer to the actual–analysis–what–design–how salient constituent in the theme. The thematic constituents ingenuity, adaptability, flexibility, and variability are the qualities analysis–what and design–how need to become actual–analysis–what–design–how.

> I4 *it's the old Kiwi number 8 fencing wire concept [viz. ingenuity and using unconventional means …] a little bit of flexibility goes a long way … we tend to be very adaptable… [the] level of analysis… varies a lot*

Ingenuity, adaptability, flexibility, and variability are interpreted as thematic constituents in the thematic field of this conception category. Therefore, these constituents are interpreted as parts in the whole of the way the conception of analysis/design is described in this category. However, ingenuity, adaptability, flexibility, and variability can be interpreted as qualities of a different phenomenon, namely the analyst/designer. This interpretation is that the analyst/designer must see herself as ingenious, adaptable, flexible, and variable to be able to dissent from ideal–analysis–what–design–how and be pragmatic about actual–analysis–what–design–how. These interpretations are an example of interpretive awareness. These interpretations are also an example of the uncertainty of describing the conscious acts of others.

The software–development–method is present as a thematic constituent relevant to the theme. The software–development–method refers to ideal–analysis–what–design–how more than actual–analysis–what–design–how. A software–development–method has a bearing on ideal–analysis–what–design–how. A perfect software–development–method is relevant to what is analysis–what and design–how in the salient constituent ideal–analysis–what–design–how.

> I4 *we don't sit down and say, "Right, now we're going to come up with a requirements analysis document. We generally come up with a Statement of Work that integrates sort of requirements analysis with maybe a little bit of design; the phases aren't as distinct [...] the perfect waterfall model [sic, viz. method], if it exists, or the perfect software development process [sic, viz. method], isn't always going to work [...]*

The gathering–requirements and documenting thematic constituents are associated with software–development–method in the thematic field. Gathering–requirements and documenting can be prescribed in a software–development–method. Therefore, gathering–requirements and documenting also have a bearing on the conception of what is ideal–analysis–what–design–how.

Gathering–requirements appears separate from the analysis–what when someone other than the analyst/designer produces a requirements document. The separation of gathering–requirements and analysis–what contributes to the interpretation of gathering–requirements being a thematic constituent in the thematic field.

> I4 *[the requirements document from the business] tend to come a bit meshed with analysis*

In a similar way to Conception Category 3, clients, as a thematic constituent in Conception Category 4, have relevancy to the theme as a source of requirements. Clients also need to agree with what is produced from analysis–what and design–how. There is a separation between the salient constituents analysis–what and design–how and the thematic constituent clients. For instance, clients are referred to as "they" (I4) and analyst/designers as "we" (I4). Clients are relevant to the theme but not part of the focus within the theme.

> *I4 [the requirements document from the business] tend to come a bit meshed with analysis: "We have this need"; "This is what we want". And they also typically include some of the how because they've got it in their own mind about how they want it to work with their business [...] they do go into a bit of detail about the how... and that's where typically we would say well you let us do that, or we don't think it's going to work that way [...] we try and distinguish between the analysis and the design in the sense of, we need to get them to agree to the items separately before we can go ahead.*

In Conception Category 4, although clients are a thematic constituent in the thematic field, having empathy–with–the–clients is at the margin. Empathy–with–the–clients is interpreted here as about acknowledging the expertise the clients possess and helping the clients understand the software design. Empathy–with–the–clients is not conceived as part of Conception Category 4. The clients are conceived as providers of requirements to the analyst/designer. The analyst/designer modifies the requirements over and above what the client provides.

> *I4 [The clients] know their business so they document [requirements] in terms of what they understand from the business and we have to come in and [...] put some expertise in here and modify it slightly because it won't work [...] Sometimes they can be quite descriptive of what they want, and then we look at it and say "well you know we don't think that's going to work", so we do have to do a level of analysis over and above their work... they don't understand the software design,*

In summary, in this fourth conception category, the how of analysis/design is to contrast and what is contrasted is actual analysis/design and ideal analysis/design. Ideal analysis/design is about following the perfect ISD method. Actual analysis/design is about sufficient analysis/design. Actual analysis/design is pragmatically better than ideal analysis/design. In the theme, inside the overlap of ideal–analysis–what–design–how and actual–analysis–what–design–how are the analysis–what and design–how. The theme, in the analyst/designer–analysis/design internal relation, takes a system–level–view. The way the system level is viewed is applicable to the way everything is viewed at the task level. Ingenuity, adaptability, flexibility, and variability thematic constituents have more bearing on the actual–analysis–what–design–how than the ideal–analysis–what–design–how. Software–development–method, gathering–requirements, and documenting have more bearing on the ideal–analysis–what–design–how than the actual–analysis–what–design–how. Clients are of some relevance, whereas empathy–with–the–client is not. Analysis and design are linked in the theme.

7.5 Conception Category 5: Integrate exploring the organisation and problem with creating an abstract solution

In Conception Category 5, analysis/design is about exploring the organisation and problem area and creating an abstract solution at the same time.

> I16 *from a theoretical point of view, I'm brought up to think of it as analysis and design. But I guess in practical use, I come more to think goals and now understanding the organisation and the problem area before making a solution. On the conceptual level [...] analysis is connected to exploration and design is connected to creating a solution [...] I would explore the organisation [...] trying to understand these systems [...] while I go out and explore, I also create a model of that organisation in my head, on a very abstract level, which is going to fit into either a standard system or into something that is going to be developed from scratch*

In this fifth and final conception category, the *what* of analysis/design is *exploring the organisation and problem and creating an abstract solution*. Exploring is the process of investigating to come to an understanding. The things explored are the organisation, its information systems (IS), and the problem area. The organisation is the entirety of the business, including the people that work for the organisation, its interactions with other organisations and people, and its IS. The organisation's IS are a representation of everything the organisation does. An IS includes the people as part of the system. The problem area is where the analyst/designer directs her attention to effect an organisational change. The problem area is not always regarded as a problem to be fixed. The problem area may be a case of adding value to the business by improving efficiency, such as, cost-cutting and improving business processes.

> I12 *we aim to add value to our customers' businesses. Therefore, we will often be talking to them about not just the software but [also] the business processes that surround that. That may involve cost cutting because they're doing things more efficiently. Both because they have new software, potentially, and just what's the point of getting Jack to sign something every time. All he does is pull out his in-tray, sign, and put it back; he doesn't even look at them. [...] But also you now have additional capacities that you didn't have before: you can now offer discounts on a customer by customer basis and that is something that will allow you to obtain*

more market share, or offer products that you couldn't offer before, or whatever else it might be. So a lot of what we do is business consulting as well as software development. So at the point of release there's going to be time spent understanding: how that software is now being used, what may be done to enhance it further

Creating an abstract solution happens "in [the] head" (I16) of the analyst/designer. Creating is a process of representing, at a "very abstract level" (I16), the understanding gained by exploring. An abstract solution is a model of the understanding of the organisation, its IS, and the problem area. The model is directed at the organisational change needed that will "fit into either a standard system or into something that is going to be developed from scratch" (I16).

In Conception Category 5, the *what* of the analysis/design conception is *exploring the organisation and problem and creating an abstract solution* at the same time. The focus is on integrated analysis/design.

How exploring the organisation and problem and creating an abstract solution is focused upon is to *integrate* the exploring and creating as integrated analysis/design. Integrate, as used here, is to "combine (two things) so that they form a whole" (*Integrate verb* 2010). The whole formed by integrating exploring the organisation and problem and creating an abstract solution is integrated analysis/design. The way analysis/design is brought to mind is to integrate exploring (to understand the organisation, its IS and the problem area) and creating (a representation of the solution). The exploring and creating are simultaneously started. The integration is immediate and ongoing.

I16 *while I go out and explore, I also create [...]*

Int *[...] when does that start?*

I16 *Immediately.*

The field of Conception Category 5 (Figure 7.7) is the most complex of the conception categories. Entirely within the theme are the salient constituents: integrated–analysis/design, exploring–the–organisation–and–problem–area, creating–an–abstract–solution, empathy–with–the–clients, and constant–interaction. Exploring–the–organisation–and–problem–area and creating–an–abstract–solution have such a close relationship that they could form one constituent. However, there is an awareness that exploring–the–organisation–and–problem–area and creating–an–abstract–solution are separable and therefore, are represented as separate constituents. Integrated–

analysis/design is my interpretation and description that encompasses exploring–the–organisation–and–problem–area, creating–an–abstract–solution, and the relationship between these two salient constituents, as well as empathy–with–the–clients, constant–interaction, organisation–level–view, system–level–view, and task–level–view.

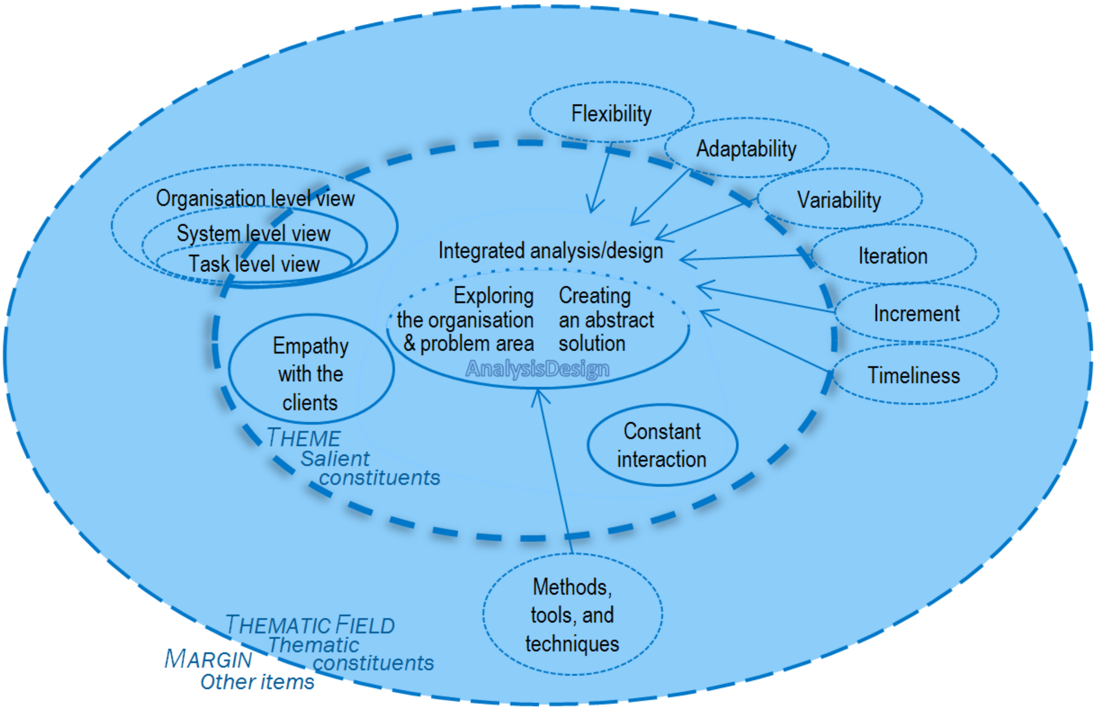


Figure 7.7: The field of Conception Category 5

In contrast to previous categories, empathy–with–the–client is part of the theme. In this category, empathy–with–the–client is about "getting inside the heads of the people who will be using the software" (I12). The functional significance of empathy–with–the–client, which makes it part of the theme, is that empathy must exist with the client for there to be understanding of the organisation and problem area.

> I12 *(sigh) getting inside the heads of the people who will be using the software [... to] have a thorough understanding of the chunk of business where the software is going to be used.*

Constant–interaction represents the character of the relationship with people, who include clients, developers, and other team members. Constant–interaction is about ISD involving people; ISD cannot be done "in isolation" (I12). For instance, in a scenario where the analyst/designer works off-site, an analyst/designer who has developed a thorough understanding of the client's business will operate as a surrogate business user. The analyst/designer works as a surrogate client to keep the project progressing, and thus maintain the constant interaction between client, analyst/designer, and developer.

> *I12 it can be difficult to get regularly enough in front of clients because we're working on a commercial basis rather than being in house [...] to make that process realistic [...] we can't very well stop until you've got time to meet with us and then come back to the project. So we often tend to find that we get further down the track than we'd necessarily like before meeting with the client, but yeah, it's certainly where I like to be: get it right, walk through the process, get a user interface in place then walk through with the customer [...] I don't think you can do anything much of the software development lifecycle in isolation... there has to be constant interaction between, in our team, me as the surrogate business user because I understand their business well enough generally and the developers [...] I have time to hang around and sort of look over people's shoulders and so on and so forth. Whereas your real business users are off doing business and tend to only get involved when they're asked to; sort of "look we need to organise a meeting to walk through some stuff", as opposed to just "how's it going? What're you doing?" "Oh, how's that work?" "What's that?", "What are you doing there?" and bugging people.*

The organisation–level–view, system–level–view, and task–level–view span the theme and thematic field boundary. Distinct from the previous categories, the highest level of view is at the level of the organisation. The system–level–view is nested within the organisation–level–view. The task–level–view is nested within the system–level–view. These three levels of view are part of the theme. Each level has Gestalt coherence with the other salient constituents in the theme. Integrated analysis/design is integrated at the task, system, and organisational level. For instance, there is constant–interaction at the task, system, and organisational level when exploring to understand the problem area. "Get[ting] a user interface in place then walk through with the customer" (I12) is a task–level–view of the exploration of the problem area. "Walk[ing] through the process" (I12) is a system–level–view of the exploration of the problem area. "I understand their business well enough generally" (I12) is an organisation–level–view. The three levels are part of what is figural. The three levels are also the extent of the theme and therefore, partly lie in the thematic field.

Conception Category 5 includes the thematic constituents of flexibility, adaptability, and variability from Conception Category 4. Flexibility, adaptability, and variability refer to the theme in a similar way as in Conception Category 4. Integrated analysis/design is flexible, adaptable, and variable. However, in this category, thematic constituents of iteration, increment, and timeliness supplement these three thematic constituents. Integrated analysis/design is conceived as the timely and iterative production of increments of improvement.

> I12 *we aim to be as iterative as possible in our development. I'd much rather get a new feature in [to the system] and get it back out [to the customer], and loop through again than spend six months doing an analysis of what's a whole suite of new stuff that we can release eighteen months from now [...] how can you possibly think [...] in business [...] that anything that was approved eighteen months ago can possibly be or is certainly going to still be relevant, it's just insanity [...] I'd much rather keep it iterative; get something out there, incremental improvement.*

The software development method is no longer present in the thematic field in the same way it is in the previous categories. This is a distinction between Conception Category 5 and the previous categories. A thematic constituent of methods–tools–and–techniques refers to exploring–the–organisation–and–problem–area and creating–an–abstract–solution. Methods–tools–and–techniques has relevance to the theme. Particular methods–tools–and–techniques are not figural.

> I16 *[exploring] could be to interview people, to make object oriented analysis, data flow analysis, different processes, SWOT analysis, whatever you need to understand more about what's going on [... to create a model of an organisation in my head] what I would do, partly based on my training, I would—have you heard of rich pictures?—[...] Like in the soft systems methodology? I would do that and make a process model and mark where the organisation is not living up to some processes, deviations. And maybe I would make a goal hierarchy, if that's appropriate, that depends very much on which level of the organisation you're working, and based on [that] process understanding you can make specifications for example, that depends on what you're actually going to do*

Analysis/design is in the theme and completely bonded in this category. The distinction of what is analysis and what is design is avoided. The focus is on understanding the business and problem and modelling a solution.

> I16 *What I found is that people have so many different opinions, especially what design is, it's a dangerous term to use when you're communicating with people so, I just don't talk very much about design anymore. I guess we would have concepts like detail, the design, not detailed specification, for example, is that analysis or design? I'm not quite sure really.*

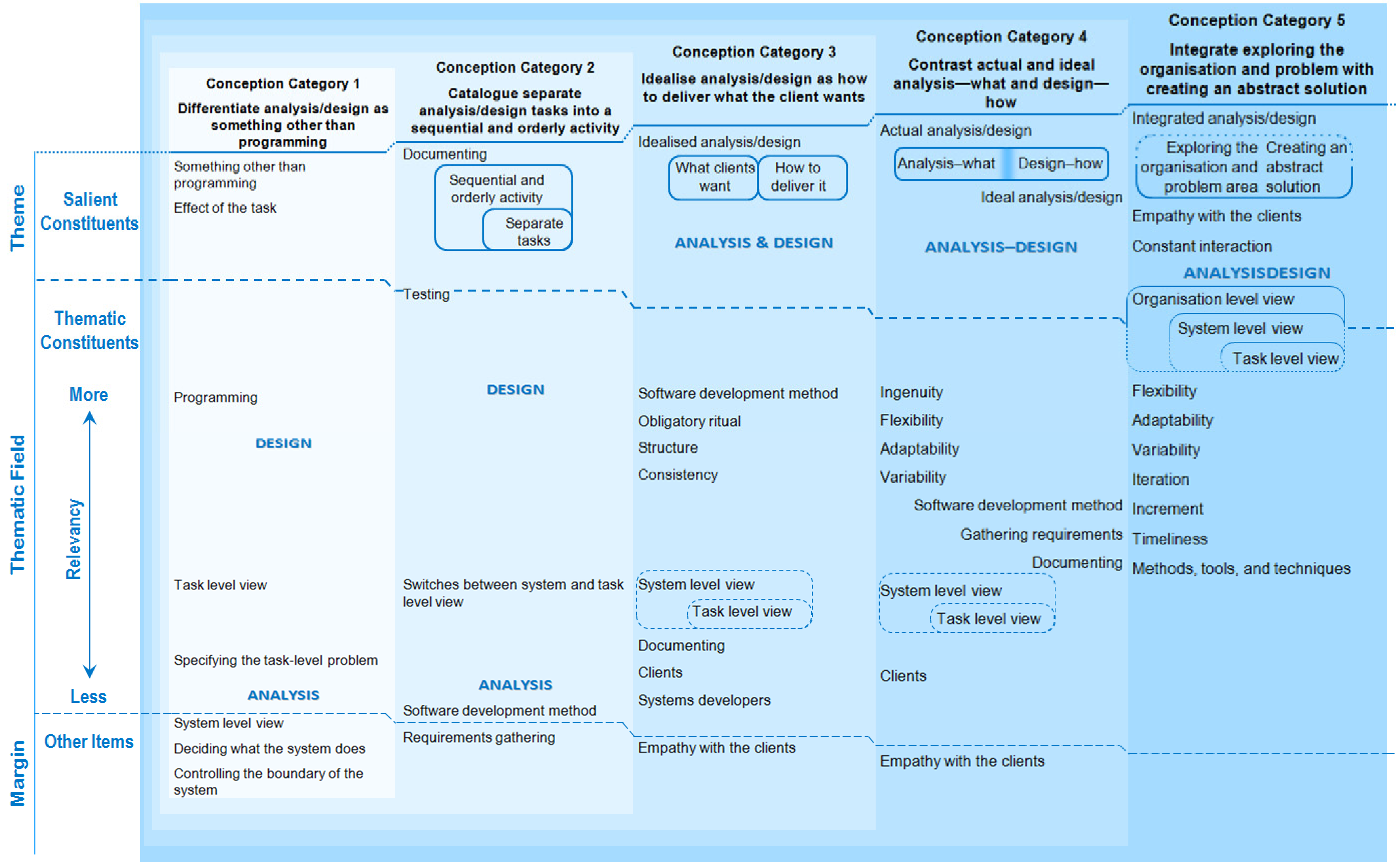
In summary, in this fifth conception category, the how of analysis/design is to integrate and what is contrasted is exploring and creating as integrated analysis/design. Integrated analysis/design is about exploring to understand the organisation and problem area and creating an abstract solution. Integrated analysis/design also encompasses empathy–with–the–clients and constant–interaction. People, represented by empathy–with–the–clients and constant–interaction, are functionally significant to the theme. The theme, in the analyst/designer–analysis/design internal relation described in this category, has a focus on organisational, system, and task levels. The flexibility, adaptability, variability, iteration, increment, timeliness, and methods–tools–and–techniques thematic constituents are of concern to integrated analysis/design. Analysis/design is bonded and in the theme.

7.6 The Conception Categories Outcome Space

The outcome space, in Figure 7.8 (foldout), is a representation of the relationship between the five conceptions of analysis/design categories of description. The conception categories are related hierarchically. Each higher level is superordinate to the previous level by being more complex and sophisticated in its conception of analysis/design. Each higher level in some way includes lower levels. Conception Category 1 is the least complex and sophisticated; Conception Category 5 is the most sophisticated.

Figure 7.8 The conception categories outcome space (Overleaf)

The Conception Categories Outcome Space



The increasing complexity and sophistication of the conception categories is manifested in a number of ways. New constituents appear in the field as relevant or functionally significant thus increasing the complexity of a category from previous categories. Other items at the margins of lower categories move into the thematic field or theme of higher categories, thus increasing the complexity and sophistication of higher categories. Constituents become more concentrated within and around the theme as the conceptions represented in each category become more sophisticated. In Figure 7.8, the shortening of the columns of text indicates increasing complexity. More constituents positioned closer to or within the theme indicate the category is more complex than previous categories.

The conception category outcome space (Figure 7.8) is a representation of a Gestalt hierarchy (Figure 6.8) of the conceptions of analysis/design. Each theme in a conception category is a Gestalt of the salient and functionally significant constituents that have unity of Gestalt coherence. Each category is a Gestalt of the theme and the thematic field, which has unity of relevancy. The conception categories outcome space is a Gestalt of ways of conceiving analysis/design.

A superordinate conception category does not literally include subordinate conception categories as a part of the superordinate conception category's whole. The relationships between categories are revealed by interpreting the data and describing how subordinate categories are related to superordinate conception categories.

Conception Category 1 describes the least sophisticated conception of analysis/design. In terms of the content of consciousness, Conception Category 1 is an awareness that analysis/design exists as something–other–than–programming and little more. The something–other–than–programming is part of the what of Conception Category 1. The something–other–than–programming is part of the content of consciousness to which the conscious act of conceiving analysis/design is directed. The conception of analysis/design described in a category becomes more sophisticated as the something–other–than–programming part of the content of consciousness changes. As the content of consciousness develops, the something–other–than–programming develops. For instance, the development was stated explicitly.

> I3 *Yeah. It's a lot more than just sitting down and coding [...] there's so much talking to a client [and] trying to figure out with the developers and systems testers*

As a development from Conception Category 1, where the content of consciousness is something–other–than–programming, the what of Conception Category 2 reveals more about the nature of the other something. In Conception Category 2, analysis/design is the sequential–and–orderly–activity of separate–tasks. In Conception Category 3 the what is idealised–analysis/design, a development of the something–other–than–programming. Idealised–analysis/design is also a development of the sequential–and–orderly–activity of separate–tasks. In Conception Category 4, actual–analysis–what–design–how and ideal–analysis–what–design–how are a development of the something–other–than–programming. For instance, that analysis/design is something–other–than–programming is implicit in making sure that analysis/design is kept formally separate from programming.

> *I4* *we don't work in large teams, so that often means that the person doing the designing is doing the implementing, which gets tricky because there's a tendency to want to get in and code [soft laugh] because you know you're going to be doing it eventually anyway. It's so clear in your head and you don't really want to formalise that because you're only going to be turning around next week and be doing that. We have to try very hard to make sure that we do separate out those phases 'cause otherwise things can go wrong*

The ideal–analysis–what–design–how is a development from idealised–analysis/design and actual–analysis–what–design–how is pragmatically better than ideal–analysis–what–design–how. The relationship between Conception Category 4 and Conception Category 3 may also be seen in the differences between two pairs of salient constituents. Analysis–what and design–how, salient constituents in Conception Category 4 are more sophisticated than the salient constituents what–clients–want and how–to–deliver–it from Conception Category 3. In Conception Category 3, the separation of what–clients–want and how–to–deliver–it is clearer than the separation of the analysis–what and design–how in Conception Category 4.

In Conception Category 5, there is a sequence and order in moving from what is undefined or not understood to a concrete solution.

> *I12* *I tend to ask a lot of questions, most of which are centred around trying to move from an undefined business process to what is going to come down to a set of rules and data structures.*

However, the exploring and creating that are happening at the same time in Conception Category 5 is conceptually not the same as the sequential and orderly activity of separate tasks from Conception Category 2. Idealised analysis/design, from Conception Category 3, has become relevant in Conception Category 5 as what may be available as methods–tools–techniques. Methods–tools–techniques are only of concern to analysis/design as the means to help understand and abstract the business information system. In Conception Category 5, analysis/design is not idealised or an obligatory–ritual that must be done, as in Conception Category 3, to do so would be "insanity" (I12).

> *I12 One thing that sticks in my head is sitting in a meeting about a project that had been going basically forever and having the project manager [...] so upset, she said "They've come back to us and said that none of the reports"— I mean and this was on a superannuation system, superannuation law changes, on average, once a month, literally, there is something new passed through parliament once a month— "I don't understand it, they have gone and said that none of the reports we have produced are of any use to them. They want to change every single one and do you have any idea how long that is going to blow out our release? We had these signed off eighteen months ago and now they've gone and changed them when we produce the final."... I just ... I managed not to say anything, but how can you possibly think, particularly in superannuation, but in business in general, that anything that was approved eighteen months ago can possibly be, or is certainly going to still be running. It's just insanity. But, she was ... very grumpy.*

From Conception Category 4, the analysis–what and design–how develops into understanding the business and modelling how the solution is going to cause organisational change in Conception Category 5.

> *I12 if I could understand the business and if I could do the processing then I'm in a position where I can figure out how the software is going to do the processing is what it boils down to.*

With each increase in complexity of the what, the how of the conception categories also increases in complexity. From differentiate, through catalogue, idealise, and contrast, to integrate, the ways analysis/design is brought to mind increase in complexity. This is not to say that the how follows the what, that is, as the what becomes more complex, the how will follow. Nor does the converse apply: as the how becomes more complex, what is brought to mind becomes more complex. The what and the how are entwined, which of the two changes first beyond the scope of this thesis.

The development of the what and how from one category to the next is a reflection of the variation in the fields from one category to the next. Representations of the two types of variation (see s. 6.6.3) indicate the increasing complexity of the fields. The quotes above are examples of individuals' experiences of the variation in the way analysis/design is conceived. The fields in the conception categories represent my experience (as the interviewer/researcher) of the variation in the way analysis/design is conceived at a collective level (by my interviewees, and the people they represent).

In Figure 7.8, shown in blue, are the terms ANALYSIS and DESIGN in each category field. This is another representation of my researcher's view of the variation in the way analysis/design is conceived at a collective level. While the fields are representations of the way analysis/design is conceived at a collective level, the blue ANALYSIS and DESIGN are a representation of my interpretation of the relationship between analysis and design in each category. In the first two categories, design is closer to the theme than analysis. Design was interpreted as having more relevancy to the theme. In the last three categories, analysis and design are within each theme. Analysis and design were interpreted as being salient and the relationship between analysis and design becomes closer. The relationship between analysis and design changes from being joined yet still separate in Conception Category 3, to being linked in Conception Category 4, to being bonded in Conception Category 5.

The level of view changes from Conception Category 1 to Conception Category 5, from being at only the task level to being at the organisational level enclosing the system and task level views. The level of view also changes from relevant to salient. In the first four categories, the level of view is the extent of the theme, that is, the theme is focused on at task, system, or both levels, without being part of what is in focus. In the fifth category, the level of view is part of the focus and the extent of the theme.

Documenting, as a constituent in a Gestalt, changes from being salient to thematic. In Conception Category 2, documenting is a salient constituent. Documenting is figural; it is part of the theme. In Conception Category 3, documenting is a thematic constituent. Documenting is relevant, it has become taken for granted, and it is obvious that it will be done; it has become part of the thematic field. In Conception Category 4, documenting is a thematic constituent. Documenting has more relevancy to ideal analysis/design than actual analysis/design; it is part of the thematic field. In Conception Category 5, documenting is no longer distinguished from other methods, tools, and techniques. Documenting is part of the methods–tools–techniques thematic constituent.

In the first four categories, clients, analysts/designers, and developers, are of negligible concern to the way analysis/design is conceived. In Conception Category 5, people are part of the focus of what is analysis/design. The way people are part of the Gestalt of Conception Category 5 is captured in the salient constituents empathy–with–the–clients and constant–interaction. The inclusion of people as part of the focus of a conception of analysis/design may come from a change in the way analyst/designers conceive of their interactions with people.

> I19 *just doing different things, trying to be a bit creative about gathering the requirements [...] That's just something I'm trying because I don't think that the old method of just getting everyone in a room and listening to what they say, writing it down, having another meeting, reviewing the written word, signing off [is working]*

For a change to take place in the way analyst/designers conceived of their interactions with people the "old method[s]" (I19) must be questioned, such as believing clients supply the exact requirements and must sign off analysis/design products. Analysis/design stops being conceived of as an analyst/designer doing a task, a sequence of tasks, a structured ritual, or something ingenious. Analysis/design starts being conceived of as an analyst/designer thinking and working with people to understand and create a solution.

———

I constituted the conception categories using GIFTed data analysis, part of which is *intentionality* as a theory of mind. Because of GIFTed data analysis, the results in this chapter are something in which I have confidence. The five conception categories and outcome space are one representation of the variation in the qualitatively different ways analyst/designers conceive of analysis/design. This concludes part (H) of the data analysis and interpretation process.

The next chapter describes part (I) of the data analysis and interpretation process, in which I constituted the approaches to analysis/design categories of description. I constituted the approach categories with support from the theory of *intention* as a theory of action incorporated into GIFTed data analysis.

8 Approaches to Analysis/Design Categories of Description

Approaches are expressions of intended action. In this chapter, the research focus is analyst/designers' reported approaches to analysis/design. An approach to analysis/design is the way of executing, realising, or physically doing analysis/design. Since this study is based on interviews, the reported ways analyst/designers do analysis/design are described. In the initial analysis of interviews, it was easier to constitute the approaches to analysis/design than the conceptions because the practical treatment of intentionality is more familiar to us (s. 6.3.2).

In this chapter, I describe part (I) of the data analysis and interpretation process (Figure 8.1), I applied the GIFTed data analysis technique in combination with the phenomenographic constant comparison method to analyse, interpret, and describe the variation in analyst/designers' ways of approaching analysis/design. I thus answer the second of my three research questions about analyst/designers' ways of experiencing analysis/design:

Research study question 2 of 3:

What is the variation in analyst/designers' qualitatively different approaches to analysis/design?

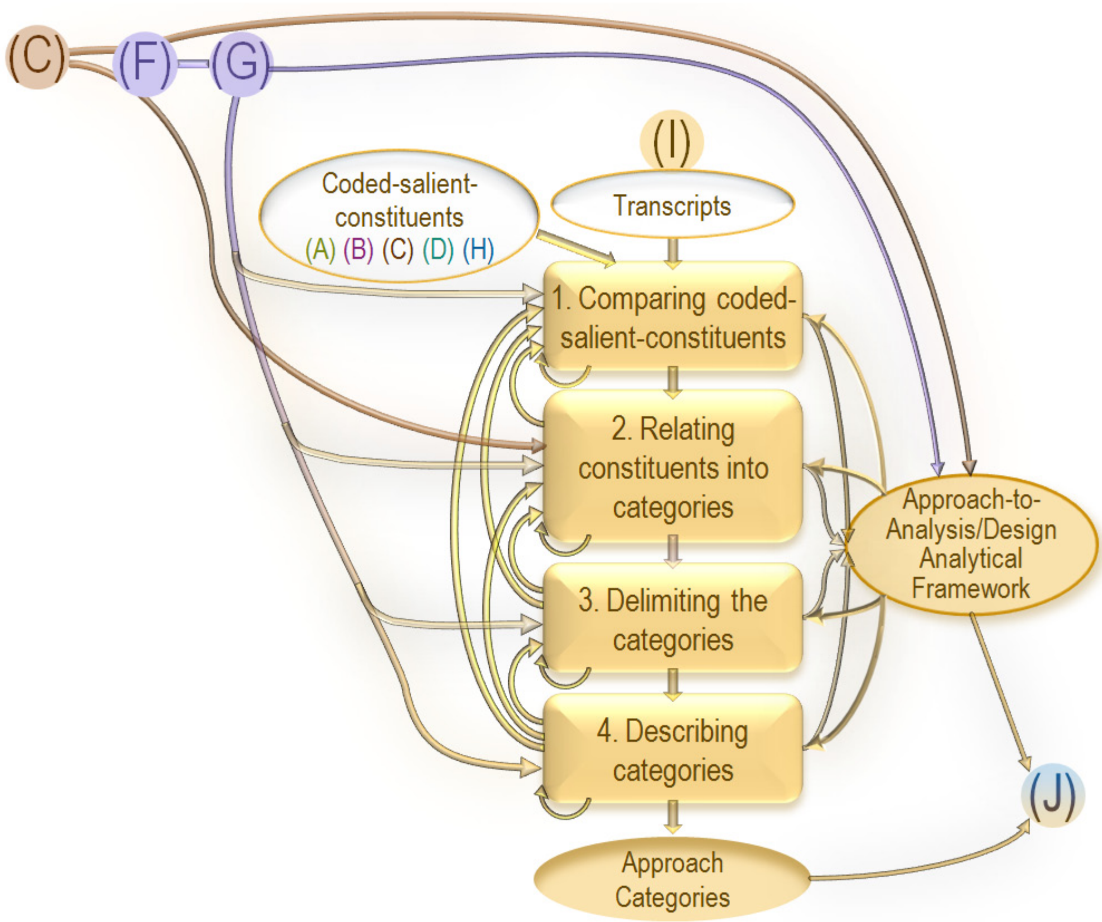


Figure 8.1: Part (I) of the data analysis and interpretation process

After the initial analysis and interpretation of the data (Figure 5.2 parts (A) to (E), I elaborated the theoretical underpinnings for this study and developed GIFTed data analysis (Figure 5.2 parts (F) & (G)). During part (H), I continued the data analysis and interpretation to constitute and describe the conceptions of analysis/design categories of description supported by the theory of intentionality as a theory of mind. In contrast with intentionality as a theory of mind as a supporting theory, approaches were constituted with the support of a theory of *intention* as a theory of action. My interpretation of intention as a theory of action provided the frame for my interpretivist/descriptivist theoretical perspective for constituting approaches to analysis/design. This frame contains *intended action* and *purpose* as elements on the same level. The purpose element contains *outcome* and *consequence* elements in an approach–to analytical framework (Figure 6.6). The approach-to analytical framework (s. 6.3.2, Figure 6.6) was adapted during the constituting of the final approaches to analysis/design categories of description. The resulting approach-to-analysis/design analytical framework (Figure 8.2) guided the data analysis and interpretation to constitute the approach categories.

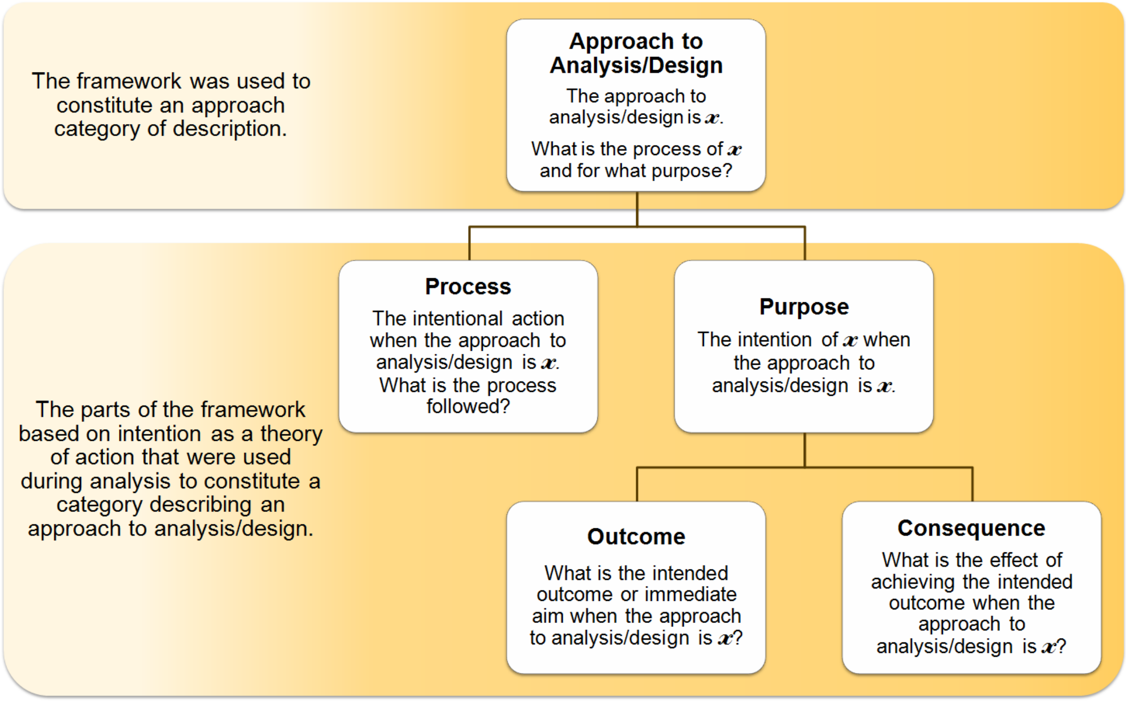


Figure 8.2: The approach-to-analysis/design analytical framework

As shown in Figure 8.2, the adaptations of the approach-to analytical framework involved changing the general doing of something to specifically targeting the doing of analysis/design. Changing the intended–action–element label to process was a choice that reflects this study's data. Process is part of the language the interviewees used to describe what they do. The choice to change the intended–action–element label to process also partly rests on the frequency the term was used (634 times in 20 interviews).

The process–element, purpose–element, outcome–element, and consequence–element of the approach-to-analysis/design analytical framework (Figure 8.2) became the foci of the analysis and interpretation of the data for the constitution of the approach categories. In part (I) of the research process, when I came to analyse the data again for the variation in approaches to analysis/design I concentrated on:

- *The process–element as the intentional action* (as captured in the transcripts): I interpreted, for each particular approach to analysis/design the (reported) intended action. My interpretation of the interviewees' utterances was guided by the question in the process–element (Figure 8.2): “What is the process followed for that particular approach to analysis/design?”.

- *The purpose–element as the intention of that intentional action*: I interpreted, for each particular (reported) approach to analysis/design the intended outcome, or immediate aim of doing analysis/design, and the consequence.
- *The intended outcome of following that process*: My interpretation of the interviewees’ utterances was guided by the question in the outcome–element (Figure 8.2): “What is the intended outcome, or immediate aim of doing analysis/design when that particular approach to analysis/design is taken?”.
- *The consequence of achieving the intended outcome when that process was followed*: My interpretation of the interviewees’ utterances was guided by the question in the consequence–element (Figure 8.2): “What is the effect of achieving the intended outcome when that particular approach to doing analysis/design was taken?”.

In a similar way that intentionality as a theory of mind is part of GIFTed data analysis, intention as a theory of action is also part of GIFTed data analysis. Again, the Gestalt whole-part relation, the Gestalt figure-ground structure, and a field theory of consciousness were included with intention as a theory of action as part of GIFTed data analysis. The Gestalt whole-part relation guided the interpretation of the structure and meaning of each approach category. Each theme, within a category, and each category are Gestalts. The Gestalt whole-part relation applies to the outcome space as the whole and the parts of the outcome space, that is, the four approach categories. The Gestalt whole-part relation applies to the parts of each category description, that is, the prose, quotes, and field diagram, which form a whole.

In the same way as for the conception categories, a field theory of consciousness, adapted from Gurwitsch (1964/2010), was used to organise the whole and parts of each approach category into a field with a theme of salient constituents, a thematic field of thematic constituents, and other items at the margin (Figure 6.10). The Gestalt figure-ground structure guided the interpretation of what is figural, that is, in the theme and what is ground, that is, in the thematic field and margin.

The four categories describing the variation in the qualitatively different approaches to analysis/design were constituted from the data using GIFTed data analysis combined with the phenomenographic constant comparison method. The four approaches to analysis/design categories of description are:

Approach Category 1: *An ad hoc process that as quickly as possible delivers something to the client and solves the problem.*

Approach Category 2: *An atomistic process that produces artefacts to show that some analysis and design took place.*

Approach Category 3: *A circumscribed process that produces the best artefacts and solution.*

Approach Category 4: *An adjustable process that shares an understanding of the problem and a vision of the solution to satisfice stakeholders.*

Each approach category is labelled as a process and the purpose that process entails. In each approach category of description, the process, the purpose, and the features of significant difference from other categories are described. Within each category are salient and thematic constituents that determine the approach category of description. The salient and thematic constituents provide the structure and meaning of a category and each constituent is supported by example quotes. Following the category descriptions, the relationship between the categories of description is represented as the approach categories outcome space.

8.1 Approach Category 1: An ad hoc process that as quickly as possible delivers something to the client and solves the problem

Approach Category 1 is an approach in which an ad hoc process is used. The outcome of this approach is to as quickly as possible get something, such as software or product, delivered to the client. The consequence of this approach is to have quickly solved the problem.

> *I13 Without any [pause] really it's all ad hoc, really. There's no guidelines to how you're supposed to do things, they just give you what they call a change request [viz. a task], and you're supposed to go and look at what you're supposed to do. So it's really your own analysis and your own design and whatever you come up with that can solve the problem. So they're not really strict on how you design the software,*

how you implement it, as long as you get it done, really. [... It's about] how quickly you can get the product out [...] The emphasis is not on analysis and design. The emphasis is on: deliver the software as quickly as possible to the customer.

In this first approach category, the *ad hoc process* is the intended action. The concept of intention that was used to constitute approach categories is: a conscious act that presents an action as something that can be done (s. 6.3.2). In this category, the conscious act presents an ad hoc process as what can be done. An ad hoc process means there are not any guidelines to follow to take this approach to analysis/design. An ad hoc process means the analyst/designer comes up with whatever she can to do the analysis/design. The ad hoc process is focused on doing a minimum of analysis/design as quickly as possible.

The *outcome* of the ad hoc process is to *deliver as quickly as possible something to the client*. The something that is delivered is product, probably software that is part of the BIS. The immediate aim is to expeditiously deliver product to the client.

The *consequence* of doing the ad hoc process and expeditiously delivering the product to the client is to *have as quickly as possible solved the problem*. The problem gives rise to the need for analysis/design to be done. The problem might be stated in the assignment of the task, such as in a change request. The problem is deemed solved after the product is delivered to the client.

The field of Approach Category 1 (Figure 8.3) is dispersed from the margin across the thematic field into the theme. The salient constituents in the theme are working–solo, technical–issues, and expeditious–task–completion. Thematic constituents of time–pressure, communicating–with–programmers, limitations–of–repeatable–successes, and failure–will–happen are most relevant to the theme. Communication–with/as–expert, analysis/design–activity, and initiation–of–analysis/design, are somewhat relevant, close to neither the theme nor the margin, though, analysis/design–activity tends toward less relevance. At the thematic field/margin boundary are thematic constituents with little relevancy to the ad hoc process, namely, communicating–with–business/client, iteration, testing, and maintenance–of–the–system. Maintenance–of–the–task's–product and justification–for–the–task–to–be–done are not relevant and therefore, are other items at the margin.

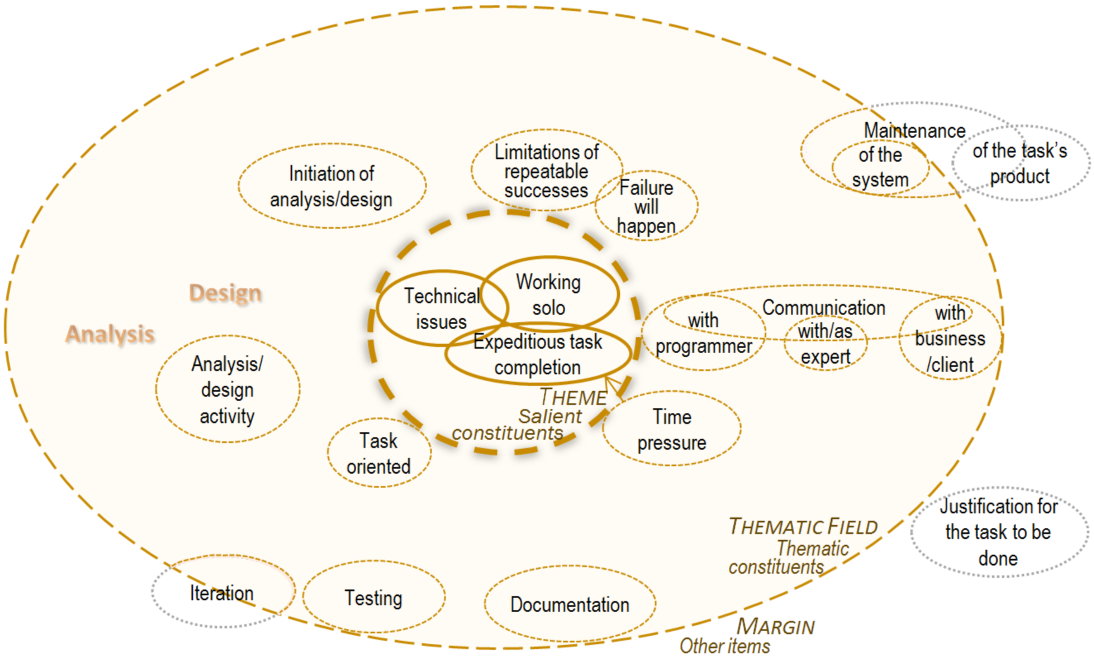


Figure 8.3: The field of Approach Category 1

Approach Category 1 is task oriented. The task might be a change request, a requirement, or a small part of the system. The task orientation means analysis/design is done one task at a time.

I18 we never talk about more than one thing at once

Task–oriented is a thematic constituent that has a bearing on the theme. Task–oriented does not have the functional significance to make it part of the theme. Task–oriented is relevant rather than functionally significant to the theme because it points to the orientation *within* which the theme is in focus. There is not a focal awareness that the orientation is only toward a task. Task–oriented is not figural; the task is the extent of what is figural. To illustrate, technical–issues are oriented toward the technical issues of the task. The orientation of the problem that is solved is toward the task. The orientation of the something that is delivered to the client is toward the task-level of that something.

The theme here is the least complex of those in the approach categories. Each of the three salient constituents, working–solo, technical–issues, and expeditious–task–completion, has a functional significance that defines and determines the constituent's inclusion in the theme. Working–solo is the individual doing analysis/design on their own, which is represented as:

- Each analyst/designer deciding how and what analysis/design will be done.

I10 *I decide how I want to do it. Everyone decides: how you're going to do it, what documentation you're going to produce and it'll be different for every project. In that sense, it's probably very ad hoc.*

- The analysis/design being done from the point of view of the analyst/designer.

I13 *it's analysis, but really in an ad hoc way 'cause it's not documented. It's from the point of view of the developer.*

- The work done as analysis/design being for the individual analyst/designer.

I10 *if you do the analysis work it's usually for yourself anyway so it's not always for another person.*

- The individual controlling the analysis/design.

I13 *it's really your own analysis and your own design and whatever you come up with that can solve the problem.*

- The individual deciding how clients need their problem fixed.

I10 *my analysis is really to do with how we're going to do something to solve a person's pain, as to how I think that they need it to be fixed.*

- The analyst/designer working as an individual even when part of a team.

I10 *I mean it's a large team, but I'm usually working [pause] say we'll have, on a project, five people, we'll break that up into, not even components, it could be different applications, or it could be different tiers, or so on, but then that person's responsible for analysing, designing, and implementing that particular aspect, now it could be actually quite large, but that's okay, it's up to you, you just need time.*

An ad hoc process emphasises the technical–issues to finding a solution, such as the technical design, what programming language to use, and the way the solution is to be constructed. Technical–issues come up early in the process and quickly become the focus.

I10 *I do take a very technical approach to everything, I do realise nowadays that that's not so good, you lose sight of a good design as opposed to a good technical design. [... By] technical, I mean, when we're thinking about what language are we going to use, or in terms of say, thinking high level classes, I'd be already thinking of Java implementation, that sort of [pause] I'll probably go straight to that too quickly.*

Expeditious–task–completion is an interpretation of the utterances about time pressing on or compelling the individual to work quickly. Expeditious–task–completion is characterised by awareness of:

- The short term being more important than the longer term.

I13 *they don't look at the long term, they look at more short term. How quickly you can get the product out, that's more the way they operate.*

- Each task having a short timeframe.

I13 *it can take from one hour to a week for a small change request, so it's not such a big deal*

- Planning to work quickly being proper.

I13 *if you estimate too long they're just going to cut it down anyway, so you might as well just give them a proper estimate*

- Estimating the time to do the task and determining the technical solution being analysis/design.

Int *[For] the small change requests, when you do your own analysis and own design [...] what are you doing in that situation?*

I13 *First of all you read what the change request asks you to do. And then you analyse how long it would take [...]*

Int *After you've figured out how long it's going to take, but before you start the implementation, before you start coding, what do you do in that time?*

I13 *Usually, you figure out how long it takes, you know exactly what to do, so once you notify the team leader how long it will take, it's just hands on really, right away.*

In this category, there is time–pressure to achieve expeditious–task–completion. Analysis/design is approached from the need to get the minimum amount of analysis/design done in as little time as possible.

How initiation–of–analysis/design happens in the ad hoc process is not in focus. Initiation–of–analysis/design is the presentation of the problem to be solved. The problem to be solved is presented to the analyst/designer as a task to be done. The presentation of a task, such as a change request or requirement, is the initiation–of–analysis/design.

I13 *first you read what it [a change request] asks you to do and then you have to analyse*

The task presented to the analyst/designer is accepted as a task that must be done. The value of doing the task has been justified by someone else. The justification–for–the–task–to–be–done is an item at the margin.

I10 *I have a requirement for a particular system, it's been justified by the business that: "Yes, a system that did this would be great", to be honest, what feeds my design is just purely satisfying that requirement*

Once initiation–of–analysis/design happens, analysis/design is not emphasised. There is not a necessity or benefit in doing much analysis/design. Analysis/design–activity is of concern only to what it contributes to the solution.

I10 *so it seems like a lot of stuff just goes … that it's not necessary, that's what it feels like. […] It just doesn't seem like there's any benefit in it […] my analysis work that I do is more solution based.*

The role and use of documentation is of little concern to this approach to analysis/design. Not documenting contributes to the ad hoc character of the process. Either documentation is not produced as there is no point in producing it or what documentation is produced, is not read.

I9 *you've probably thought the model up in your head anyway, and there's no point in expressing it on paper.*

I10 *I put a lot of effort into say a design document, do all nice diagrams and everything and so on and it's very meaningful but no-one will ever read it. [pause] Ever.*

Communication has varying relevancy to the ad hoc process depending with whom the analyst/designer is communicating. Communication–with–business/client is of little concern, as it is limited to the delivery of something to the client. Communication–with–programmer has the most bearing on the theme, particularly communication about technical–issues.

Int *In your role as an analyst you seem to spend a lot of time going from the analyst to programmers, not really from an analyst to a client sort of connection.*

I10 *No, that's true, yeah, and that's probably why I'm sort of drawing a blank when it comes to what's [pause]*

Int *What feeds into your design.*

I10 *Yeah. [Pause]*

Int *Apart from the instructions from your manager.*

I10 *Yes, exactly*

Communication–with/as–expert is related to perceived level of expertise of the analyst/designer. When the analyst/designer perceives he/she does not have the necessary expertise, he/she may ask the expert for an opinion on technical–issues.

I13 *when I first started I wasn't as experienced as I am now so a lot of thinking had to be done, you had to go and talk to people that are expert in those areas but now that you know the system just go ahead and do it really.*

Int *So the talking to people that you did, what sort of things were you doing with them?*

I13 *When I wasn't really experienced, I would say "I'm going to implement this in this way, is that a good idea?", or "Is there a better way of to do the implementation?", or "What sort of language should I use?" [...] most of the time I try to talk to the expert in the area that I'm working, that I want to do the change, and get their opinion really, on what is the best way to implement a certain thing.*

Alternatively, the analyst/designer may be perceived to have the necessary expertise. Communication is then between other people and the analyst/designer as the expert.

I10 *I get people started all the time, I do proof of concepts a lot and people will end up using that proof of concept to build a whole system*

Communication–with/as–expert appears to be about technical–issues and design. Even so, communication–with/as–expert is not as regular and not as relevant as communication–with–programmer.

Preparing a test plan is part of the ad hoc process. Figure 8.3 shows this as the testing thematic constituent. Test plans are prepared without guidelines and consequently the tests allow through bugs as the product is tested according to the analyst/designers expectations.

I13 *we don't have strict guidelines in terms of tests procedures [...] when we do a change request we have to actually write down test instructions, which is not really good [...] we have done the implementation, test the implementation ourselves, and write down how the actual developer would test it [...] a lot of bugs fall through the loop because the developer is blinded by what he's doing, so he's always entering data that would always work [laughs] and if you're following his test plan obviously it's going to work*

As tasks to be done are accepted as justified, the product must be delivered to the client as quickly as possible and thus the problem is solved as quickly as possible. This means the ad hoc process cannot have iterations within the process. There is not the time to evaluate the task. Therefore, iterations are at the margin. However, iterations where the problem to be solved is modified or redefined after delivery of the product to the client can happen. These complete cycles of the ad hoc process are iterations of little concern to the theme. During iterations of complete cycles of the ad hoc process, the analyst/designer communicates to the client via the delivery of product to the client. The client communicates to the analyst/designer by refining what the problem is. The communication from the client to the analyst/designer may be channelled through the person who assigns the analyst/designer the task to be done.

> I10 *Trying to find out business functions it's going to provide and so on, like we don't, that's [pause] if anything that's more of an iterative approach. It's sort of like, [after receiving product, the client says] "Okay, oh it can do this", "Oh that's great, what if it can do this?", "Okay, what do you know, I can do that as well". And it's just continually communicating back with the business.*

Maintenance–of–the–task's–product is not relevant. Expeditious–task–completion means there is no time to consider maintenance–of–the–task's–product. The need for maintenance–of–the–system is vague and indistinct. Maintenance–of–the–system, which might be needed in the future because of the way the current task is done, has little bearing on the way the task is done. There is a vague awareness that maintenance–of–the–system might be needed in the future.

> I10 *I've always argued, "Okay, well what happens if I want to update this particular package that we use in ten systems?" "Ah, that's fine; we'll fix it when it happens."*

Working–solo as part of the figure has limitations–of–repeatable–successes and failure–will–happen in the background. In this category, there is awareness that repeatable successes are limited to particular individuals. The limitations–of–repeatable–successes means failure–will–happen.

> I10 *it's all about the individual being able to do a particular thing [...] there's only specific individuals that can actually repeat successes in terms of a system that they write or work on, or a piece of coding even and some people do fail pretty badly*

In summary, in this first approach category, the process is ad hoc and the immediate aim is to deliver as quickly as possible something to the client. The consequence of achieving the delivery of something to the client is that the problem is then deemed solved. The theme of Approach Category 1 is focused on working–solo, expeditious–task–completion, and technical–issues. The approach to analysis/design, in the analyst/designer–analysis/design internal relation described in this category, is task–oriented. Minimal analysis/design is done in the shortest possible amount of time. In this category, design, in relation to technical–issues, appears more relevant than analysis.

8.2 Approach Category 2: An atomistic process that produces artefacts to show that some analysis and design took place

Approach Category 2 is an approach in which an atomistic process is used. The immediate aim of this approach is to produce artefacts. The consequence of this approach is that the analyst/designer is able to show that some analysis/design took place.

> I14 *what we used to do is, after having requirements for a particular project, even if it's written or oral [...] We used to sit together, the development team, to do the analysis for what's required, do proof of concepts for some vague portions of the program of that system and for the design we had some design templates that we had to follow, mainly it was RUP [Rational Unified Process] documents that we have to use [...] after finishing the design and analysis we used to start coding with unit testing and with integration testing and all these thing [...] For example, when we start with these documents usually we used to start with the use cases, "Okay, what do we have to do?", "Ah let's draw some ellipses, mark some actors to it.", that's the general idea of it. There wasn't really studying or understanding of what is really required and transform that as use cases, it was just like "Draw these ellipses, mark some arrows to them, that's it, okay, class diagram, what do we have?" It wasn't really analysis or design with classes of these things. Just we have to fill in these documents, we have to produce them, give it to the project manager, and that's it.*

In this second approach category, the *atomistic process* is the intended action. An atomistic process is presented as the analysis/design that can be done. Atomistic, as used here, means "consisting of many separate, often disparate elements" (*Atomistic adjective* 2009). An atomistic process means the focus is on doing many separate analysis/design tasks. The tasks are completed without comparing or relating the artefacts produced from doing each task.

The *outcome* of the atomistic process is the *production of unconnected artefacts*. Artefacts include documents, models, diagrams, and proofs of concept. An artefact is produced from doing an analysis/design task without comparing or relating the artefact to any other that might have been produced. The immediate aim is to produce the artefacts.

The *consequence* of doing the atomistic process and producing artefacts is that the analyst/designer can *show that some analysis/design took place*. The production of artefacts provides evidence that analysis/design was done. The content of the artefacts is not the focus. The achievement is in having the artefacts to confirm analysis/design took place.

The field of Approach Category 2 (Figure 8.4) is centred on the oriented–toward–the–artefact and producing–artefacts salient constituents. Oriented–toward–the–artefact is also a thematic constituent along with communication, software–development–method, document–templates, analysis/design–activity, technical–issues, maintenance, iteration, and testing. The thematic constituents refer to the oriented–towards–the–artefact salient constituent. Understanding–what–is–really–required is not relevant and is an item at the margin.

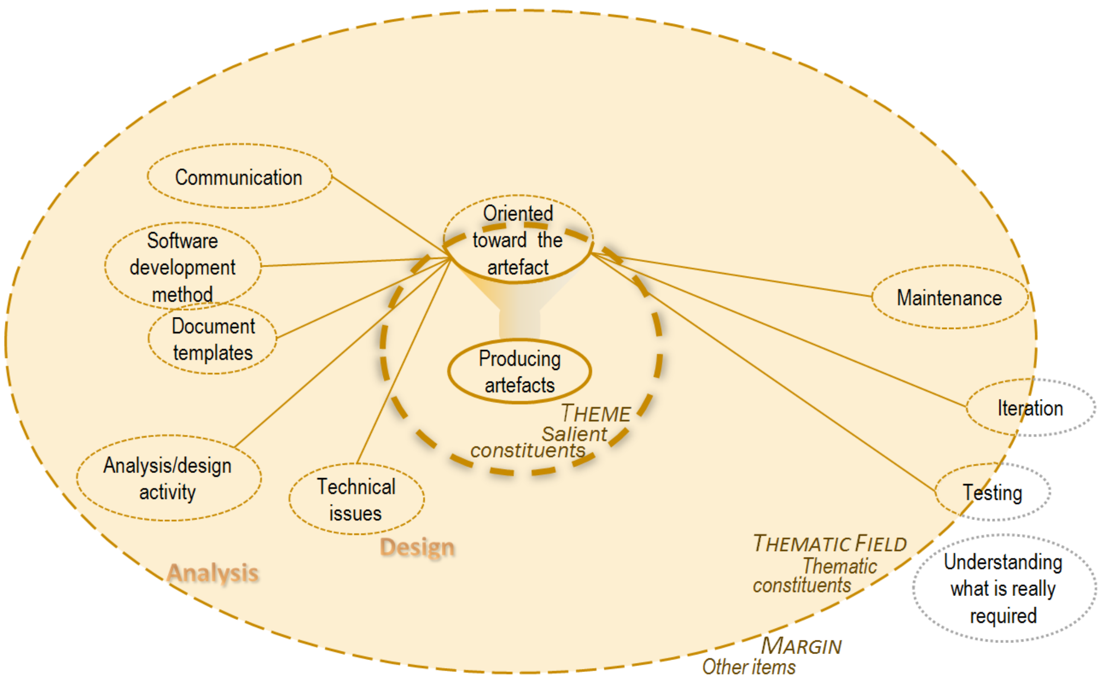


Figure 8.4: The field of Approach Category 2

Approach Category 2 is oriented–toward–the–artefact. The focus is on one artefact at a time, such as first the use case diagram and then the class diagram. Oriented–toward–the–artefact means analysis/design is done task by task, producing one artefact, then the next, and so on.

> *I14 start with the use cases […] "Draw these ellipses, mark some arrows to them, that's it, okay, class diagram, what do we have?"*

Oriented–toward–the–artefact is a constituent lying on the theme–thematic field boundary. Oriented–toward–the–artefact is a thematic constituent that has a bearing on the theme by being relevant to the extent of what is figural. There is not awareness that the orientation toward the artefact is the extent of what is figural. Oriented–toward–the–artefact is a salient constituent with functional significance because each artefact, in turn, and its production, is figural. There is awareness that each artefact is in focus while the task of producing an artefact is being done. For example, there is an orientation toward producing use cases first, once the use case diagram is complete; the orientation is then turned toward producing the class diagram.

Oriented–toward–the–artefact, as a salient constituent, determines and emphasises the disparity between the artefacts. The artefacts are isolated pieces. Each artefact shows a view of the system or part of the system in isolation. Each artefact is disconnected from the other artefacts. The focus is on one artefact at a time, such as when the focus is on the class diagram, the use cases are not referenced.

Producing–artefacts is functionally significant because the immediate aim of the atomistic process is to produce artefacts. Producing–artefacts is a salient constituent. Even though document–templates from a software–development–method might be used to produce artefacts, these are thematic constituents, only relevant, rather than salient, to the atomistic process.

> *I14 we had some design templates that we had to follow, mainly it was RUP [Rational Unified Process] documents […] we have to fill in these documents, we have to produce them, give it to the project manager and, that's it.*

Producing–artefacts is not about "really studying or understanding […] what is really required and transform[ing] that [understanding into] use cases" (I14). The rationale behind creating a particular artefact, which might be explained in a software–development–method, is not part of the intent of producing–artefacts. Nor is traceability or the connection between one artefact and another of concern to the production of artefacts. The production of each separate artefact according to the rules of what the artefact must look like is the focus. For example, a use case diagram is produced by "draw[ing] some ellipses, mark[ing] some [arrows from the] actors to [the ellipses], that's the general idea" (I14).

In contrast to Approach Category 1, where the documentation was only for the analyst/designer, in this category, producing–artefacts is for showing the artefacts to someone. The people to whom the artefacts might be shown includes the "project manager" (I14), the "user [..., the] head of [the] company [...,] or a new designer" (I11).

Showing these people the artefacts is a form of communication. For example, producing–artefacts for the project manager shows that the document–templates were "fill[ed] in" (I14), that is, communicating that analysis/design took place. When a current user is shown the artefacts, it communicates "proof that the system was actually designed by [a particular analyst/designer]" (I11). The artefacts are also a way of communicating that the system exists.

> I11 *I think documentation also proves the existence of the system*

The artefacts are also perceived as communicating legal entitlements.

> I11 *it's a legal document to let people know who designed this thing and whose rights are on this program or system.*

Oriented–toward–the–artefact has functional significance because the thematic constituents are filtered through oriented–toward–the–artefact, as a salient constituent. Each thematic constituent, other than oriented–toward–the–artefact, has a bearing on the theme that is filtered through the oriented–toward–the–artefact, as a salient constituent. For instance, communication via an artefact shows that analysis/design took place.

The software–development–method provides a sequence in which the artefacts are produced, such as the Rational Unified Process (RUP) specifying to first produce the use case diagram, and then the class diagram. The software–development–method also may provide document–templates for the production of the artefacts.

> I14 *mainly it was RUP documents that we have to use*

A document–template is a starting point for the production of an artefact. A document–template is a form in which the rules for what an artefact must look like are presented. The artefact is produced according to these rules.

> I14 *we had some design templates that we had to follow*

An artefact shows some analysis/design–activity took place. Analysis and design are interpreted as not being parts of the theme. Design appears to be emphasised more than analysis. In this category, there is little emphasis on analysis because producing–artefacts is not about "really studying or understanding [...] what is really required"

(I14). Design was emphasised by resolving technical–issues “for some vague portions of the program” (I14) and using “design templates” (I14).

Technical–issues are oriented–toward–the–artefact in a way that producing an artefact, will resolve technical–issues. For example, producing a “proof of concept” (I14) will clarify “some vague portions of the program of that system” (I14).

Maintenance is oriented–toward–the–artefact. Maintenance, that is, “add[ing] more stuff or refin[ing] the programme” (I11), has a vague association with the theme of this category. An analyst/designer, who is new to the system, might need the artefacts produced, which can be interpreted as a type of maintenance.

> *I11 a new designer, who is going to add more stuff or refine the programme, [...] probably needs the documentation*

The artefacts produced demonstrate completing one task after another. Once an artefact is produced, it does not seem to be revisited. This suggests that completing the cycle of tasks, similar to Approach Category 1, might begin the cycle again. Iteration of one or more tasks within the cycle does not seem likely. There is a suggestion that iteration takes place after the user gives the analyst/designer the requirements. The analyst/designer produces an artefact. The artefact is shown to the user. Depending on the response from the user, the artefact may be modified. As a sequence of events, this sequence might be iteration. As a sequence of tasks, this sequence might be some of the separate tasks the analyst/designer is required to do in an atomistic process. Whether iteration has a bearing on the theme is ambiguous, which places iteration on the thematic field–margin boundary.

> *I11 the whole process [...] starts with the user telling you what he or she needs; [...] the designer, [...] putting it into a diagram [...] and then, showing it back to the user, modifications being made*

Testing is oriented toward producing a test artefact, such as the test plan or test cases. Whether testing is part of analysis/design or part of construction is not clear. Testing may be represented as being done after analysis/design is complete.

> *I14 after finishing the design and analysis we used to start coding with unit testing and with integration testing and all these thing*

Testing, as in producing test artefacts, may also be represented as being part of analysis/design.

I13 *to do all that [viz. analysis/design] properly, you actually have got to document what you do [...] document the actual testing process or, like, you have to write it down what test plan and document the actual testing process*

Whether testing is part of analysis/design or part of construction is ambiguous, which places testing on the thematic field–margin boundary.

The atomistic approach breaks the process and system into unconnected pieces. These pieces are represented by the unconnected artefacts. Consequently, understanding–what–is–really–required is outside this approach to analysis/design. Understanding–what–is–really–required is handled by someone else, such as "the user telling you what he or she needs" (I11). That understanding–what–is–really–required is not part of analysis/design in this category places this item at the margin.

In summary, in this second approach category, the process is atomistic and the immediate aim is to produce unconnected artefacts. The consequence of achieving the production of the artefacts is that the analyst/designer can show that analysis/design took place. The theme of Approach Category 2 is focused on producing–artefacts and oriented–toward–the–artefact. The approach to analysis/design, in the analyst/designer–analysis/design internal relation described in this category, is oriented–toward–the–artefact. Some analysis/design is shown to be done by producing one artefact after another. In this category, design may be more relevant than analysis, although neither is in the theme.

8.3 Approach Category 3: A circumscribed process that produces the best artefacts and solution

Approach Category 3 is an approach in which the process is circumscribed by the development method. The immediate aim of the circumscribed process is to produce analysis/design artefacts and a solution. The consequence of the circumscribed process is that the produced artefacts and solution are perceived to be the best.

I20 *there is a methodology [sic, viz. method] and a procedure that you can read for any type of task you're about to do and best practice in design phase, analysis phase, or implementation and so on. Lots of things like document templates for everything around and everyone is using the same thing and everyone is following the same methodology [sic, viz. method] So if you move from project to project [...] it's not* *that hard because you're just implementing the same process [sic, viz. method] or going through the same process that you have done on another project*

In Approach Category 3, the *circumscribed process* constitutes the intended action. A circumscribed process is presented as the analysis/design that can be done. The process is circumscribed by following a development method. The development method restricts what analysis/design is done and how analysis/design is done. The restriction of the process within the limits specified by the development method circumscribes the process.

The *outcome* of the circumscribed process is *the artefacts and a solution*. Artefacts are typically documents. A solution is a new system or a change to an existing system. The development method determines the order in which the artefacts must be produced and which artefacts must be produced. A circumscribed process will result in a solution.

The *consequence* of doing the circumscribed process and producing artefacts and solution is to *produce the best* artefacts and solution. The analyst/designer perceives the best artefacts and solution come from following one development method that circumscribes the process.

I20 So if there were better processes in place and we followed a better methodology [sic, viz. method] then maybe we would end up with better systems which are easier to support.

The field of Approach Category 3 (Figure 8.5) has a theme of process enclosed by the development–method joined with producing–the–best. The thematic field is the ground in which producing–the–best is most relevant. The ground is divided between formality and informality. Formality is associated with: design, artefacts, solution, standardising, templates, the method being predefined–tried–and–tested, permanent, structure, maintenance, and communication–with–the–IT–team. Informality is associated with: analysis, transitory, the client, understanding–requirements, requirements–from–the–client, communication–with–the–client, and meetings–and–interviews.

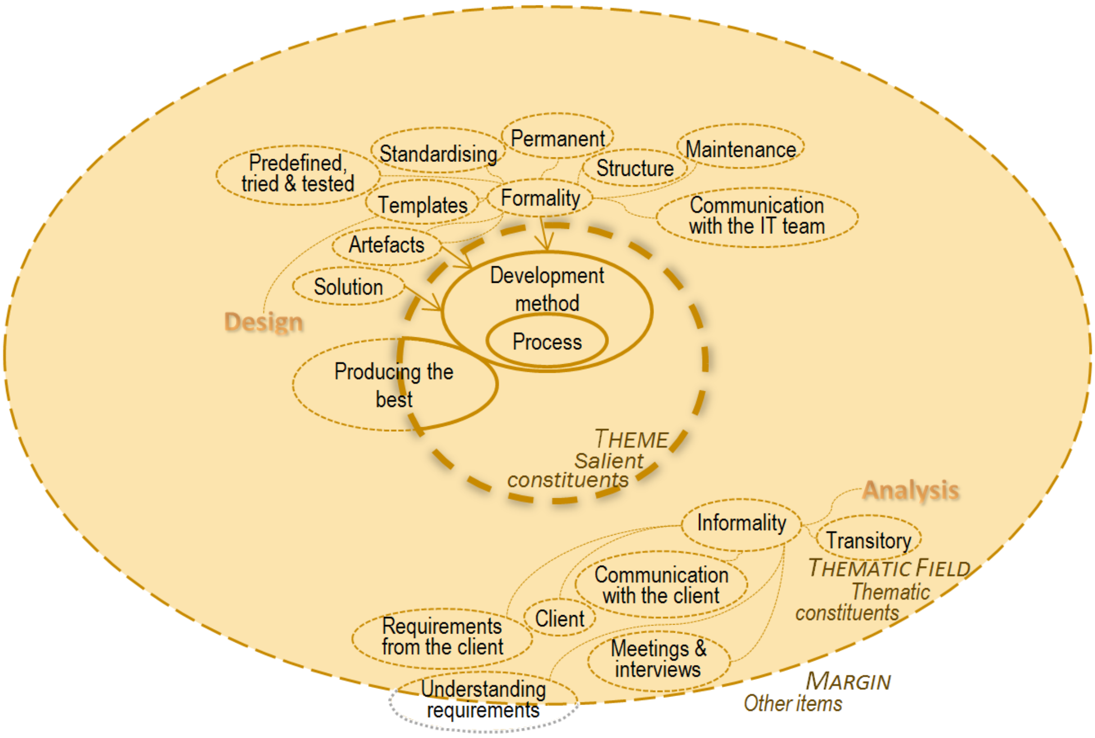


Figure 8.5: The field of Approach Category 3

The theme of Approach Category 3 is the development–method, the process circumscribed by that method, and, in part, producing–the–best. There is a development–method suitable for whatever is to be done.

> I20 *If that process [sic, viz. method] say is, [...] a testing methodology [sic, viz. method], [...] you should follow this process [sic, viz. method] in the testing phase of every IT project, or you should follow this process [sic, viz. method] if it's a small change, you should follow this other process [sic, viz. method] if it's a very large system change or a new system being generated.*

The process is the realisation of *only* what is contained in the development–method. For "every IT project [. . .] there is a [method] and a procedure that you can read for any type of task" (I20). The development–method specifies "best practice" (I20) for developing the system or part of the system, which includes best practice for analysis/design. That the development–method specifies best practice is a justification to circumscribe the process.

Other justifications for using the circumscribed process as the approach to analysis/design are:

- The development–method is predefined, which makes it easier than defining a method during development. A predefined method is also tried and tested.

I20 *I think if there is a predefined process [sic, viz. method] for doing something that's often easier than trying to define a process [sic, viz. method] for yourself [...] especially if it's tried and tested*

- A predefined–tried–and–tested development–method results in a better outcome.

I20 *if you follow a better process [sic, viz. method] the outcome will be better, not necessarily, but it may be [...] there might be a sacrifice in quality as well [without a predefined method].*

- A predefined–tried–and–tested development–method guides the analyst/designer doing something for the first time or when the analyst/designer is not sure what to do. The circumscribed process is a way of dealing with uncertainty when something is new and the analyst/designer needs to decide what to do.

I20 *a predefined [method] [... is] often easier [...] especially if it's something that you haven't done before [...] and if you're doing something for the first time and you're not sure: "Should I have interviews with these people or should I just make up the requirements myself or should I do it this way or should I listen to the feedback at all these different stages or should I wait to the end".*

- The circumscribed process results in a better outcome of higher quality.

I20 *maybe if you follow a better process [sic, viz. method] the outcome will be better, not necessarily, but it may be [...] there might be a sacrifice in quality as well [without a predefined method].*

Producing–the–best is a constituent that lies across the theme–thematic field boundary. As a salient constituent, producing–the–best is part of the figure. The focus on following a development–method that circumscribes the process includes a focus on producing–the–best artefacts and solution. These three salient constituents, development– method, process, and producing–the–best, have Gestalt coherence:

- The circumscribed process produces the best artefacts.

I20 *do everything by the book and we're going to have all this really nice documentation to associate with it.*

- Producing–the–best results from following a development–method that circumscribes the process.

I20 *So if there were better processes in place and we followed a better methodology [sic, viz. method] then maybe we would end up with better systems which are easier to support.*

Producing–the–best is a thematic constituent that has a bearing on the theme by being relevant to the extent of what is figural. There is not awareness that producing–the–best is the extent of what is figural. Producing–the–best provides the context from which "do[ing] everything by the book" (I20) emerges as the approach to use for analysis/design.

In Approach Category 3, formality and informality are two thematic constituents that divide the thematic field. Formality is of more concern to the theme than informality. Formality has a bearing on the development–method. The development–method is the focus of the formality and its associated thematic constituents. The thematic constituents associated with formality are:

- design, as the more formal phase of documenting and detailing the solution

I20 once [the analysis] phase was over or coming to an end we then start on design

- artefacts

I20 if we have [...] very formal things [...] having output from every single phase, having lots and lots of documentation and even logic specs and technical specs, that would be great I think if we did have that

- solution

I20 we then start on design, we start thinking: "These are the requirements, now how does that fit into a system, how do we build a system that answers those requirements"

- standardising

I20 I wish that maybe more emphasis [...] or concern was given especially within ISD [...] to standardising methodologies [sic, viz. method] and processes

- predefined–tried–and–tested

I20 there is a predefined process [sic, viz. method ...] it's tried and tested

- templates

I20 I wish that maybe more emphasis was given [...] to [...] even producing sets of documents and templates even that could be used within the group

- permanent

I20 so it's a bit more formal because it's fixed, it's an actual physical thing [... by fixed I mean] it's a physical document, it's there for all time

- structure

I20 *if we have […] very formal things and very structured things*

- maintenance

I20 *if we have […] very formal things […] that would mean […] we would end up with better systems which are easier to support.*

- communication–with–the–IT–team

I20 *if we have […] very formal things […] that would mean […] it was easier to pass on information between new members of the team or people moving around within IT*

Formality is the design phase, a formal phase of producing artefacts that specify a solution. Standardising a development–method, the presence of a predefined–tried–and–tested development–method, and having templates for artefacts, point to formality. Formality is about having structure and permanent evidence of the circumscribed process. The formality makes maintenance easier. Communication–with–the–IT–team is the passing on of the artefacts and solution to people in the IT team. Formality and the thematic constituents associated with formality make up the distinct ground from which the theme emerges. These thematic constituents are more relevant to the circumscribed process than informality and its associated thematic constituents.

Informality is of less concern to the theme than formality. Informality has a vague bearing on the theme. The thematic constituents associated with informality are:

- analysis

I20 *[What makes analysis distinct is …] the more informal interviewing and just meetings and things like that […] we would have the analysis phase, we would sit down and talk with people and produce a requirement specification*

- meetings–and–interviews

I20 *the more informal interviewing and just meetings and things like that […] My idea of informal is just conversations, meeting, interviews*

- client

I20 *sitting down at someone's desk […] the person sees something working […] just sitting down with someone*

- communication–with–the–client

I20 *talk with people [...] conversations, meeting, interviews [...] looking through a problem or trying to get more information [...] talking about things*

- requirements–from–the–client

I20 *we would sit down and talk with people and produce a requirement specification [...] looking through a problem or trying to get more information on how the person sees something working*

- transitory

I20 *we often talk about ideas and ways of doing things that never eventually turn into anything, just the ideas get discarded or you change your mind.*

- understanding–requirements

I20 *My idea of informal is just [...] sitting down at someone's desk for half an hour and looking through a problem or trying to get more information on how the person sees something working*

Informality is the analysis phase, an informal phase of meetings–and–interviews with the client. Communication–with–the–client is having conversations, meetings–and–interviews to gather requirements–from–the–client. The outcomes of analysis are transitory, thus making it informal and of less concern to the theme. The informality of the circumscribed process is about ideas being thought of, talked about, which are possibly discarded or changed. Informality and the thematic constituents associated with informality make up the indistinct ground from which the theme emerges. These thematic constituents are less relevant to the circumscribed process than formality and thematic constituents associated with formality.

Informality and formality are captured in the delineation of phases. Analysis is the informal phase of interviews and meetings with people and design is the more formal phase of documenting and detailing the system design. The transition from informality to formality is the production of the requirement specification. The production of the requirement specification signals the end of analysis activity and the beginning of design activity. The transitory nature of the analysis phase transitions to the permanent nature of the design phase when the artefact, the requirement specification, is produced.

In Approach Category 3, requirements are met by supplying what has been asked for, which is attained by performing the circumscribed process. The requirements are met by completing that circumscribed process. As in previous categories, there remains a dichotomy between analyst/designer and client. Thus, the client, communication–with–

the–client, requirements–from–the–client, and understanding–requirements are of less concern than having a solution and artefacts.

Understanding–requirements crosses the thematic field–margin boundary, as there is an element to understanding–requirements that is not relevant. The client is the source of the requirements and then approves artefacts. The circumscribed process progresses with client approval.

> *I19 you ask them and they read it [viz. the requirements artefact] and they go "Yep", they sign it*

Part of the circumscribed process is the analyst/designer and IT team recording and understanding–requirements. Getting the client to sign off the artefact from the analysis phase is how understanding of requirements is verified. However, the client may not review or read the artefact. Although it is recognised that the client not reviewing or reading the artefact is problematic, the process nevertheless progresses because of the sign off. The circumscribed process continues by following what is defined in the development–method.

> *I20 analysis generally occurs towards the beginning of the project [...] the main type of tasks [... are] interviewing [...] system stakeholders [...] trying to get them to describe in various different ways what it is they want from the change of the system, and then recording those facts, and maybe reviewing them, talking to [or] bouncing round ideas with other members of the team, trying to ensure that [...] the IT persons understanding of what the business person wants is the same so that we're all on the same page. [I get to be on the same page by...] trying to describe what my understanding is in my words and hoping that that links in with what the person has just told me and then there's also the more formalised feedback in terms of writing up an analysis document, requirements document [...] which we'd detail very clearly what the understanding of the project is or the new phase or whatever [...] that would give a very formal version of feedback to the requestors of what our understanding is. [...] that would be my understanding [that's in the document] but then that would be reviewed and generally the process would be: send that out to all the people who are involved and get them to review it and read it hopefully, doesn't always happen, and actually physically sign it off so thereby they're saying, "yeah your understanding is the same as my understanding this is what I want from the system".*

> *Int If you send out the document to check your understanding and they're not reviewing it and reading it how do you know that you've got your understanding right?*

I20 You probably don't. Yeah that is a bit of a problem

In summary, Approach Category 3 describes an approach focused on a circumscribed process. The process is circumscribed to be within the limits defined by the development–method. The justification to restrict or circumscribe the process in this way includes producing–the–best artefacts and solution while ensuring that the process continues by getting artefacts approved by the client. Producing–the–best overarches the context, which is divided between formality and informality. Formality, which is more relevant to the theme than informality is associated with the permanent artefacts and solution that are produced using a standardised, predefined–tried–and–tested method. The informality is associated with analysis where ideas from meetings and interviews are transitory. There is more concern with communicating with the IT team than there is with the client. The analyst/designer and client, as in previous categories, are in a dichotomous relationship, which means that there is still part of understanding requirements that lies at the margin.

8.4 Approach Category 4: An adjustable process that shares an understanding of the problem and a vision of the solution to satisfice stakeholders

Approach Category 4 is an approach in which the process is adjusted. The outcome of an adjustable process is sharing an understanding of the problem and a vision of the solution with the people involved. Satisficed stakeholders are the consequence.

I5 showed them some similar scenarios that we had developed and what we envisage the system would probably look like—plus too, having had a verbal and [they are] ready [for us] to go get some prices, do a very quick mock up and say "Okay, here's what I envisage we could do, now you have seen that and this is what you had in your mind, this is what I've got in my mind, can we see some potential to extend this into other areas and let's make this the most beneficial thing that we can do". And then that stimulates their thinking and we end up with a contract being signed, we're going to get to do the job, we've gone away and done framework, we've imported data from their old system and we've got a server on site, we've set the data up and we've said "Okay, now let's have a look at this data and what we can do with it. Now you said you wanted to do this and I think this is already covered by how it looks like here, which you didn't have and now we've got this available you

> *could do this, this, this, and this which would save you double entry and save you time and we could actually get all that through to there and we've got this happening over here." So we've got a semi-working very rough model. The forms are all there, they're pretty hairy but they're all just enough to show you. So that's what they're working with at the moment and they'll go through that and sort of clarify in their mind what's missing or what is there or what potentially will be there and what we need to work. And in that process we've also raised a list of questions about their business and saying have you identified this, this, this, and this and we will then build it into the model, and that's the development phase.*

In Approach Category 4, the *adjustable process* constitutes the intended action. An adjustable process is presented as the analysis/design that can be done. An adjustable process may not follow a defined development method. The adjustable process is a "satisficing path" (Simon 1956, p. 136) to the immediate aim and consequence. The satisficing path "will permit satisfaction at some specified level of all of [the] needs [of the people involved]" (p. 136). The choice of what is done during the adjustable process is suited to the perceived situation.

The *outcome* of the adjustable process is *the shared understanding of the problem and vision of the solution*. The understanding of the problem and vision of the solution is shared among the people involved in the development of the system. The understanding of the problem is an understanding of the requirements for a system or organisational change. The vision of the solution is how the requirements for a system or organisational change are to be met. The vision of the solution includes specifying the level at which all of the needs of the people involved will be met.

The *consequence* of doing the adjustable process and sharing an understanding of the problem and vision of the solution is *satisficing the stakeholders*. Satisficing means that each stakeholder is satisfied that the process and solution is sufficient. For the analyst/designer, satisficing means using an approach that is satisfactory and sufficient to achieve the outcome and have the desired consequence.

The field of Approach Category 4 (Figure 8.6) has the most salient constituents in the theme. The salient constituents form a sophisticated figure. The focus is on sharing understanding–of–the–problem and vision–of–the–solution by communicating, the adjustable–process, available–resources, and satisficing–stakeholders. The thematic constituents of development–method, tools–and–techniques, and artefacts produced are of concern to the adjustable process. Working–efficiently, ensuring–no–surprises, iteration, and incremental–improvement bear on the theme. Of less concern is the formality of the adjustable process.

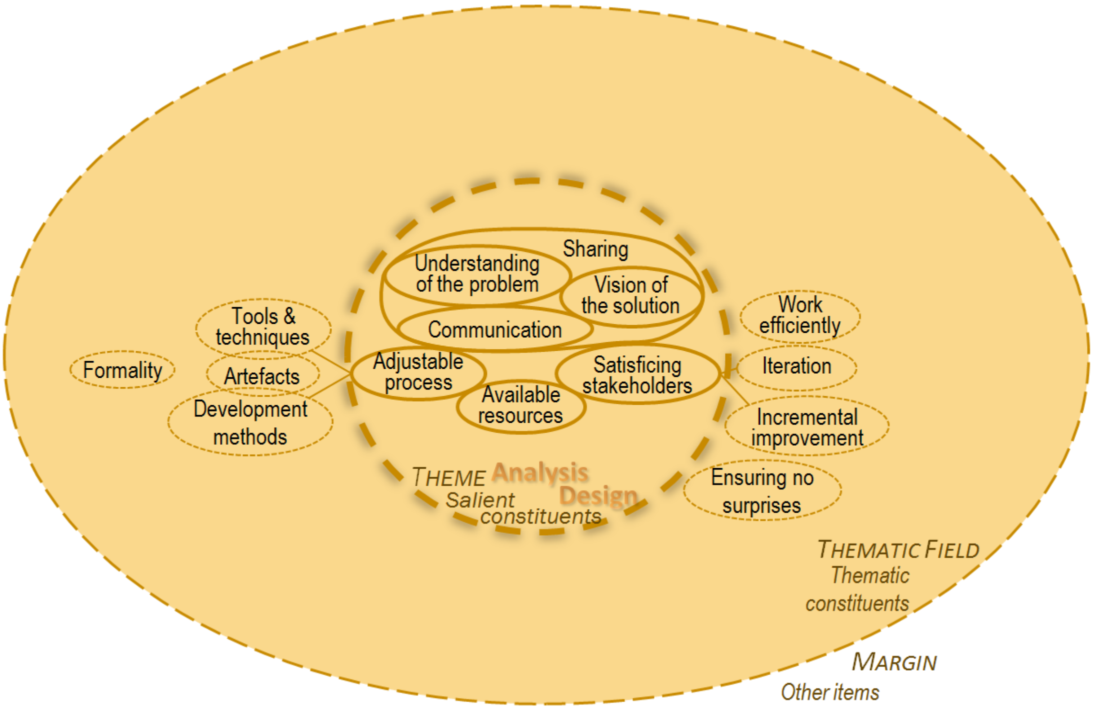


Figure 8.6: The field of Approach Category 4

The focus on sharing emphasises the importance of people to the process, that is, satisficing–stakeholders. Sharing understanding–of–the–problem is making "everybody […] comfortable that they know what [is] trying to [be] achieve[d]" (I12). Sharing vision–of–the–solution is making "everybody […] comfortable that they know […] what [the solution] is going to look like and how it will work" (I12). "Everybody" refers to the stakeholders. The stakeholders include the analyst/designer, and other people, such as "the programmers [...] the client [...] recognised users of a particular function [...] the head of the section [...] her staff [...] one person who is our major liaison [...] their IT person" (I12).

The shared understanding–of–the–problem is between the analyst/designer, client, and other stakeholders, such as the developers who are downstream in the process.

> *I2 the idea [...] is to see the first part of that process through to the extent where developers can understand and be quite clear about what the requirements are*

The shared vision–of–the–solution is between the analyst/designer, developers, and other stakeholders, such as the client.

I2 The customer will have a very, very clear understanding of what is expected and when they see the final product they all say, "Oh yes, this is exactly what we wanted".

In this category, communication is intrinsically connected with the approach to doing analysis/design.

I2 Initially I think I had, dare I say it, an academic view of the real world and [exasperated sigh] it didn't cut the mustard, from that point of view the thing that I had was the theory, but not really a strategy for getting the results that I wanted from that theory alone [...] I probably added that dimension of saying communicate, communicate, communicate [...] when they [the academic view and communication] met together and essentially one part became a very, very intrinsic part of the other that's when I felt personally that progress was being made.

Communication switches between sharing understanding–of–the–problem and sharing vision–of–the–solution. Communication is aimed at making the shared understanding and vision clearer. For example, sharing a vision–of–the–solution involves working with something from the developing system, such as user interfaces, which the client can see or relate to. Once the vision–of–the–solution is "in front of the [client]" (I12), communication readily and easily switches to sharing an understanding–of–the–problem.

I12 get[ting] the user interfaces in front of the users and say "This is how it's all going to work" and they've said "Okay, that's great, but what if we have one of these how is that going to fit in?" "Oh, you didn't tell me we had any of those." [...] there's all these exceptions and interesting bits and pieces that nobody ever got around to mentioning until we actually sat them down in front of a set of screens and said "Guys, that's what you're going to see." "Where's the field for such and such?" "Oh ..."

While there is little focus on the distinction between analysis and design in the adjustable process, analysis/design is part of the theme. Design tends to be about vision–of–the–solution, such as "user interfaces" (I12) and developing a "semi-working very rough model" (I5). The analysis in the adjustable–process tends to be about communicating with the client.

I12 [Analysis work is] getting inside the heads of the people who will be using the software, understanding the processes the software is designed to either enhance or replace, learning what the business rules are that the software is going to have to conform to, learning about the exceptions and what sort of data is coming in and what the variations within that data are, what those variations imply in terms of *processing, working through that process to have a thorough understanding of the chunk of business where the software is going to be used. [I would do that by] talking, asking lots of questions; I suppose the formal definition would be the interview process.*

In Approach Category 4, the adjustable–process is adjusted according to the understanding–of–the–problem, vision–of–the–solution, and available–resources. For instance, when a problem is small and one person does the analysis/design and construction, the system, as an executable on the computer is shown. The two-week timeframe is one of the available–resources for the adjustable–process. The system is shown to the clients instead of, say analysis/design documents.

Int *If a client said "Show me what you've been doing?" What would you show them?*

I7 *[long pause] I'm just trying to think of a circumstance where the analysis went on for sufficiently long that there was no system or code or something produced for a while. The problems are usually sufficiently small that there was something to show for it in a very short time, and, by something, I mean something on the computer that could be executed. In a short time, I'm talking about maybe two weeks.*

There is awareness of what *may* be done and a conscious choice is made of what *is* done. There is awareness that the process could be defined by one of several development–methods, which is "an academic view of the real world" (I2). However, when the focus includes available–resources, such as limited time and money, "the perfect waterfall model […] or the perfect software development process isn't always going to work" (I4). The process needs adjusting.

I4 *[the adaptability of software lifecycles is] very different in a commercial environment where you've got so many other pressures, I mean you go in this isolated view at university of software development should be this way, and you get into the real world and it's not always possible to do it [...] there are these pressures on time and money and the perfect waterfall model if it exists or the perfect software development process isn't always going to work with those other things in mind*

The specified level at which all of the needs of the stakeholders will be met includes a solution that satisfies and is sufficient for the stakeholders. For instance, a solution that the clients are willing to pay for rather than the optimal or best solution is a satisficing solution. There is a trade-off between what may be the best solution and providing an affordable solution.

I15 *in general, our experience has been that what you learn actually doing it is fairly different from what you're learning in a learning environment. And a lot of that does come off with these trade off type things, a learning environment is often how do we come up with the best solution rather than how do we come up with a solution someone's happy to buy*

The notion of "getting inside the heads of the people" (I12) depicts the Gestalt coherence of the salient constituents. During the adjustable–process, communication is key to sharing understanding–of–the–problem and vision–of–the–solution. The adjustable–process is adjusted according to available–resources. Available–resources contribute to specifying the level at which all of the needs of the people involved will be met. The effect of sharing understanding–of–the–problem and vision–of–the–solution is satisficing–stakeholders. Satisficing–stakeholders is about everybody knowing what is to be achieved and feeling comfortable with that.

In Approach Category 4, exactly which artefacts are produced has a bearing on how the understanding–of–the–problem and vision–of–the–solution is to be communicated and shared. Artefacts are the products of selected tools–and–techniques and portions of development–methods. The available tools–and–techniques and development–methods are relevant to the adjustable–process.

Int *You said at one point that you draw on a whiteboard ...*

I12 *Constantly...*

Int *What sort of things are you drawing?*

I12 *Rough screen designs, process flows, table designs ...*

Int *And what would they look like? The user interface squares with squares and words and stuff?*

I12 *Yeah.*

Int *What would the process flow look like?*

I12 *[I] don't tend to use sort of formal "This particular symbol means this" because people aren't familiar with them anyway, but just boxes with arrows between them and descriptors on the arrows [...] so that people have got "Yes , that is actually what happens", or "That is what needs to happen". [We] use a digital camera a lot too [...] we find it a lot more effective than a printable whiteboard simply because you've actually got it in electronic format, you can email it out to everybody [...] you've got it in a format that is easily transported.*

Int *And table designs. What would they look like?*

I12 *... don't use those all that often, particularly not with the end users because they're not necessarily something that they're going to really get their heads around but [...] organisations tend to have one or two people who are reasonably IT savvy and interested and they're the people that we're often working with. Table designs will often be a reasonably formal diagram with the one to many, crow's feet, and so on, on them. So "I've got a header here and then there's a detail record and there's many detail records per header [...] if people can cope with understanding that, it is a nice way of being able to say this is how the data will be stored. [...]*

The selection of tools–and–techniques and portions of development–methods is about finding the satisficing path that is the adjustable process. The selection is made based on what will satisfice. For instance, an artefact is produced based on what stakeholders who need to understand the artefact are familiar with. The client and analyst/designer will work with artefacts that the clients can understand and the programmer and analyst/designer will work with artefacts that the programmer can understand.

I12 *What's going to the client tends to be defined in terms of the business functions that the software will perform. What goes to the programmer will tend to be a more formal "This is what the tables are going to look like; this button here will do this process." There may well be calculation, "The calculation of gross margin is bah, bah, bah, bah, bah, and so on*

Formality has a bearing on the use of formal development–methods and tools–and–techniques. Formality is only of concern in the potential it has to add value to the adjustable–process.

I12 *there's a possibility that [using formal methods and techniques] would improve around the edges, it would potentially give me more formal structures for saying "Okay, hang on a minute, are you sure you've covered everything. Do you know you've gotten all the business rules in place?" Because you've actually worked through and said, "Right I know where all the variations are in the data and have I accounted for all those variations" or potentially giving me structures.*

In this category, formality means being precise, definite, unambiguous, and expressed in a way that everybody understands, rather than conforming to particular development–methods. Formality is a thematic constituent with some relevance to the theme.

I12 *My formal definition of formal would be a careful statement that aims to be unambiguous and in a form that is generally accepted [...] So it is rare for us to use formal statements in spoken communication. It is rare for us to use formal statements in emails because they tend to fairly closely approximate to spoken communication. You'll get a statement, "This report's not working". That to me* *wouldn't be formal; a formal statement would be "Whenever I click this button the following error message occurs". It's precise, it's defined, it's using wording that everybody understands because it's actually giving you the specific error message that's popping up on the screen or whatever else.*

In the ground, to work–efficiently is relevant to the focus on the available–resources. To work–efficiently means that the vision–of–the–solution is made available as quickly as possible as something that the clients can see.

I5 *If I'm taking on a new project [... then I] sit down and have a bit of a face to face with the person, I whip in and whip up the classes for that and you're talking about an hour's work and that's given you a framework to run and [my colleague] comes in [...] and I say "Look I've got that framework in there can you put some forms around if for me please, here's what the client said about it" and a couple of hours later he says "I've got the forms done" and then so that's it [...] The work is done.*

Part of what is of concern to the satisficing–stakeholders salient constituent is being responsive to those stakeholders. Iteration and incremental–improvement are in the thematic field as thematic constituents that have a bearing on satisficing–stakeholders.

I12 *at the point of release there's going to be time spent understanding how that software is now being used, what may be done to therefore enhance it further, monitoring it for bugs that have slipped through the testing stage [...] and therefore fixing them. We aim to be as iterative as possible in our development. I'd much rather get a new feature in and get it out, and loop through again than spend six months doing an analysis of what's a whole suite of new stuff that we can release eighteen months from now [...] I'd much rather keep it iterative, get something out there, incremental improvement.*

In the ground to the theme of Approach Category 4, is a thematic constituent of ensuring–no–surprises. Ensuring–no–surprises is about the delivery of the system and satisficing–stakeholders. The satisficed analyst/designer has implemented the shared understanding–of–the–problem and vision–of–the–solution. The satisficed client has a clear understanding of the problem that was solved and what the solution should look like.

I2 *the primary aim [...] is to implement [the system] so that essentially two things happen: One is that it does what it's supposed to do, and secondly, there are no errors which are returned to us in terms of its functionality. In other words, there are no surprises to the customer. The customer will have a very, very clear understanding of what is expected and when they see the final product they all say, "Oh yes, this is exactly what we wanted".*

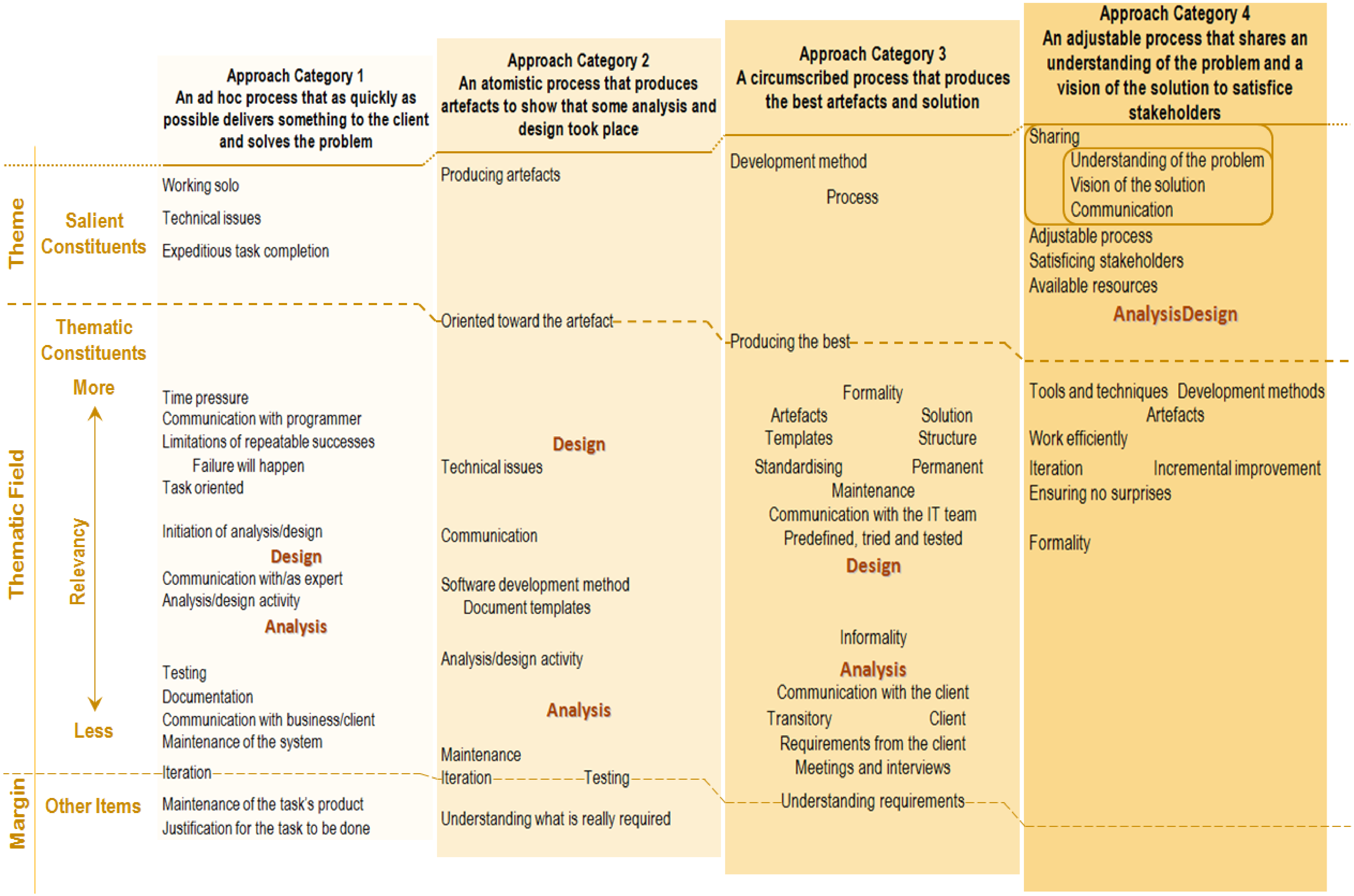
In summary, Approach Category 4 describes an approach focused on an adjustable–process. The adjustable–process makes it possible to share an understanding–of–the–problem and a vision–of–the–solution with the stakeholders. Communication is integral to the analysis/design of this approach. The adjustable–process is adjusted to accommodate available–resources. The consequence of this category is satisficing–stakeholders. The analyst/designer works with the stakeholders throughout the adjustable–process, providing artefacts as needed and suited to the stakeholders. Artefacts are produced from selected tools–and–techniques and portions of development–methods. What has a bearing on the theme of Approach Category 4 is to work–efficiently, providing iterations and incremental–improvement, and ensuring–no–surprises.

8.5 The Approach Categories Outcome Space

The outcome space, in Figure 8.7 (foldout), is a representation of the relationship between the four approaches to analysis/design categories of description. The approach categories are related hierarchically, each higher level is superordinate to the previous level by being more complex and sophisticated in its approach to analysis/design. Approach Category 1 is the least complex and sophisticated; Approach Category 4 is the most sophisticated.

Figure 8.7: The approach categories outcome space. (Overleaf)

The Approach Categories Outcome Space



The increasing complexity and sophistication of the approach categories is manifested in a number of ways. New and different constituents appear in the field as relevant or functionally significant thus increasing the complexity of a category from previous categories. Other items at the margins of lower categories become of concern, relevant, or salient in higher categories, thus increasing the complexity and sophistication of higher categories. Constituents become more concentrated within and around the theme as the approaches represented in each category become more sophisticated. In Figure 8.7, the shortening of the columns of text indicates increasing complexity. More constituents positioned closer to or within the theme indicate the category is more complex than previous categories.

The approach category outcome space (Figure 8.7) is a representation of a Gestalt hierarchy (Figure 6.8) of the approaches to analysis/design. Each theme in an approach category is a Gestalt of the salient and functionally significant constituents that have unity of Gestalt coherence. Each category is a Gestalt of theme, with unity of Gestalt coherence, and thematic field, with unity of relevancy. The approach categories outcome space is a Gestalt of ways of doing analysis/design.

A superordinate approach category does not include subordinate approach categories as a part of the superordinate approach category's whole. Each approach is a separate approach. A superordinate approach category cannot logically be regarded as an approach with the intended action of the superordinate approach plus any intended actions of the subordinate approaches. For instance, the atomistic process as the intended action in Approach Category 2 cannot also include the intended action from Approach Category 1, the ad hoc process, as part of the intended action of Approach Category 2. The superordinate intended action of an approach category displaces any subordinate intended action as a way of approaching analysis/design. Therefore, the atomistic process displaces the ad hoc process, the circumscribed process displaces the atomistic process, and the adjustable process displaces the circumscribed process. In Figure 8.7, the non-inclusion of intended action is shown by the separation of each category from the others.

Each category describes a phase of achievement (s. 6.4.4). The difference from one phase of achievement to the next, in terms of ways of doing analysis/design, is described in each of the approach categories. Each theme is different in what is emphasised in each phase of achievement. In Approach Category 1, working–solo on the technical–issues for expeditious–task–completion, tends to emphasise the analyst/designer as an individual. In Approach Category 2, being oriented–toward–the–artefact and producing–artefacts, emphasises analysis/design artefacts. The emphasis in Approach Category 2 has shifted away from the analyst/designer and onto the evidence that analysis/design takes place. In Approach Category 3, the development–method circumscribing the process emphasises the analysis/design method. The emphasis in Approach Category 3 has shifted away from the evidence that analysis/design takes place and onto the methodical doing of analysis/design. In Approach Category 4, sharing understanding–of–the–problem and vision–of–the–solution by communicating during the adjustable–process, which is adjusted to available–resources, all of which has the consequence of satisficing–stakeholders emphasises a holistic analysis/design approach. The emphasis in Approach Category 4 has shifted away from just the methodical doing of analysis/design and onto doing all of what analysis/design entails.

Corresponding to what is in focus in each theme, as part of each phase of achievement, is the bearing the thematic constituents have on the theme. In Approach Category 1, what is most relevant to working–solo on the technical–issues for expeditious–task–completion is being task–oriented, accepting time–pressure, communication–with–programmer, acknowledging limitations–of–repeatable–successes, and that failure–will–happen.

In Approach Category 2, the thematic constituents are filtered through oriented–toward–the–artefact and have a bearing on being oriented–toward–the–artefact and producing–artefacts. The constituents in Approach Category 1 that are conducive to maintaining an emphasis on the individual are no longer salient or as relevant in Approach Category 2. Working–solo and expeditious–task–completion from Approach Category 1 do not appear in Approach Category 2. Technical–issues appears in Approach Category 2 as a thematic constituent in the same way as all thematic constituents in Approach Category 2 appear, that is, filtered through oriented–toward–the–artefact.

In Approach Category 3, the development–method circumscribing the process emphasises the analysis/design method. Correspondingly, formality and its associated thematic constituents have more bearing on the theme of Approach Category 3. Formality and its associated thematic constituents are conducive to maintaining an emphasis on the methodical doing of analysis/design. Informality and its associated thematic constituents have less bearing on the theme as they are less conducive to maintaining emphasis on the methodical doing of analysis/design. The constituents conducive to maintaining an emphasis on analysis/design artefacts in Approach Category 2 only appear in Approach Category 3 if they are conducive to maintaining an emphasis on the methodical doing of analysis/design. For instance, artefacts is just one of the thematic constituents in Approach Category 3.

In Approach Category 4, the theme emphasises a holistic analysis/design approach. The thematic constituents in Approach Category 4 have a bearing on doing all of what analysis/design entails. One development–method is no longer salient to this approach, as it is in Approach Category 3. Many development–methods, along with the other thematic constituents of Approach Category 4, are conducive to maintaining an emphasis on doing all of what analysis/design entails.

Maintaining the emphasis of the theme supports the Gestalt of the approach. Alternatively, maintaining the emphasis of the theme engenders the perception of the success of the approach. Any perceived success is conducive to maintaining the emphasis of the approach category.

Increasing complexity and sophistication consolidates the structure of the approach categories. The dispersed field of Approach Category 1 becomes more ordered in Approach Category 2. The field consolidates in Approach Category 3 around the thematic constituents: formality, informality and the respective associated thematic constituents. In Approach Category 4, the structure is a complex theme with thematic constituents consolidated around the theme.

I constituted the approach categories with support from the theory of *intention* as a theory of action as part of GIFTed data analysis. The result, this chapter, is something in which I have confidence. The four approach categories and outcome space are one representation of the variation in the qualitatively different ways analyst/designers report doing analysis/design. This concludes part (I) of the data analysis and interpretation process.

In the next chapter, after I describe the research process and the relationships analytical framework I used, I present the ultimate results of this study, which include the Gestalts of analysis/design.

9 The Relationships between Conception and Approach Categories

Part (H) of the data analysis and interpretation process for this study (Figure 7.1) resulted in five conceptions of analysis/design categories and an outcome space. Part (I) of the data analysis and interpretation process (Figure 8.1) resulted in four approaches to analysis/design categories and an outcome space. Part (J) of the data analysis and interpretation process (Figure 9.1) resulted in a set of relationships between conception categories and approach categories. Below I present the process that resulted in that set of relationships, followed by the set of relationships and the factors that influence analyst/designers use of an equal or less sophisticated approach in comparison to their conception. I then present how I selected the five relationships between the highest approach category to which a conception category is related for further analysis, interpretation, and description. Each one of the selected relationships is presented as aligned field or theme Gestalts and as a development life cycle from a hypothetical analyst/designer's view.

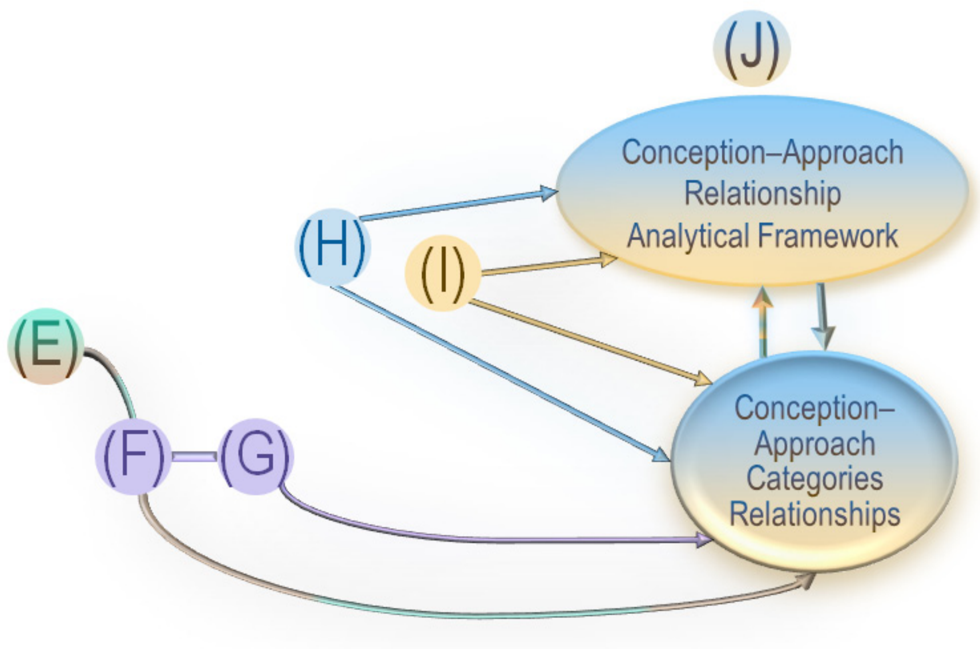


Figure 9.1: Part (J) of the data analysis and interpretation process

The set of relationships is based on the data, that is, the interview transcripts. As with categories of description, the relationships are not the classification of an individual, but a description of the relationship at a collective level between a conception category and an approach category. The description of the set of relationships is my interpretation, as the researcher.

During part (J) of the data analysis and interpretation process (Figure 9.1), I based my interpretation on an analysis of the data with the use of an analytical framework. The analytical framework helped me judge the rationality of the relationships. Thus, I answered the third of the three research questions about analyst/designers' ways of experiencing analysis/design:

Research study question 3 of 3:

How are these qualitatively different conceptions of, and approaches to, analysis/design related?

9.1 Research Process

The research process used to relate the different conception categories and approaches categories occurred as two phases. The first phase began with the development of an analytical framework. The analytical framework was then used to align Gestalts of the conception categories and approach categories.

The second phase of the research process was the synthesis of development life cycles. A development life cycle was synthesised for each of the five selected relationships from a hypothetical analyst/designer's view. A development life cycle is a way of describing the selected conception and approach category relationships.

9.1.1 Aligning Gestalts

The conception categories and approach categories were constituted using a data analysis technique based on a combination of a type of intentionality, Gestalt theory, and the field theory of consciousness. I refer to this combination as GIFTed data analysis. I developed the relationships analytical framework (Figure 9.2) to guide the constituting of the relationships between conception categories and approach categories based on:

- Gestalt theory

- the field theory of consciousness
- the folk concept of intentionality

to maintain a consistency with the data analysis to constitute the categories. I added to these three supporting theories:

- an argument for the connection between conception, knowledge, and belief
- an adaption and instantiation of a closure argument
- an argument that practical reasoning is influenced by organisational, project, and personal factors.

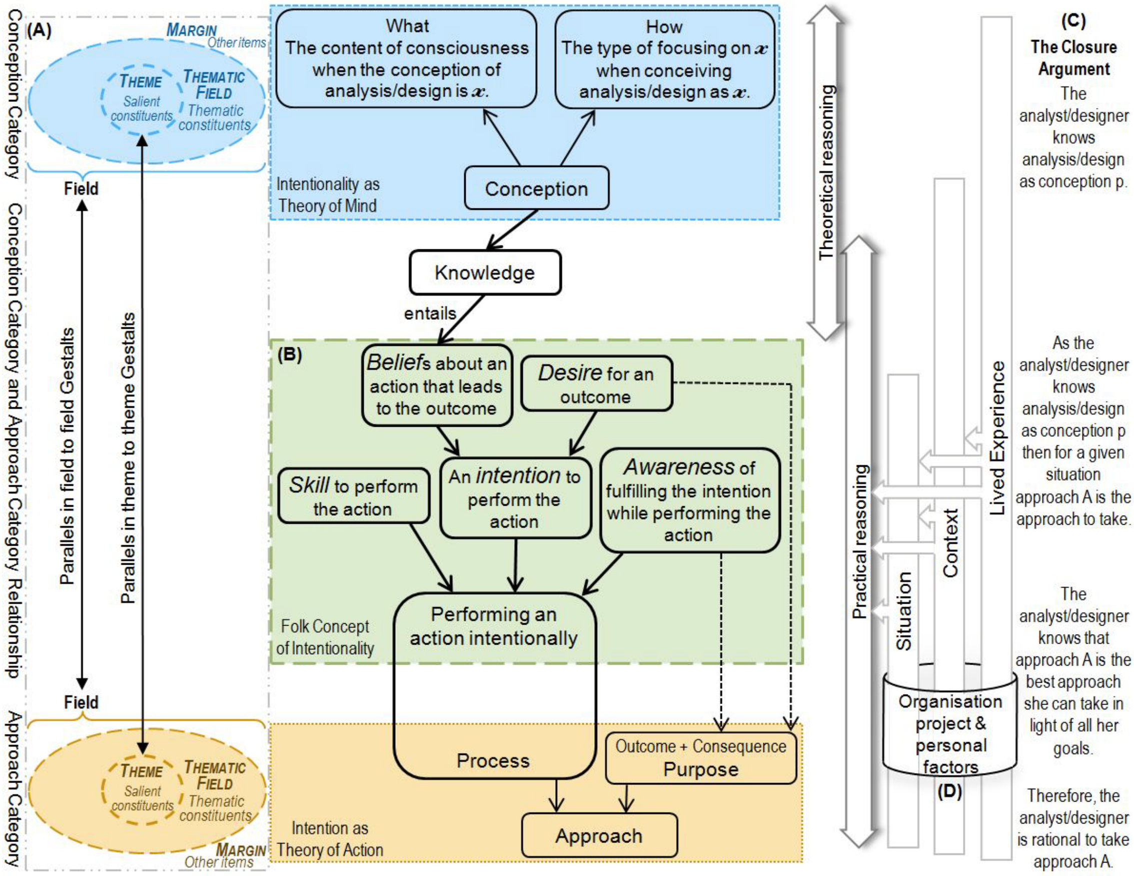


Figure 9.2: The relationships analytical framework

Figure 9.2(A) (i.e., the left side of the figure) refers to the parallels between the field Gestalts and theme Gestalts of the categories. A conception category is a field. This field represents a Gestalt of a certain way of conceiving analysis/design. An approach category is also a field and similarly it represents a Gestalt of a certain way of approaching analysis/design.

The theme within a category is also a Gestalt. The theme in a conception category represents a Gestalt of a certain focus (i.e., the figure) on the way of conceiving analysis/design. The theme in an approach category represents a Gestalt of a certain focus on the way of approaching analysis/design.

A parallel in Gestalts indicates a relationship between a conception category and an approach category that is equal. Parallel Gestalts indicate a match between a conception category and an approach category at the level of the Gestalt. Parallel Gestalts may be a match between a conception category and an approach category at either the field or the theme level. Pairs of conception category and approach category field Gestalts and theme Gestalts were analysed for parallels.

Figure 9.2(B) (i.e., the centre of the figure) refers to the folk concept of intentionality. As with the analytical frameworks for the conception categories and approach categories, I used a type of intentionality in the development of the relationships analytical framework. In the conception-of-analysis/design analytical framework (Figure 7.2), intentionality as a theory of mind was the type of intentionality used to develop the framework. In the approach-to-analysis/design analytical framework (Figure 8.2), intention as a theory of action was the type of intentionality used to develop the framework. The Malle and Knobe (1997) folk concept of intentionality was the type of intentionality used to develop the relationships analytical framework. The folk concept of intentionality is described earlier (s. 6.3.3). The folk concept of intentionality necessitates *belief* and *desire* to form an *intention*, and intention with *skill* and *awareness* results in intentional action (Malle & Knobe 1997).

In the relationships analytical framework, the folk concept of intentionality is linked to the approach-to-analysis/design analytical framework and conception-of-analysis/design analytical framework. There are three links between the folk concept of intentionality and the approach-to-analysis/design analytical framework. The process–element in the approach-to-analysis/design analytical framework is equivalent to the intended-action–element in the generic approach-to analytical framework. There is a clear link between intentional action in the folk concept of intentionality model and process in the approach-to-analysis/design analytical framework; intentional action is the process. In Figure 9.2, the rounded rectangle enclosing performing–an–action–intentionally and process shows the link between intentional action and process (i.e., intended action).

The other two links between the folk concept of intentionality and the approach-to-analysis/design analytical framework are from desire and awareness elements in the folk concept of intentionality model to the purpose element in the approach-to-analysis/design analytical framework. There must be a desire for the outcome and consequence. There must be awareness that the outcome and consequence are being fulfilled. In Figure 9.2 the two dashed arrows indicate the links between desire and awareness in the folk concept of intentionality to the purpose element in the approach-to-analysis/design analytical framework.

The conception-of-analysis/design analytical framework is linked from its conception–element, via the knowledge element in the relationships analytical framework, to the belief element in the folk concept of intentionality. The relation between conception and belief is made using a number of philosophical positions that link conception, knowledge, and belief. A category describes what Gurwitsch called a "phase of achievement" (1964/2010, p. 31). A phase of achievement (s. 6.4.4) when regarding a conception category is a way of conceiving analysis/design that describes what analysis/design *is*; it is what analysis/design is understood to be or it is possible to say that analysis/design is *known* to be this way. To know analysis/design in the way described in a conception category is to have certain knowledge about what analysis/design is. This argument forms the link between the conception element in the conception-of-analysis/design analytical framework and the knowledge element in the relationships analytical framework.

A presentation of the adapted instance of a closure argument is required to establish the link between the knowledge–element and the belief–element.

Figure 9.2(C) (i.e., the right side of the figure) is an adapted instance of a closure argument. A closure argument is a philosophical position that we can know more things from what we know already (Luper 2010). This is expressed as a "principle of closure of knowledge … [that is stated as]: If person *S* knows *p*, and *p* entails *q*, then *S* knows *q*" (§ The Closure Principle). The arguments about the truth of the closure principle are varied, complex, and controversial. These arguments include views of contextualism, invariantism, relativism, and contrastivism (Luper 2010). Of interest here, is contextualism; the idea that the context determines the truth value (how true a piece of knowledge is) and worth of knowledge.

Luper (2010) stated that "knowledge entails belief (according to nearly all theorists)" (§ The Closure Principle). Beliefs can be the concepts we acquire (Fodor 1980; Peirce 1877), which form knowledge, and, as in the folk concept of intentionality, there is belief that a particular action will lead to a certain outcome (Malle & Knobe 1997). Belief as knowledge is expressed as a conception category, while belief in an intended action is expressed as a process in an approach category, with both linked by an adapted instance of a closure argument.

My use of the contextual view of the truth of the closure principle, and the link between belief as knowledge and belief as intended action, contributed to my adaption of a closure argument relating analysis/design knowledge to rationality of analysis/design action (Fantl & McGrath 2002, pp. 72–3) and its instantiation for a hypothetical analyst/designer. The adapted instance of the closure argument relating the knowledge (the conception category) of the hypothetical analyst/designer to the rational (intentional) action (the approach category) is:

1) The analyst/designer knows analysis/design as *conception p*.
2) As the analyst/designer knows analysis/design as *conception p* then for a given situation, *approach A* is the approach to take.
3) The analyst/designer knows that *approach A* is the best approach s/he can take in light of *all* her/his goals.

   Therefore,

4) The analyst/designer is rational to take *approach A*.

An example of how I analysed data by applying the adapted instance of a closure argument is shown using the following quote as an example. The interpretation of the quote is shown in Table 9.1.

Quote:

> I14 *there wasn't really studying or understanding of what is really required. Just formatted use cases [...] "Draw these ellipses, mark some arrows to them, that's it, okay, class diagram, what do we have?" It wasn't really analysis or design with classes, all these things. Just we have to fill in these documents, we have to produce them, give it to the project manager, and that's it.*

Table 9.1: An interpretation using the adapted instance of a closure argument

Adapted Instance of the Closure Argument	Interpretation of the Quote
1) The analyst/designer knows analysis/design as *conception p*.	• I14 knows analysis/design includes really studying or understanding what is really required and classes and all these things. • Really studying or understanding what is really required and classes and all these things is I14's *conception p* of analysis/design. • *Conception p* could be part of Conception Category 4 or 5.
2) As the analyst/designer knows analysis/design as *conception p* then for a given situation, *approach A* is the approach to take.	• I14 knows analysis/design as *conception p*. • I14 perceives the given situation as one where he is expected to fill in and produce documents and give them to the project manager. • For I14's given situation, I14 takes the approach of formatting use cases by drawing ellipses, marking some arrows to them, and moving onto the class diagram. • Formatting use cases by drawing ellipses, marking some arrows to them, and moving onto the class diagram is *approach A*. • *Approach A* could be part of Approach Category 2. • Even though I14 knows analysis/design as *conception p,* for this situation, *approach A* is the approach to take.
3) The analyst/designer knows that *approach A* is the best approach s/he can take in light of all her/his goals.	• I14's goals are to do the work he is assigned, satisfy his manager by doing what his manager asks of him, keeping his job, etc. • I14 knows that *approach A* is the best thing to do in light of all his goals.
Therefore,	Therefore,
4) The analyst/designer is rational to take *approach A*.	• I14 is rational to take *approach A*. • Therefore, Conception Category 4 or 5 is related to Approach Category 2.

In the example quote above, there is a more sophisticated conception related to a less sophisticated approach. I14 has certain knowledge about analysis/design, that is, *conception p*. He is not taking an approach that is as sophisticated or complex as his *conception p*. When I14 takes *approach A,* he does so even though I14 knows there is a more sophisticated approach he could take. Therefore, mapping relationships between Conception Categories 4 and 5 and Approach Category 2 is possible from this example.

Figure 9.2 shows the knowledge element in the relationships analytical framework entails the belief element in the folk concept of intentionality (Figure 9.2(B)). The arrow connecting the knowledge element to the belief element represents the link between knowledge described in a conception category and beliefs about an action in the folk concept of intentionality, which, in turn, leads to the process described in an approach category. Relationships between conception categories and approach categories were constituted by interpreting the data using the closure argument (Figure 9.2(C)).

Figure 9.2(D) (i.e., the lower right side of the figure) refers to an argument that practical reasoning is influenced by organisational, project, and personal factors. Practical reasoning is "reasoning about what to do" (Brown 2008, p. 167). There is a philosophical argument that knowledge determines action. For instance, having a more sophisticated conception determines that a more sophisticated approach will be taken. However, there is a view that more than knowledge determines the action taken. Factors weaker than knowledge and factors stronger than knowledge influence our practical reasoning about action (Brown 2008). The relationship between a conception category and an approach category is not only that having knowledge (conception) will determine action (approach). Practical reasoning is influenced by knowledge *and* organisational, project, and personal factors:

- Organisational factors are those characteristics of the organisation that are particular to a business and are applicable to any project and analyst/designer at the organisation.
- Project factors are those characteristics of the project that could apply to the information system project no matter where that project is being developed or by whom.
- Personal factors are those characteristics of the analyst/designers themselves that apply to the analyst/designers no matter where they work or what they work on.

The organisational, project, and personal factors are present in the situation, context, and lived experience elements of the relationships analytical framework. Prosser and Trigwell (1999) argue that a student's lived experience of a context is constituted by that student as a unique situation (p. 18). To enlighten part (D) of the relationships analytical framework, in the remainder of this paragraph I paraphrase Prosser and Trigwell (1999), substituting "analyst/designer" for their "student"… The context element in the relationships analytical framework is the "world" in which analysis/design takes place. The context includes organisational, project, and people's personal factors. An analyst/designer's being-in-the-world is unique (s. 6.1). Therefore, the interaction between an analyst/designer and the context constitutes a unique situation for the analyst/designer. Even though analyst/designers may be in the same context, the situation is different for each analyst/designer. The situation element in the relationships analytical framework is the situation constituted in the interaction between the analyst/designer and the BISD context. The situation includes the analyst/designer's perception of organisational, project, and personal factors. The lived experience element in the relationships analytical framework is the lived experience (s. 6.1) of the analyst/designer, which includes experiences of other contexts that include other organisational, project, and personal factors.

The relationships analytical framework was applied to constitute the set of relationships between conception categories and approach categories. The application was a combination of:

- interpreting parallels in the field and theme Gestalts of a category (Figure 9.2(A))
- describing the connection between the conception category and approach category using the folk concept of intentionality (Figure 9.2(B)) and an adapted instance of a closure argument (Figure 9.2(C))
- describing the organisational, project, and personal factors in the situation, context, and lived experience that determines the action (Figure 9.2(D))

9.1.2 Synthesising Development Life Cycles

The second phase of the research process used to relate the different conceptions of and approaches to analysis/design was my synthesis of a development life cycle for each selected relationship. What I came to realise during the constituting of the results in the previous two chapters was that categories are related in a way that has an implicit impact on the analyst/designer's view of the development life cycle. During the data analysis, as I first sketched a development life cycle for Approach Category 1 (Ad hoc), I found I was incorporating the understanding described in Conception Category 1 (Other-than-programming) and how the Other-than-programming–Ad hoc relationship would manifest as a development life cycle. When I came to draw the development life cycle for Approach Category 2 (Atomistic) I did a similar thing; I incorporated the understanding described in Conception Category 2 (Catalogue) and how the Catalogue–Atomistic relationship would manifest as a development life cycle. Each conception category, approach category, and corresponding relationship has a different impact on the development life cycle. I finished drawing the development life cycles, by focusing on the five relationships that were between the most sophisticated approach category to which a conception category is related. While drawing these development life cycles, I found I needed to add another element from Gurwitsch's field theory of consciousness to the theoretical underpinnings of this study to be able to understand and synthesise the development life cycles, which I describe in the next paragraph.

The added element from Gurwitsch's field theory of consciousness is concerned with the perceptual process. In describing perception, Gurwitsch (1964/2010) described each single perception experience to be "a phase of a process" (p. 200). Each single perception can be regarded similarly; each perception is a phase in the development process of the capability of an individual toward an increasingly complex experience. Each phase in the process complements proceeding phases; later phases go beyond the earlier ones, harmoniously continuing and complementing earlier ones (p.203).

While drawing each development life cycle, I synthesised each one in relation to Gurwitsch's theory of the perceptual process and the theoretical underpinnings of this study in the following way:

> I imagined a hypothetical individual being-in-the-world with an internal relation with analysis/design. I set aside the hypothetical individual's perceptions of the context and imagined for each conception she held she was able to take the highest related approach for that conception. When she thought about analysis/design her Gestalt conception of analysis/design was as described in a conception category; that was her conception phase of achievement. When she did analysis/design, her Gestalt approach was as described in the highest approach category related to the conception category for the development life cycle I was synthesising. The approach category was her approach phase of achievement. Her Gestalt conception of analysis/design was the extent of her knowledge of analysis/design. Thus, when she was doing analysis/design her actions were bound by the relationship between the conception category and approach category. I construed a phase of achievement to be a phase of the process in the hypothetical individual's development of her experience of analysis/design. I imagined the hypothetical individual in each of the selected relationships between conception categories and approach categories for which I was drawing development life cycles. I compared each development life cycle to the preceding or succeeding development life cycle, looking for a manifestation of the "phase of a process" (Gurwitsch 1964/2010, p. 200) and how the development life cycle could be part of the harmonious and complimentary continuous development of an experience of analysis/design.

I also took into account the data for this study while synthesising development life cycles. The details beyond the analysis/design parts of the development life cycles are drawn from the data. As the interviews were focused on analysis/design, these details are vague and like the development life cycles themselves, the details beyond analysis/design require further research.

Each development life cycle is presented below, following the presentation of the parallel Gestalts of the conception category and approach category relationship for which the development life cycle is drawn.

9.2 The Set of Conception-Approach Relationships

The first phase of the research process used the relationships analytical framework to constitute a set of relationships between conception categories and approach categories. Figure 9.3 shows the set of conception–approach relationships.

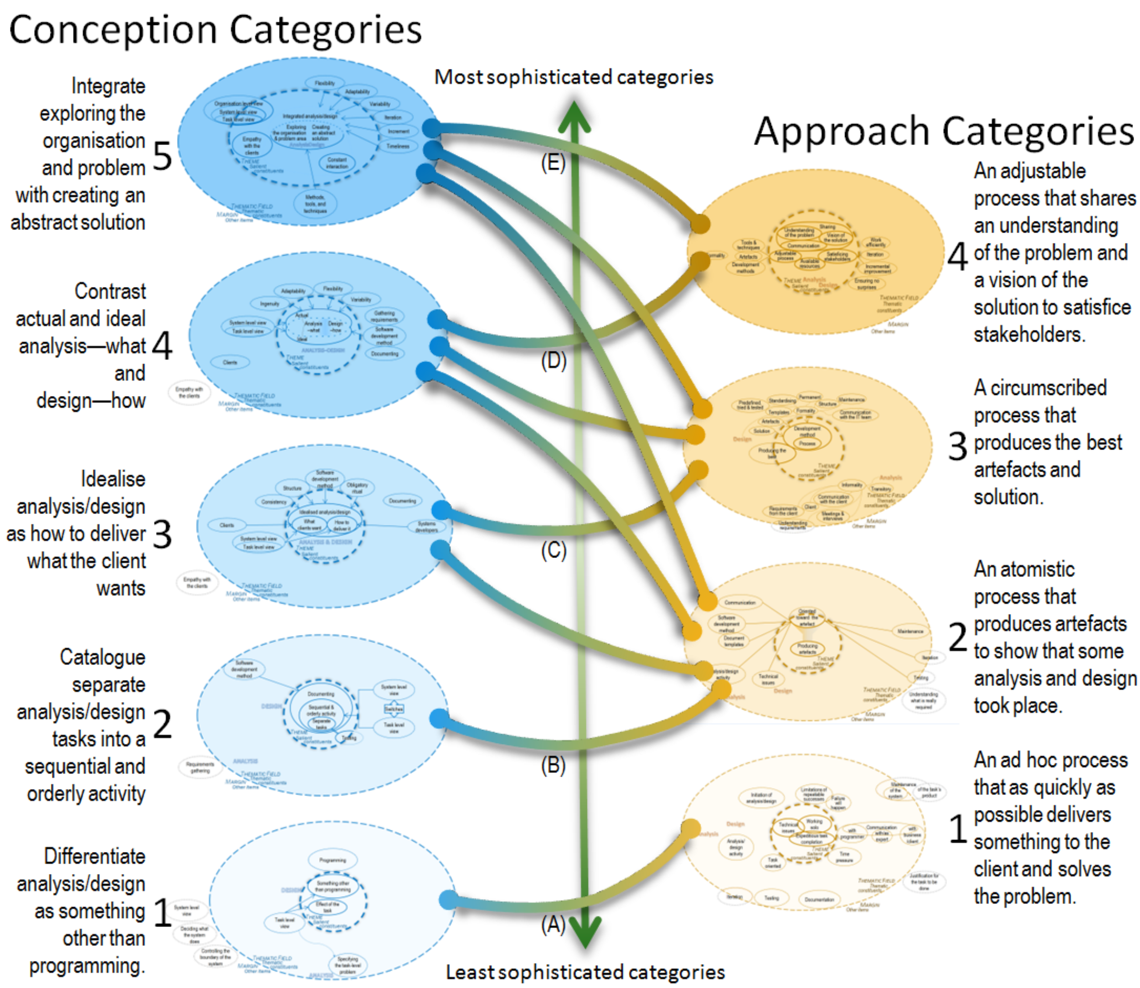


Figure 9.3: The set of relationships between conception and approach categories

Figure 9.3 shows the 10 relationships between conception categories and approach categories that represent *rational* (s. 9.1.1) ways of experiencing analysis/design. Conception Categories 2 to 5 are not related to Approach Category 1, for example, because such a relationship would not be rational. (This is not to say that an individual analyst/designer would not choose to use an ad hoc process when she knows more about analysis/design than Conception Category 1. An individual can behave irrationally.) At a collective level, the relationship from a conception category higher than Conception Category 1 with Approach Category 1 is not an intentional action that would be rational. Once the way of conceiving analysis/design is more than that described in Conception Category 1 the belief that Approach Category 1 will lead to the desired outcome no longer exists. Therefore, an intention to perform Approach Category 1 does not exist and the relationship from a conception category other than Conception Category 1 with Approach Category 1 does not exist. Additionally, once an approach category other than Approach Category 1 is a phase of achievement, then relating to Approach Category 1 is not rational.

A less sophisticated conception category cannot be related to an approach category that is more sophisticated or complex, as this would falsify the adapted instance of the closure argument. It is not possible for practical reasoning to take place where the necessary knowledge and entailed belief are not present. Therefore, as shown in Figure 9.3:

- Conception Category 1 (Other-than-programming) cannot be related to an approach category higher than Approach Category 1 (Ad hoc)
- Conception Category 2 (Catalogue) cannot be related to an approach category higher than Approach Category 2 (Atomistic)
- Conception Category 3 (Idealise) cannot be related to an approach category higher than Approach Category 3 (Circumscribed)
- Conception Category 4 (Contrast) cannot be related to an approach category higher than Approach Category 4 (Adjustable)

Conception Category 5 (Integrate) cannot be related to an approach category higher than Approach Category 4 (Adjustable) as this is the highest approach category constituted from the data. However, the relationship between Conception Category 5 and Approach Category 4 is not the same as the relationship between Conception Category 4 and

Approach Category 4. These relationships are discussed in more detail in Sections 9.4.4 and 9.4.5.

9.2.1 Category and Relationship Taxonomic Labels

Table 9. shows the taxonomic labels for the 10 conception category and approach category relationships. I created the taxonomic labels for the relationships by first assigning taxonomic labels to the conception and approach categories. I then combined the taxonomic labels of the conception and approach categories to form the taxonomic labels for the 10 conception–approach relationships.

Table 9.2: The taxonomic labels for the conception–approach relationships

Conception Categories	Approach Categories			
	Ad hoc	Atomistic	Circumscribed	Adjustable
Other-than-programming	Other-than-programming/Ad hoc A			
Catalogue		Catalogue/Atomistic B		
Idealise		Idealise/Atomistic	Idealise/Circumscribed C	
Contrast		Contrast/Atomistic	Contrast/Circumscribed	Contrast/Adjustable D
Integrate		Integrate/Atomistic	Integrate/Circumscribed	Integrate/Adjustable E

In Figure 9.3 and Table 9., five relationships are marked from A to E. These five relationships are between the most sophisticated approach category to which a conception category is related. These five relationships are the selected relationships that I describe in more detail in Section 9.4.

9.3 Factors Influencing the Relationships

The 10 conception–approach relationships are rational ways of experiencing analysis/design. For the Other-than-programming–Ad hoc and the Catalogued–Atomistic relationships, the level of knowledge (conception category) determines the action (approach category). The influence knowledge has on the approach taken is described in Section 9.3.1

For the remaining eight conception–approach relationships (see Table 9.), Conception Categories 3, 4, and 5 are related to approach categories of equal or less sophistication. That these more sophisticated conception categories are related to equal or less sophisticated approach categories is based on the application of the relationships analytical framework. Part (D) of the framework (Figure 9.2) was applied to analyse and interpret the factors that influence the relationships. The factors the interviewees describe as influencing their use of an approach are part of the representation of their streams of consciousness, rather than a particular category. Their utterances are in terms of using an acceptable, or inadequate, approach, compared to how they think they would do analysis/design. As such, I have interpreted their description of the organisational, project, and personal factors as influencing the use of a less, or a more, sophisticated approach.

In Sections 9.3.2 to 9.3.4, I describe the organisational, project, and personal factors that influence the use of a less sophisticated approach when a more sophisticated conception is present. In Sections 9.3.5 to 9.3.7, I describe the organisational, project, and personal factors that influence the use of an approach that is more sophisticated, that is, equal or close to equal with the conception that is present. My description of the factors interviewees presented, and that I interpreted, includes illustrative quotes.

9.3.1 Knowledge as the Influence on the Use of an Approach

For Conception Categories 1 and 2, the knowledge described in the conception category is a stronger factor than organisational, project, and personal factors as the influence on which approach is taken. These less sophisticated conceptions of analysis/design have restricted skill, intention, and awareness and thus strongly influence the intentional action (Figure 9.2(B)). For example, a belief in luck or chance as the reason for success, not having a method to work from, and yet still being able to satisfy the business indicates restricted skill, intention, and awareness.

> *I10 We don't have that [viz, a method] at the moment, if we repeat something it's probably pure luck to be honest. I know for a fact that other teams in my department are not very good at repeating successes [...] I've got successes but I think it's out of pure luck and I think very soon I'm going to have a big failure [...] at the moment, I'm doing well, but I think only by chance. That is in the back of my mind, "What happens when it finally falls apart?", I can't reproduce it [...] Where does it [viz, ideas that feed into design] come from and, to be honest, that's probably why I'd like a process [sic, viz, method] 'cause I don't know where it comes from now. I seriously just satisfy the business and I just happen to do it well and I think it's purely out of luck but then it goes back to "Is this waiting for a failure to happen?", that's what it feels like.*

Conception Categories 3, 4, and 5 are related to approach categories of equal or less sophistication. For these three conception categories, knowledge alone is not enough to determine which approach is taken.

9.3.2 Organisational Factors that Influence the Use of a Less Sophisticated Approach

Organisational factors are particular to the organisation where the analyst/designer works or for whom the project is being done. These organisational factors would apply to any project and analyst/designer at the organisation. Table 9.3 shows the organisational factors described by interviewees as influences on the use of less sophisticated approaches.

Table 9.3: Organisational factors described by interviewees as influences on the use of less sophisticated approaches.

Organisational Factor	Example Quote
Meeting the business goal to make money	*I'm not saying that I don't need a [process that includes documenting] just I'm not in a bad need for it. All the time I keep saying to our architect, let's adopt something… let's try to just take a look at it, try to implement it. He agrees with me… but [the system I am working on is] a system that gets the company some money, [so maybe later we will adopt] something (I14)*
Organisational culture is accepted	*from what I can gather a lot of places are like that. I mean, it's only usually if you're working for say an actual software development company where they're producing products to sell, then they'll start introducing all these, say introducing a proper process or using say technology the way it's meant to be used (I10)*
Management is focused on the short term	*[documenting the analysis/design process is not being done because] they don't look at the long term; they look at more short term. That's more the way they operate. (I13)*
Now isn't the time to change (to a more sophisticated approach)	*after we finish this project, maybe after ten months, we will search for something like this, we are going to adopt something because for sure it have some benefits, we can assess these benefits later on and most of the companies are growing number of persons per team so we need something like this but not in the meantime, not for this project. (I14)*
Resistance to taking on new ideas or concepts	*If I try and talk to the chief architect about anything in terms of, like business process is the latest thing at the moment, so I try and suggest different approaches to business process. I just get laughed at, because, this is for real, I just get laughed at and told that "Oh they're just buzz words" or "That's just pure academic" (I10)*
Inexperienced team leaders supervising more experienced team members	*the team leaders were not appropriate […] they didn't have enough experience to lead the section for seven months or that part of the project for seven months and under them there used to be more experienced programmers […] which is a major problem (I14)*
The business is small	*small businesses are renowned for ad hoc development (I10)*
Structure of the company prevents the analyst/designer from having a say	*the structure of the company is structured in a way that I will never get a say. Yeah. If I really wanted to have a say then of course I need to move higher up in terms of senior software engineer or even a team leader (I13)*
An analyst/designer does not have the authority to act	*In practice, like if you need to organise like a meeting, I'd probably need more authority to authorise it, like we can't just say ask the users to do these ones (I8)*
Freedom to do as please	*I think that all the work that I do has a larger impact on the business, and hence I have more responsibility than if I was working for a software development company where it's very structured, they have a, I think it's more about your skill and your experience and I'm sure there's a chain of like signing off, whether it's in terms of testing or so on, it seems a bit more policed, I think. Whereas I'm pretty much given free rein to do whatever I want… I really want to go into a more structured environment (I10)*
Analysis/design is de-emphasised as programming is more important	*[I know that management doesn't want us to do that] because during those meetings with the our manager or even with the high managers they don't seem to be stress this point, they seem to think that we just get it within one day or two or something and the most important thing is the programming and all this kind of thing (I8)*
Improving the method is slow and hard to do	*[the company is] succeeding very slowly and I think they could be succeeding a lot faster. I believe we find it very hard to put ideas into reality; it's a very slow process […] we're starting from scratch every time, it's really hard (I10)*

The organisational factors shown in Table 9.3 may be mutually exclusive, for example, an analyst/designer may not have the authority to act, or may have the freedom to do as she pleases, but not both. The factors may also be complementary, for example, resistance to taking on new ideas and concepts, and improving the method is slow and hard to do. The issue of contradictions and complementarities between factors suggests a direction for future research.

An organisational factor I interpreted influencing the user of a less sophisticated approach is that the analysis/design work is set or assigned for the analyst/designer to do. The analyst/designer understands what the work is that they are to do at the task level and the approach they take is focused on the task.

I13 *I'm only a person actually doing the work that get assigned to me, I don't have a lot of say in what I do except for that little part I can do analysis and design on it but apart from that …*

Int *[…] how can you be confident that the change request that has come from a user is a valid change request?*

I13 *Oh, because it's gone through a review process by people higher up*

Int *And how would they know that it's a valid change request?*

I13 *How would they know? Because, oh I don't know really, because they go through a review process and all I do is I get assigned to it so I don't know how they would do a review and give high priority. I guess it comes from a customer using the product that would have higher priority than from a change request raised by a developer or a tester, because the client pays us the money, so of course is high up. I'm not sure really 'cause all I do is get assigned the change request and I'm supposed to go and do that.*

9.3.3 Project Factors that Influence the Use of a Less Sophisticated Approach

Project factors are those characteristics that could apply to the project no matter where that project is being developed or by whom. Table 9. shows project factors described by interviewees as influences on the use of less sophisticated approaches.

Table 9.4: Project factors described by interviewees as influences on the use of less sophisticated approaches

Project Factor	Example Quote
The requirements are known	*If you know what the inputs and the outputs are then you don't need to do the other bits in between. (I9)*
The requirements are small	*we don't normally do that one because normally these are small requirements. It's informally like exchanging email and then we just start on the system design (I8)*
The system is small	*If you're only looking at a very small system then [modelling, prototype coding] become optional. It is very much size dependent. I mean there's no point in putting modelling in for a project in which there's a couple of hundred lines of code to be written. You just go straight to coding (I9)*
The system is large with many clients	*in smaller projects if you were a software development company that was doing little small projects for other people to solve situations in there, that I can understand why [the formal stuff is] there because you're specialised, you have a spec, you want to design it properly with them and you know formalise what you're going to produce and things like that. Because […] we have hundreds of clients who are using [the information system the formal stuff is not used] (I18)*
The cost	*[When you've only got a few hundred lines of code and you don't need models, the reason that you'd go straight to coding is] Cost. (I9)*
The solution is very simple	*it's probably a very simple solution that you're dealing with (I9)*
Short duration project	*The way we [were] working on this [digital marketing platform …] usually the requirements used to be met in a really short period of time, so we didn't have time for writing documentation, following […] something like [a method] (I14)*
Not enough time	*we do not have enough time and put in enough effort to try and understand everything because of the time constraint (I8)*
The tasks are straightforward	*our architect says that in the meantime you don't really have time for [adopting a method] because most of the tasks are really straight forward (I14)*
Client demand	*we have so many clients waiting for these tasks to be finished (I14)*
A more sophisticated approach is not needed	*there isn't really a bad need for using methodology [viz, a method] or it's not something that you really really really must have (I14)*
An expert wasn't involved	*we needed someone who really knows more about technology and can make better decisions, what to use and when to use these things […] I think that their responsibility is to make sure that this is what's required (I14)*
Inappropriate team structure and supervision	*The project manager was really good [at solving conflict between the people] but he wasn't technical and there's no intermediate link between us which should be an architect (I14)*
Restricted practices are imposed	*doing the university project it seemed like we were more restricted to only use Larman's technique 'cause we all kind of knew it, we could follow it a lot more easier, we had more accessed information about it and so I guess for us at the time we did feel restricted but you only could use Larman's, UML methodology [viz, method]. (I3)*

As for the organisational factors in Table 9.3, the project factors shown in Table 9. may be mutually exclusive, for example, the system is small, or the system is large with many clients, but not both. The factors may also be complementary, for example, the requirements are known and small.

Project factors relating less sophisticated conception and approach categories that were interpreted from the data are:

- The client is distant from the analysis/design. For example, requirements come from the analyst/designer's manager and the analyst/designer supplies products of analysis/design to the manager. Alternatively, the client has little involvement in the analysis/design process. The client provides requirements at the beginning of the project and signs off products at the end of phases.

I18 *we have be to be sure we've got it right for [the information system software] I think, not for the client. [... The system development manager] came up with the design of how he wanted his system to work and he tells me how to do it, I release it and release the update notes to a client [...] but in fact, it's actually him that's telling the client how his software works kind of thing.*

- The analyst/designer can view part of the system or project in isolation. The analyst/designer then works in isolation on that view.

I1 *if your role has been defined and you know well this is what you have to do, you don't really care much about what's going on away from your pod. It can get that way. I mean maybe it's not a complete disinterest, but it's kind of like, well at least for me, it's a need to know basis. I don't need to know it; I just want to do what I need to do. So for example I'm aware vaguely of processes that are being undertaken in other departments, but I wouldn't be capable of discussing those or that in detail, whereas it's a pretty small company [12 working on BISAD] you would expect that a lot of people would be able to do that*

9.3.4 Personal Factors that Influence the Use of a Less Sophisticated Approach

Personal factors are those that apply to the analyst/designer not matter where they work. Table 1.5 shows the personal factors described by interviewees as influences on the use of less sophisticated approaches.

Table 9.5: Personal factors described by interviewees as influences on the use of less sophisticated approaches.

Personal Factor	Example Quote
Cannot refuse to work	*you can't just say that you don't do your job, "Oh okay, you don't do your job. Are you wrecking our job [viz. project]?" (I14)*
Will not change what is done	*there were a few things that are wrong but you can't do too much about it. (I14)*
Trying to use a more sophisticated approach on one's own is difficult	*I try to do it on myself, but I find that very hard as well. (I10)*
Accepting the situation as normal	*I just put up with it like, accept it, this is the way it's going to be (I10)*
Number of years of experience overrides knowledge	*I've tried, it's very hard for somebody who's only got four years experience to push that [a more structured environment] onto people who've been doing that for 20 years (I10)*
Inexperience	*we had some experience but not too much experience, on average a year, a year and a half, the project manager used to have something like 12/13 years of experience (I14)*
There is no point in using more sophisticated approaches	*you've probably thought the model up in your head anyway, and there's no point in expressing it on paper. (I9)*
Analysis/design is easy	*I mean it's just as easy doing it in my head and just do the plan [of the system], when you have got the plan in your head, so do it. (I9)*
Personal relationships interfere	*most of them are friends they cannot say too much just to keep friendship […] they had really close relationships and that is interfering too much (I14)*
Having an acceptable level of skill to use less sophisticated approaches	*I'm a jack of all trades […] we are a bunch of cowboys, it's all about the individual being able to do a particular thing (I10)*
Prefer not to argue	*I think it's more a personality thing, probably. Because I'm not very strong and I don't like to argue with people, so I would just accept it. (I8)*

As for the organisational and project factors (Table 9.3 & Table 9. respectively), the personal factors shown in Table 9.5 may be complementary, for example, an analyst/designer will not change what is done and she believes she has an acceptable level of skill to use less sophisticated approaches. Whether any of the factors may be mutually exclusive is not apparent, which suggests the relationships between factors would also be a direction for future research.

A personal factor interpreted from the data relating less sophisticated conception and approach categories is the value the analyst/designer places on parts of analysis/design such as the methods, tools, or techniques.

> *I18 the design and all that it's just verbally between each other, no use cases, no diagrams, none of that crap going, you know, doing all that formal stuff […] I label it as crap because I think so many times I had to do one for uni and you're just like, (exasperated sigh) do I have to do this kind of thing.*

For the less sophisticated conception categories, the analyst/designers interviewed presented a range of organisational, project, and personal factors that justified their reasoning for using a less sophisticated approach. I interpreted other organisational, project, and personal factors from the data. However, knowledge, described in the less sophisticated conception categories, is a stronger factor than the organisational, project, and personal factors in determining a less sophisticated conception category to less sophisticated approach category relationship.

For the more sophisticated conception categories, the knowledge described in the conception category is a weaker factor than the organisational, project, and personal factors in determining when a conception category is related to which approach category. A more sophisticated conception category can be related to an equally or lesser sophisticated approach category depending on organisational, project, and personal factors. The analyst/designer's reasoning about which approach to use is dependent on these factors. Therefore, as shown in Figure 9.3, Conception Categories 4 and 5 can be related to Approach Category 2, 3, or 4 and Conception Categories 3 can be related to Approach Category 2 or 3.

The influence that skill, intention, and awareness have on the intentional action or process increases when the way analysis/design is conceived is more sophisticated. However, organisational, project, and personal factors have a stronger influence on the conception category and approach category relationship when the conception category is more sophisticated. For example, when there is sophisticated understanding of what is analysis/design, there is recognition that it is the circumstances or conditions (organisational factors), the type of system or plan (project factors), and that time is needed to develop a thorough understanding of the organisation (personal factors) that determines the intentional action or process used.

I16 *in any systems development project you start out with trying to understand these systems [...] to understand the business first, to a certain extent, [... how much of understanding the business I do] depends I guess on the system and on the plan. If you have a contract and you have x weeks to do this then you use those weeks. That's all from a practical point of view. From a theoretical point of view, you could go on forever [...] it takes about two years to understand an organisation; you don't have that time just to fiddle around.*

Int *So if it takes you two years to understand a business, and you don't have that time, what do you do? How do you resolve that?*

I16 *Oh, well you do as best as you can, and then you get some surprises along the way (laughs) [...] for example they could say to you something in an early stage, and* *they say "Oh this is really important." and you say "Yes, sure, it's really important." and then it takes another two years to understand why this was really important. So you don't know, really, at that point in time whether [it is important or not], because there's so much that's important you don't really know what's really important and what isn't. I guess, yes I guess I am involved or in this organisation I worked for a long time it does take me a long time to understand the organisation thoroughly. But often you're just entitled to make a really small technical solution, like an increment for example, and then you just do as best as you can, maybe four weeks or six even if you're lucky, so you read reports and talk to people and find out.*

Int *And doing the best that you can, does that mean that you rarely get to do your best work?*

I16 *Well that depends on the notion of best, because if best means the best that you can do in your lifetime, the answer is no, but certainly it is possible to do very little in the short time you have, given the conditions, so I think you have to, it's a relative concept. It's regarding the circumstances [...] I think [knowing that you can only do the best that you can] comes very easily when you're out in contract based projects. Because if you say that you need more time the consequences are huge economically. So you don't really do that very often.*

When there is a more sophisticated conception category, but factors result in a less sophisticated approach being used, there can be a conscious effort to increase the sophistication of the approach. For example, when working on a commercial basis the project needs to keep progressing. The client may not be available as described in Approach Category 4. However, there is an effort made to improve the client interaction to compensate.

Int *Do you normally work with user interfaces first or was that an exception?*

I12 *(sigh) ... It's where I like to work first because it can be difficult to get regularly enough in front of clients because we're working on a commercial basis rather than being in house it can be difficult to get in front of clients enough to make that process realistic [...] we often tend to find that we get further down the track than we'd necessarily like before meeting with the client, but yeah, it's certainly where I like to be, yes. Get it right, walk through the [business] process, get a user interface in place, then walk through with the customer*

9.3.5 Organisational Factors that Influence the Use of a More Sophisticated Approach

As described above, organisational factors are those characteristics particular to the organisation that would apply to any project and analyst/designer in the organisation.

Table 9.6 shows the organisational factors described by interviewees as influences on the use of more sophisticated approaches.

Table 9.6: Organisational factors described by interviewees as influences on the use of more sophisticated approaches.

Organisational Factor	Example Quote
The business produces software to sell	*it's only usually if you're working for say an actual software development company where they're producing products to sell, like software products, then they'll start introducing all these, like say introducing a proper process or using say technology the way it's meant to be used (I10)*
The business producing systems to sell is small	*We're a small organisation… we tend to only have at most three people working on anything, me doing the analysis, a programmer and then somebody testing, from analysis to design there doesn't tend to be all that much in the way of documentation. [The digital photos are] part of it. I guess part of the reason for that is because documentation tends to be a way of handing knowledge on from one person to another and because the analysis and design are so tightly tied together for us, there's not a lot of need to encapsulate that knowledge. It's at the point where it's going from design to development that it needs to be more clearly documented, firstly for the client, this is what we're going to do, and secondly for the programmer, this is what you've got to do. (I12)*
Large consultancies who analyse/design different types of systems (need Approach Category 3)	*I think large consultancies who are doing lots of different types of work need methodologies because it sort of keeps them grounded when they're faced with lots of different types of things that they haven't faced before whereas when you work for an in-house IT team things don't change that much. You're dealing with the same business and the same business needs and the same business drivers generally from day-to-day so if you understand your business and you're not suddenly faced with a new client that is totally different with the clients you've dealt with in the last 10 years it's a bit easier. You can just mull it the same way as you did the last project. So consultancies need, and bigger companies who run bigger projects, need methodology I think. (I20)*
Larger companies have larger systems and more money	*[a large company would] probably have something that was a bit more structured, a bit more process [because a large company would have] larger systems, more money (I10)*
The business is large and accepts the cost of using Approach Category 3 whereas a small business would not so Approach Category 4 is used	*if you do that project for a big organisation, a big corporate, that doesn't want to get burnt, not so much on dollars it's normally on time frame, then they're happier to spend much more time doing test plans and doing functional requirements and doing technical requirements and things like that and so you can spend twice as long doing the technical spec, and the functional spec as you do actually doing the development itself and the end result is there's very little that's unambiguous, there's very little that hasn't been thought of and when you come down to the unit and acceptance testing there's very little that goes wrong and they've accepted the cost that goes along with that (I15)*
It is not appropriate for the client	*by and large our clients are sort of medium sized business and the idea of saying to someone okay we're going to spend six months of hard core coding therefore we'll spend a year of talking about it and writing it up is just never going to fly, never adopt it (I15)*
The client trusts the experience of the analyst/designer	*[the specifications] are still much lighter than they should be. And the clients sort of accepts that but again I suppose from the client's level it's whether or not they've been burnt or not and they haven't been burnt so they're used to keeping it at a higher level. (I15)*
Close proximity to clients, users, or programmers	*I guess the interaction between myself, as a business analyst, and the business users doesn't stop at the end of the analysis phase so once we get into design and implementation I will still be interacting with them on a daily basis. For example, here, it's very easy; all the people that I work with are on the same floor. So, if I have a question I just go and talk to them and sometimes issues are a matter of "Oh yeah we didn't actually understand it correctly." (I20)*

An organisational factor interpreted from the data relating conception categories with more sophisticated approach categories is that the analyst/designer has a self–team–stakeholder governance balance. Having more governance balance is in contrast to the less sophisticated conception category and approach category relationships. In the less sophisticated conception category and approach category relationships, the analyst/designer has less say; the decisions and judgements of the analyst/designer are overridden. In the more sophisticated conception category and approach category relationships the analyst/designer has more say in what is being done and how. The analyst/designer is in an organisation where communication with all stakeholders is more likely to be encouraged and permitted.

9.3.6 Project Factors that Influence the Use of a More Sophisticated Approach

As described above, project factors are those characteristics that could apply to the project no matter where that project is being developed or by whom. Table 9. shows the project factors described by interviewees as influences on the use of more sophisticated approaches.

Table 9.7: Project factors described by interviewees as influences on the use of more sophisticated approaches

Project Factor	Example Quote
The client is involved in the decision to go live	*we're actually deciding if this [change we're about to put into production, into the live system] goes wrong what impact is it going to have and that is managed with the client (I15)*
Risk minimisation	*If you said everything's got a level of risk associated to it […] How do you guarantee that you're going to not have any surprises along the way and that's how through these specifications. (I15)*
The system is very large	*[that all the requirements gathering, planning the project, modelling, and prototype coding are must haves or optional] depends on the size of the system, if you're developing a very large system then they're must haves. (I9)*
The number of developers increases	*knowing that you were going to have more developers working on the code and with more requirements for integrating between the various software modules, you would need to have that formalised prior to starting because otherwise you get yourself into a mess. (I4)*
The dependency between modules of the system	*knowing that you were going to have… more requirements for integrating between the various software modules you would need to have that formalised prior to starting 'cause otherwise you get yourself into a mess... but it would depend on the level of integration across the different modules. (I4)*
Large problem size	*Depends on how big or how small the problem is. Because the system study is basically like a new sub-system so it will take two months normally to do it so it's quite formal. (I8)*
The project has a small budget, time frame, and team	*we tend to operate off reasonably small projects, for us a twenty thousand dollar project is big, a hundred hours is substantial, we tend to only have, at most, three people working on anything, […] From analysis to design there doesn't tend to be all that much in the way of documentation because the documentation tends to be a way of handing knowledge on from one person to another. And because the analysis and design are so tightly tied together, for us, there's not a lot of need to encapsulate that knowledge. It's at the point where it's going from design to development that it needs to be more clearly documented. Firstly, for the client, "This is what we're going to do.", and secondly for the programmer "This is what you've got to do." (I12)*

Project factors interpreted from the data relating more sophisticated conception and approach categories that were interpreted from the data are:

- The client becomes more involved in the analysis/design.
- The analyst/designer is allowed to work at a task, system, and organisational level as needed so that the analyst/designer has an understanding of the BIS at different levels of abstraction.

9.3.7 Personal Factors that Influence the Use of a More Sophisticated Approach

As described above, personal factors are those that apply to the analyst/designer no matter where they work. Table 9.8 shows the personal factors described by interviewees as influences on the use of more sophisticated approaches.

Table 9.8: Personal factors described by interviewees as influences on the use of more sophisticated approaches.

Personal Factor	Example Quote
Perseverance	*some people have very strong conviction that they are right and you can't really argue with them and that's very hard. When someone is very aggressive, I probably would just agree with them and then trying to do something underneath it to try to improve it. (I8)*
Prior experience improves her conception and approach	*the first time I was [with a] project in hospitals, but that was a research project so we had more time there than we normally have […] and we also had a very resourceful anthropologist so he introduced us to social anthropological methods, that was very valuable actually […] Because this notion of being out there and looking, not only listening, which is when you're brought up in a mathematical technical tradition you're not really brought up to be very hands on with the world only with technology […] and he also taught us to notice what we don't understand because it's what you understand is the easy part, and what you don't understand, you can't really write it down because you don't understand what's happening with that and we need to learn to listen for key phrases. I think that was a valuable experience for me. […] people go out and do analysis and design from the background of what they are so different people will ask different questions for example. [… do you think you're better off for that experience than perhaps others?] Yes, I would say so. (I16)*
Self-confidence	*more self-confidence (I16)*
Not being afraid of asking questions	*not being afraid of asking (I16)*

A personal factor interpreted from the data relating more sophisticated conception and approach categories is being reflective about what happens and improving based on that reflection. With increasing awareness of a more sophisticated conception of analysis/design, the analyst/designer becomes more aware of her thoughts and actions in relation to what she is thinking and doing.

A range of organisational, project, and personal factors are presented as influences on practical reasoning for using a more sophisticated approach. I interpreted from the data other organisational, project, and personal factors that influence the practical reasoning for using a more sophisticated approach. The organisational, project, and personal factors are stronger factors than knowledge in determining a more sophisticated conception category to approach category relationship.

9.4 The Gestalts of Selected Conception–Approach Relationships

The five relationships between the most sophisticated approach category to which a conception category is related were selected for closer examination. In Figure 9.3 and Table 9., these five relationships are marked from A to E. I describe each of these relationships in detail in Sections 9.4.1 to 9.4.5.

9.4.1 The Cowboy Gestalt: The Other-than-Programming–Ad Hoc Relationship

The Other-than-programming–Ad hoc relationship between Conception Category 1 (Other-than-programming) and Approach Category 1 (Ad hoc) (relationship (A) in Figure 9.3 & Table 9.) was constituted using the relationships analytical framework. Applying the framework (Figure 9.2) resulted in an interpretation that the Gestalts of Conception Category 1 and Approach Category 1 corresponded at the field level. The Gestalts of Conception Category 1 and Approach Category 1 have a similar phase of achievement. The fields, which represent the two phases of achievement, were interpreted as parallel, as shown in Figure 9.4. Conception Category 1 describes a limited knowledge of analysis/design. This limited knowledge entails belief that doing analysis/design is incidental to doing BISD. This belief, combined with the desire to deliver something to the client as quickly as possible and solve the problem result in an intention to do as little analysis/design as possible. Little skill is needed to do the analysis/design as little analysis/design is done. The ad hoc process is the resulting action performed intentionally. When a hypothetical analyst/designer knows analysis/design only as Conception Category 1 then she will take Approach Category 1. Her goals include delivering something to the customer and solving the problem as quickly as possible. Organisational, project, and personal factors have little influence. Approach Category 1 is the rational choice for the hypothetical analyst/designer whose conception is Conception Category 1.

The identification of the Other-than-programming–Ad hoc relationship as the cowboy comes from the data: "I'm a jack of all trades […] we are a bunch of *cowboys*, it's all about the individual being able to do a particular thing" (I10). The cowboy metaphor describes analyst/designers acting "outside the law […] in a distinctly unpleasant sense" (Punter 2007, p. 9).

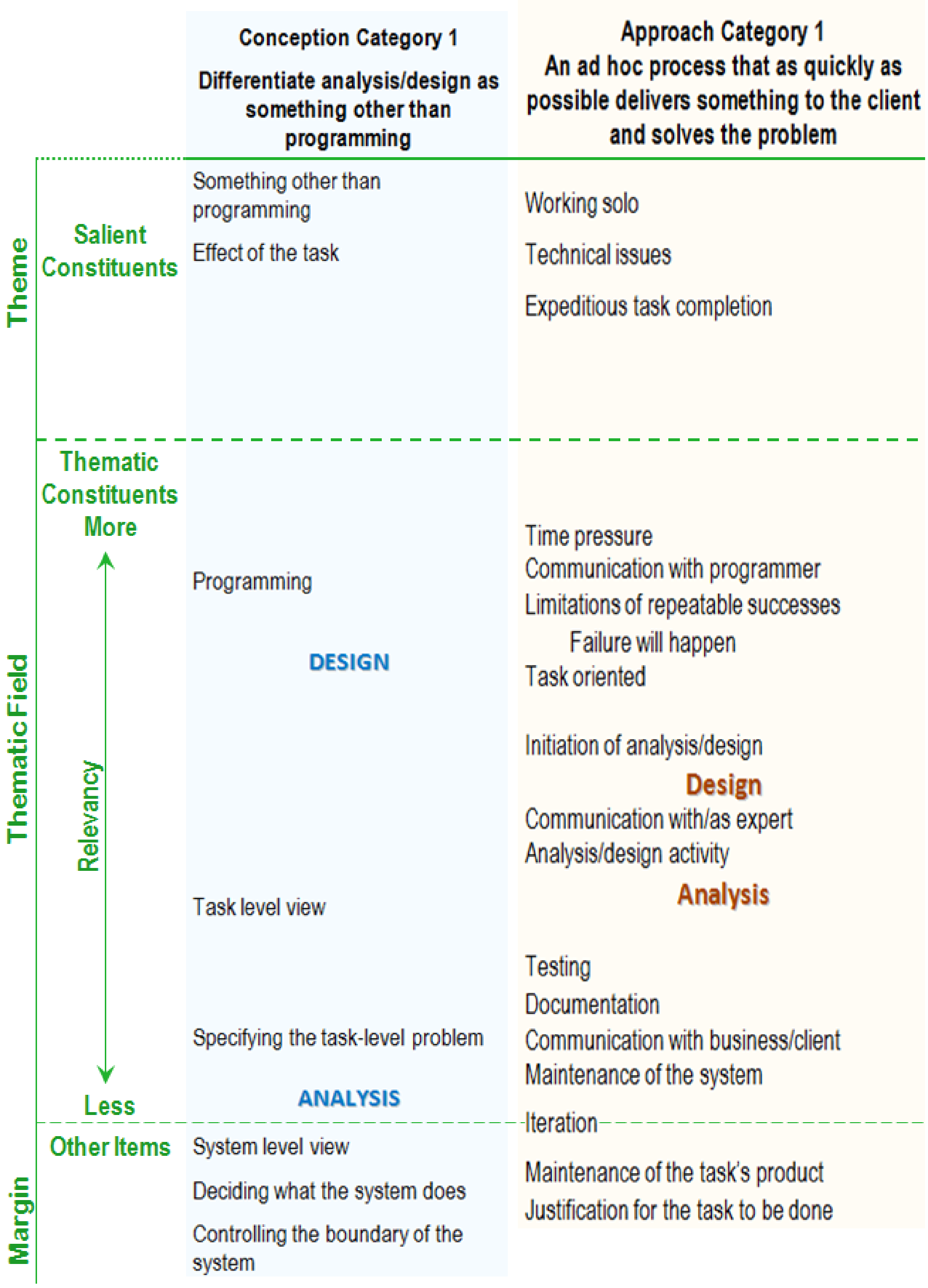


Figure 9.4: The Other-than-programming–Ad hoc relationship showing parallel Gestalts at the field level

Figure 9.5 shows the hypothetical analyst/designers view of the development life cycle that I synthesised from Conception Category 1 (Other-than-programming), Approach Category 1 (Ad hoc) and the Other-than-programming–Ad hoc relationship. Requirements coming from the analyst/designer's manager initiate the cycle (i.e., the analyst/designer receives as a request to fulfil a requirement). Analysis/design starts with the appraisal of the request. Solution focused analysis and technical design take place briefly. The three arrows between Receiving–a–request–to–fulfil–a–requirement, Initiate–analysis/design–actions, Solution–focused–analysis, and Technical–design are more representative of the flow of mental activity than the passing of documentation or artefacts. Solution–focused–analysis and technical–design are closely followed by coding and implementation. The cycle concludes with delivery to the client and the request fulfilled. Iterations can occur if, after delivery to the client, the initiating requirement is amended by an addition or extension. The cycle is rapid, possibly happening within one hour to a week. The cycle is a continuous flow as represented by the text and arrows within the partial annulus. The analysis/design part of the cycle is rapid and brief aimed as it is at delivery to the customer as quickly as possible and consequently solving the problem.

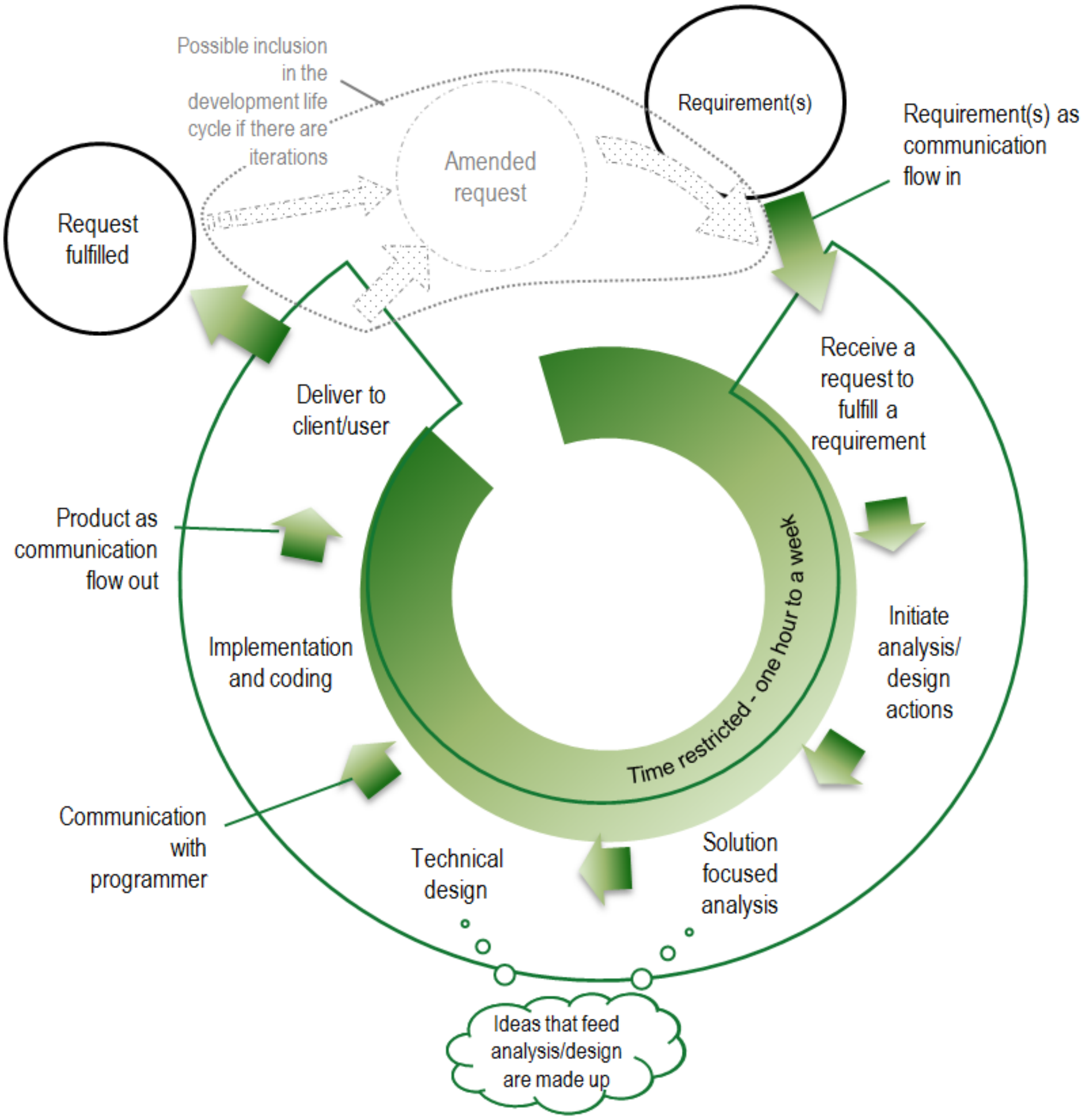


Figure 9.5: The hypothetical analyst/designer's view of the Other-than-programming–Ad hoc development life cycle

9.4.2 The Cataloguer Gestalt: The Catalogue–Atomistic Relationship

For Conception Category 2 (Catalogue) and Approach Category 2 (Atomistic) the Catalogue–Atomistic relationship (relationship (B) in Figure 9.3 & Table 9.) was constituted as a correspondence between the Gestalts at a field level as shown in Figure 9.6. The Gestalts of Conception Category 2 and Approach Category 2 have a similar phase of achievement. Conception Category 2 describes knowledge of analysis/design artefacts. This knowledge entails belief that doing analysis/design is the production of analysis/design artefacts. This belief, combined with the desire to produce artefacts to show that some analysis and design took place result in an intention to do analysis/design as a sequence of producing separate artefacts. Skill is needed to ensure artefacts conform to document–templates and little else. The atomistic process is the resulting action performed intentionally. When a hypothetical analyst/designer knows analysis/design only as Conception Category 2 then she will take Approach Category 2. Her goals include producing artefacts to show that some analysis and design took place. Organisational, project, and personal factors have little influence. Approach Category 2 is the rational choice for the hypothetical analyst/designer whose conception is Conception Category 2.

The identification of the Catalogue–Atomistic relationship as the cataloguer comes from the verb of the conception category describing how the content of consciousness is focused upon.

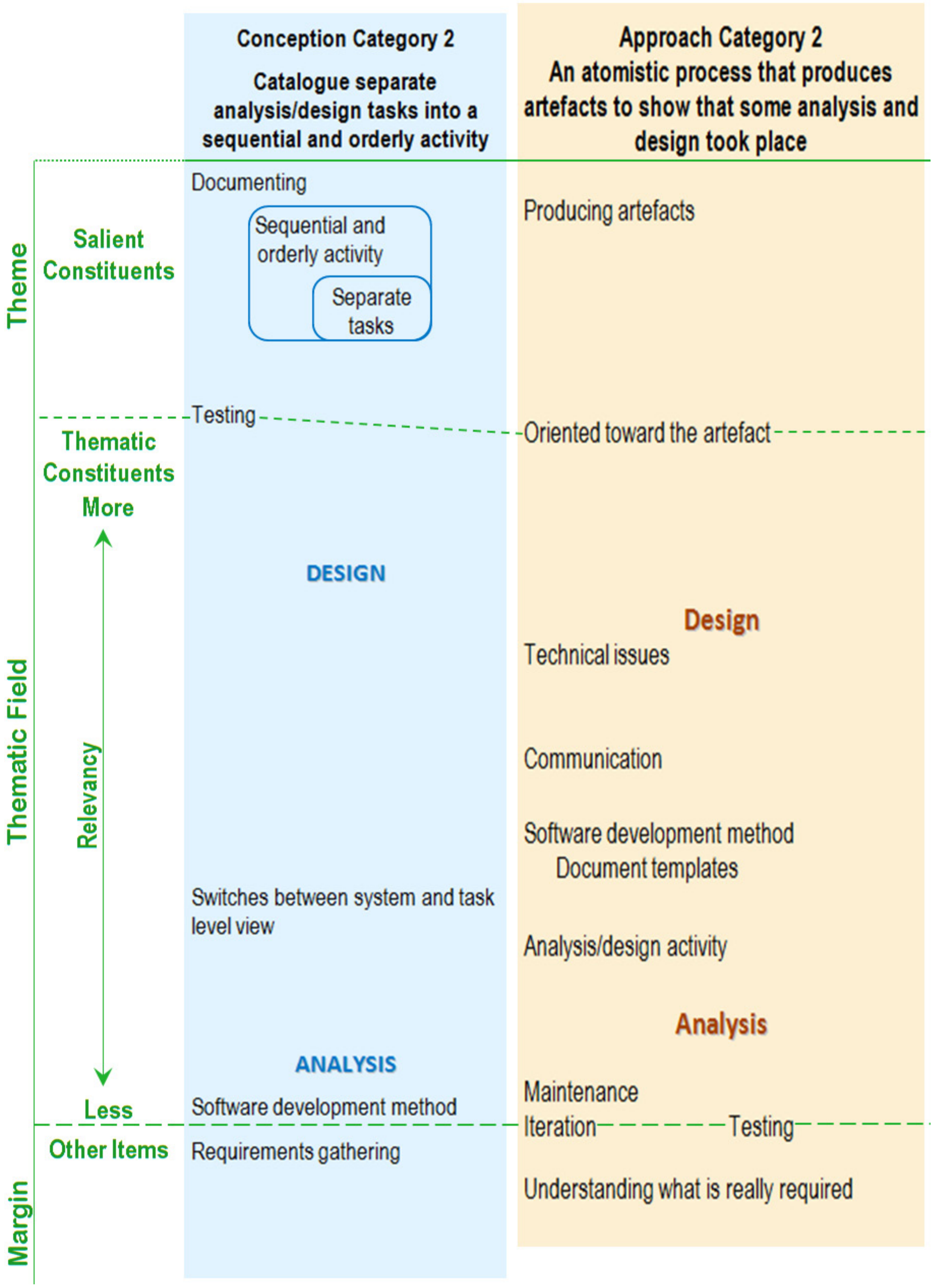


Figure 9.6: The Catalogue–Atomistic relationship showing parallel Gestalts at the field level

Figure 9.7 shows the hypothetical analyst/designers view of the development life cycle that I synthesised from Conception Category 2 (Catalogue), Approach Category 2

(Atomistic) and the Catalogue–Atomistic relationship. Whether the user or someone in the business gives requirements to the analyst/designer, the Catalogue–Atomistic development life cycle starts when the analyst/designer receives the requirements. The analyst/designer starts with an analysis phase of producing high-level detail artefacts. A high-level detail artefact might go through iterations of being shown to the user, resulting in requirements and the artefact being modified, but this often is not necessary from the analyst/designer's view; the user has given the requirements and the analyst/designer's conception is that the users know what they want. Design starts when the high-level detail artefacts are complete. Design is a phase of producing low-level detail artefacts. The cycle progresses by an artefact being completed, which initiates the production of the next artefact. The analyst/designer views the artefacts as sufficient for the coding and testing to be done and the system to be produced. For the analyst/designer, her role in the cycle concludes with delivery of artefacts downstream to the programmer, user, or business. Iterations can occur if, after delivery to the user or business, the user or business provides more requirements to the analyst/designer. The Catalogue–Atomistic development life cycle is of an indeterminate length. However, in most contexts the expectation would be for a speedy production of the artefacts. The analyst/designer experiences the cycle more as a sequence of artefact producing tasks than phases of analysis and design.

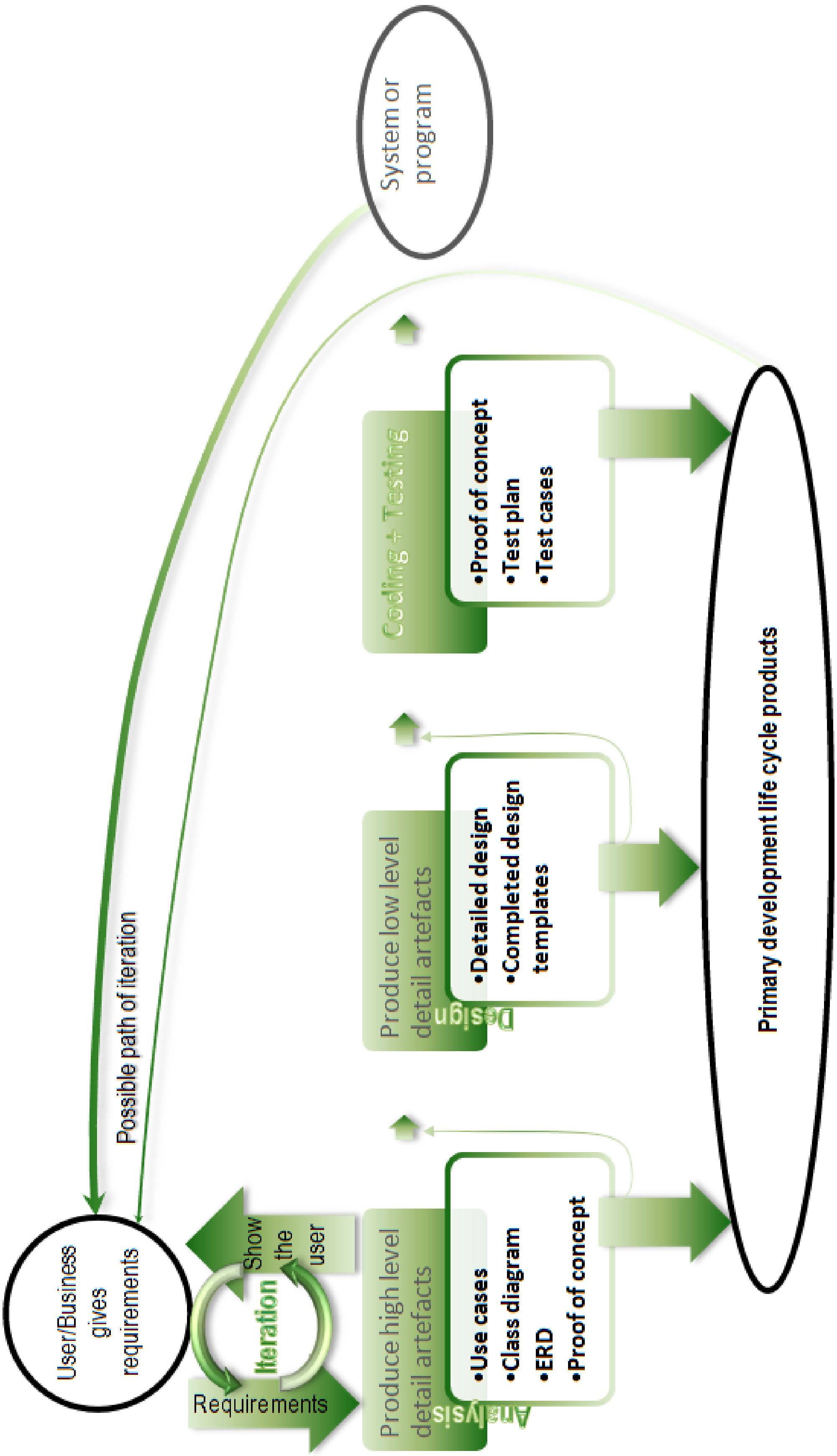


Figure 9.7: The hypothetical analyst/designer's view of the Catalogue–Atomistic development life cycle

9.4.3 The Methodist Gestalt: The Idealise–Circumscribed Relationship

For Conception Category 3 (Idealise) and Approach Category 3 (Circumscribed) the Idealise–Circumscribed relationship (relationship (C) in Figure 9.3 & Table 9.) was constituted as a correspondence between the Gestalts at a field level as shown in Figure 9.8. The Gestalts of Conception Category 3 and Approach Category 3 have a similar phase of achievement. Conception Category 3 describes knowledge of methodical analysis/design. This knowledge entails belief that doing analysis/design is an obligatory–ritual following a software–development–method. This belief, combined with the desire to produce the best artefacts and solution result in an intention to do analysis/design as a methodical execution of the software–development–method. Skill is needed to ensure the software–development–method is followed. The circumscribed process is the resulting action performed intentionally. When a hypothetical analyst/designer knows analysis/design only as Conception Category 3 then she will take Approach Category 3 when the organisational, project, and personal factors support her. Her goals include producing the best artefacts and solution. Approach Category 3 is the rational choice for the hypothetical analyst/designer whose conception is Conception Category 3 and organisational, project, and personal factors favour it.

The identification of the Idealise–Circumscribed relationship as the methodist comes from the definition of methodist with a lower case "m", namely, "a person who follows or advocates a particular method or system of procedure" (*Methodist noun* 1997).

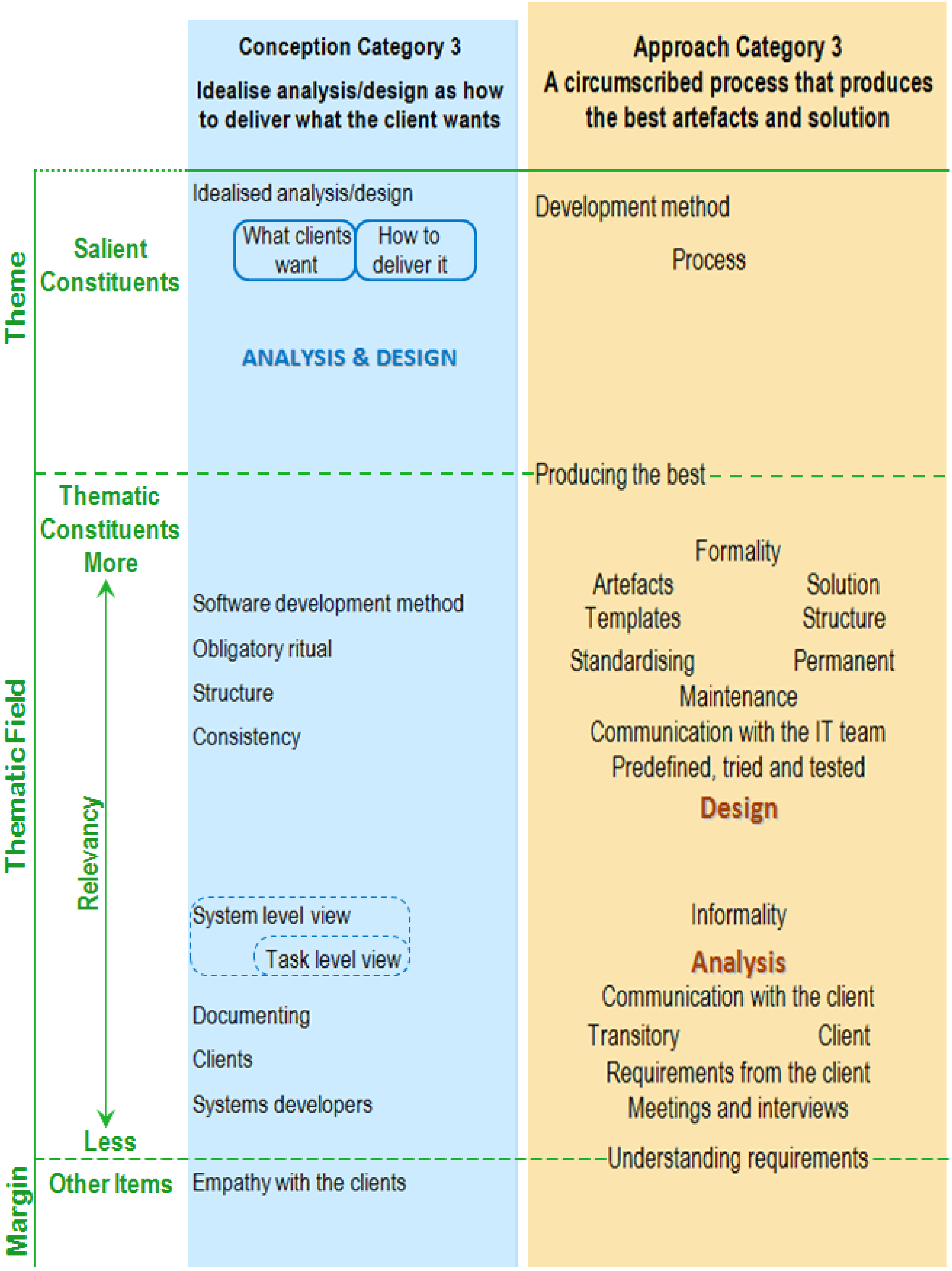


Figure 9.8: The Idealise–Circumscribed relationship showing parallel Gestalts at the field level

Figure 9.9 shows the hypothetical analyst/designers view of the development life cycle that I synthesised from Conception Category 3 (Idealise), Approach Category 3 (Circumscribed) and the Idealise–Circumscribed relationship. The requirements are supplied to the analyst/designer from the business, client, customer, a user, or other system stakeholder. Receiving the supplied requirements initiates the analysis phase. The analysis phase, alternatively named gathering requirements, is when the analyst/designer asks for more requirements and checks the accuracy of the requirements. The analysis phase is where iteration is expected to occur to ensure the accuracy of the requirements. The analyst/designer will take the time to make the requirements the best she can. When the analyst/designer is satisfied that the requirements are accurate and complete, the requirements specification is produced. The requirements specification is passed to the source of the requirements for approval and signing (i.e., the business, client, customer, a user, or other system stakeholder). Either the completion or the signing of the requirements specification initiates the design phase. In the design phase, the analyst/designer transforms the requirements specification into the functional specification, alternatively named the system specification or detailed design. The transformation of the requirements specification is the conversion of business language into the technical language of the system developers. The analyst/designer passes this specification document to the source of the requirements for approval and signing. Either the completion or the signing of the functional specification initiates the programming phase. The programming phase produces the solution, that is, either the new system or the change to the existing system. When the solution is delivered, the support/maintenance phase begins. The Idealise–Circumscribed development life cycle takes a long time from start to finish due to the analyst/designer's desire to control the project and the process by keeping within the bounds of the method and progressing only upon completion or sign off of the artefacts from each phase.

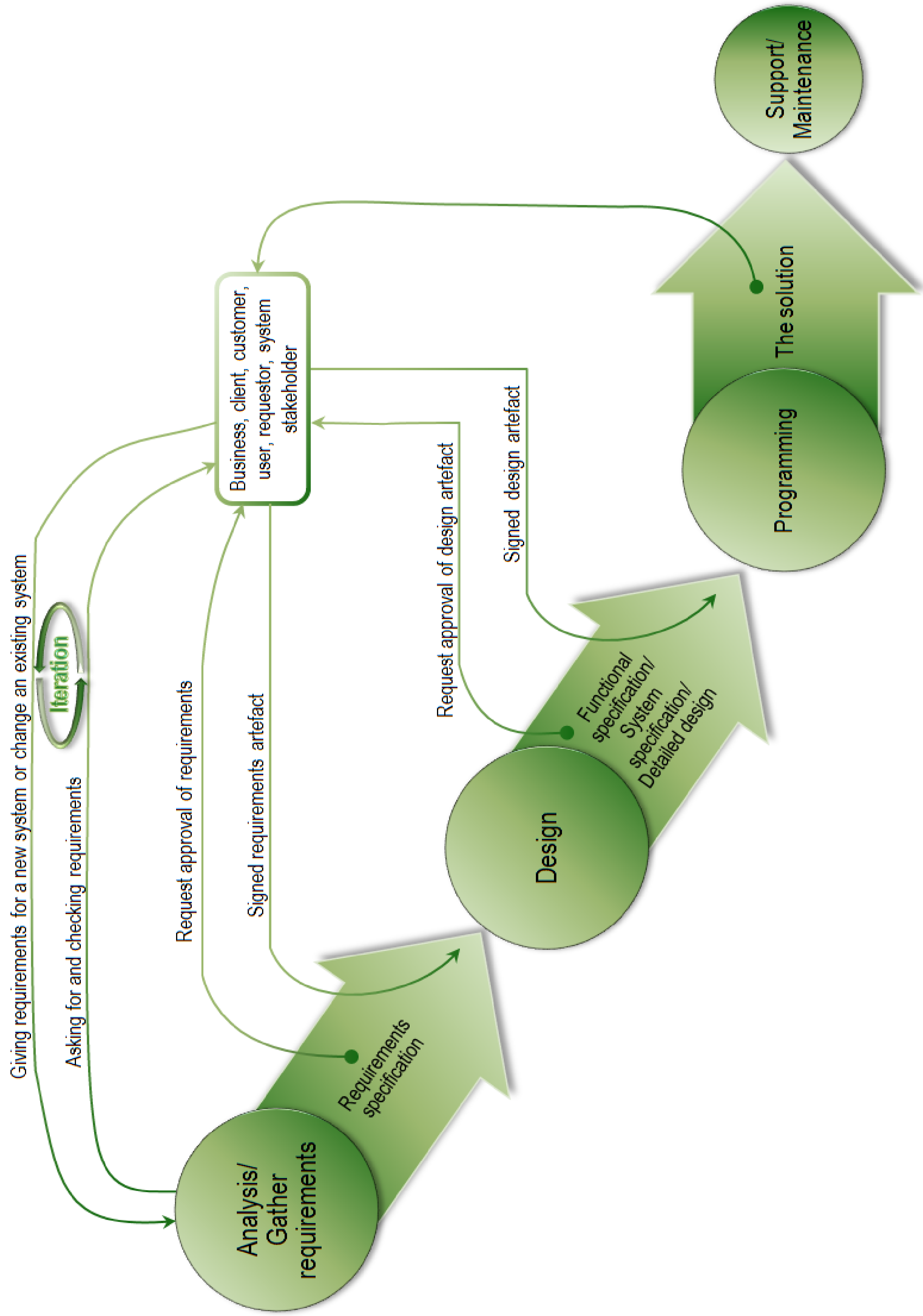


Figure 9.9: The hypothetical analyst/designer's view of the Idealise–Circumscribed development life cycle

9.4.4 The Magician Gestalt: The Contrast–Adjustable Relationship

For Conception Category 4 (Contrast) and Approach Category 4 (Adjustable) the Contrast–Adjustable relationship (relationship (D) in Figure 9.3 & Table 9.) was constituted as a correspondence between the Gestalts at a field level. The themes and thematic fields of Conception Category 4 and Approach Category 4 have a parallel, as shown in Figure 9.10. The Gestalts of Conception Category 4 and Approach Category 4 have a similar phase of achievement. Conception Category 4 describes knowledge of alternative analysis/design methods. This knowledge entails belief that doing analysis/design is selecting and using tools–and–techniques and portions of development–methods. This belief, combined with the desire to share an understanding of the problem and a vision of the solution to satisfice stakeholders, results in an intention to do analysis/design as an adjustable process that takes into account available resources. Skill is needed for the process to be appropriately adjusted, and communication to be facilitated, by the choice of tools–and–techniques and development–methods. The adjustable process is the resulting action performed intentionally. When a hypothetical analyst/designer knows analysis/design only as Conception Category 4 then she will take Approach Category 4 when the organisational, project, and personal factors support her. Her goals include sharing an understanding of the problem and a vision of the solution and satisficing stakeholders. Approach Category 4 is the rational choice for the hypothetical analyst/designer whose conception is Conception Category 4 and organisational, project, and personal factors favour it.

The identification of the Contrast–Adjustable relationship as the magician is linked to the data. There is reference to “the old Kiwi number 8 fencing wire concept” (I4, see s. 7.4). This reference suggested that the analyst/designer, when experiencing the Contrast–Adjustable relationship, has a “magical” ability to understand the analysis–what and design–how and do the adjustable process. Magic in this context refers to “an inexplicable or remarkable influence producing surprising results” (*Magic noun* 1997) and the magician is observed as “a person with exceptional skill” (*Magician noun* 1997).

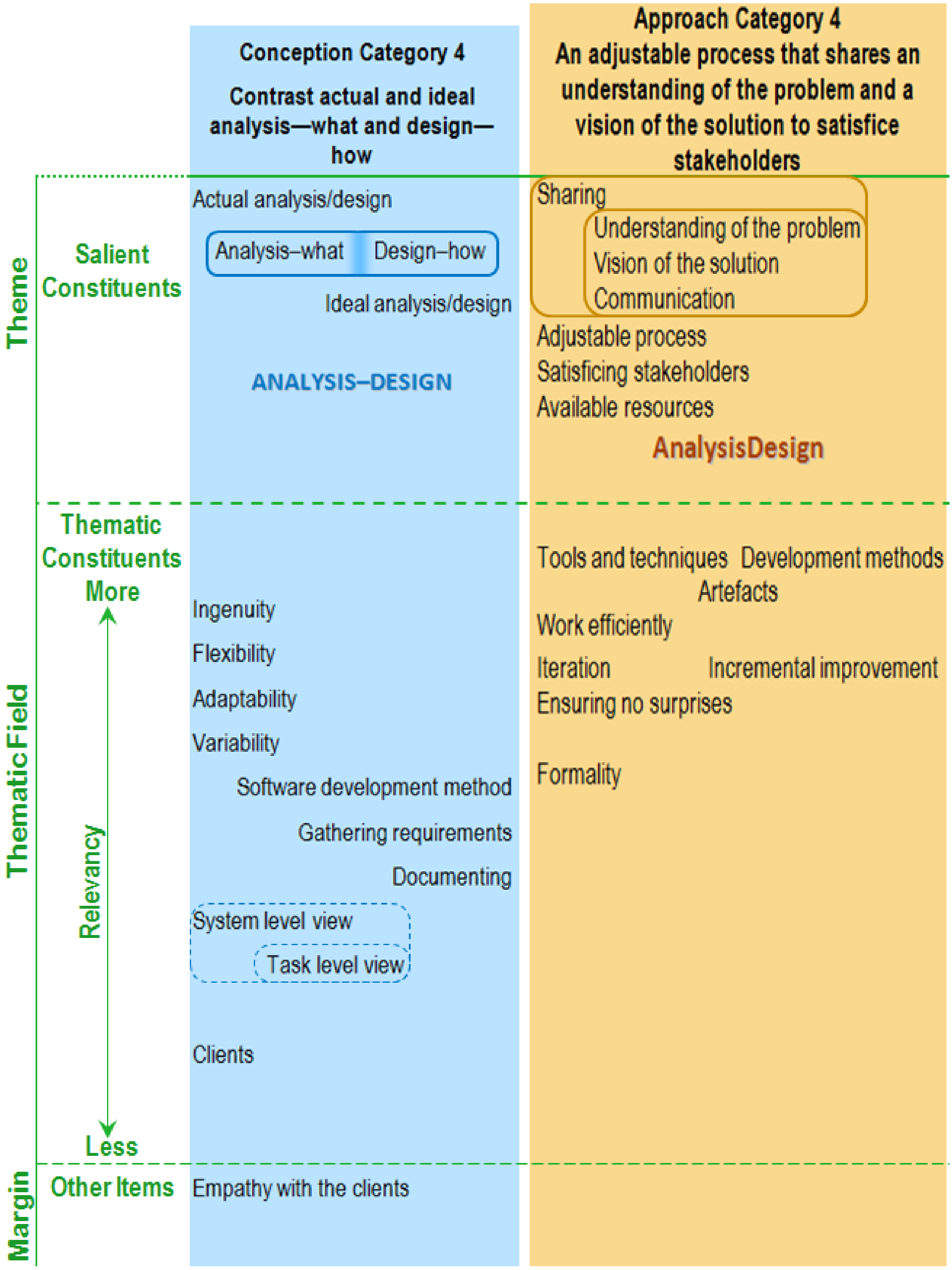


Figure 9.10: The Contrast–Adjustable showing parallel Gestalts at the field level

Figure 9.11 shows the hypothetical analyst/designers view of the development life cycle that I synthesised from Conception Category 4 (Contrast), Approach Category 4 (Adjustable) and the Contrast–Adjustable relationship. Requirements coming from a user or business client initiate the Contrast–Adjustable development life cycle. The analyst/designer commences analysis by engaging in an exchange with the user/client about the requirements for the system. Analysis and design are blended; the analyst/designer does not discern when analysis is happening and design is not happening and vice versa. During analysis, the analyst/designer is collecting the analysis–what aspects of the system and coming to an understanding of what the system is meant to do. The user/client is the initial source of the system requirements, though the analyst/designer will use her ingenuity to fill gaps in her and the users/client's understanding and to resolve her and the users/client's misunderstandings. During design, the analyst/designer is deciding on the design–how aspects of the system and coming to an understanding of how the system will be constructed. The analyst/designer will use her ingenuity to fill gaps in her understanding and the programmer's understanding. Using ingenuity involves mental activity and selecting, adapting, and using methods, tools, and techniques as the analyst/designer sees fit. The analyst/designer incorporates the selected and adapted methods, tools, and techniques into creating a new system or a change to an existing system with skill, imagination, cleverness, ingenuity, and inventiveness. Iteration during analysis/design will depend on the development method, tools, and techniques the analyst/designer chooses. Programming and testing commence as soon as the analyst/designer has something, such as a specification or prototype from which the programmers and testers can work. Following programming and testing, increments of the system are deployed. The conclusion of the cycle is ambiguous as delivery of system increments can inspire new or altered system requirements from the user/client. The duration of the Contrast–Adjustable development life cycle is dependent on, and is measured by, the time between receiving system requirements and delivery of system increments. The time between receiving a particular system requirement and delivering the system increment satisfying that system requirement may vary from days to months.

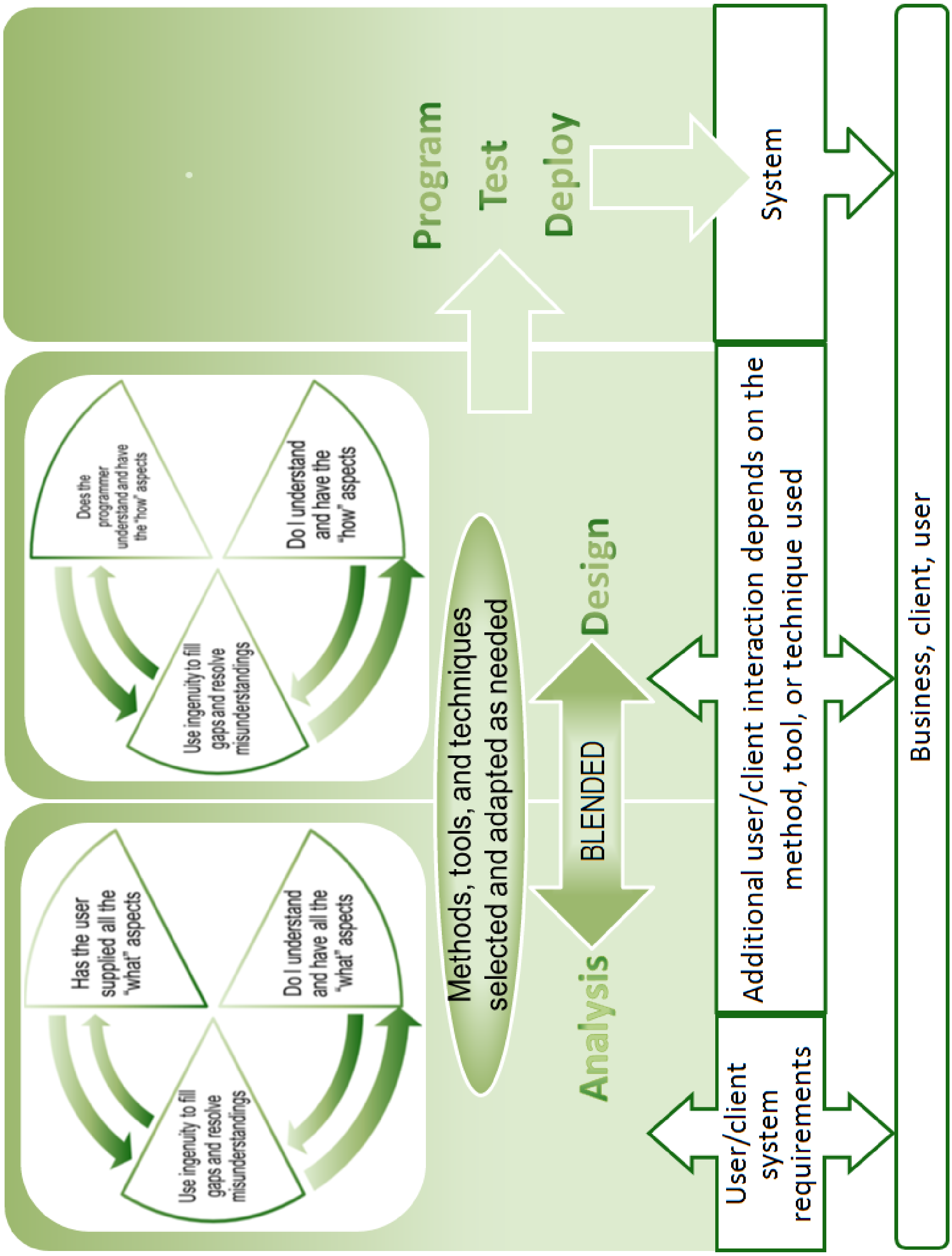


Figure 9.11: The hypothetical analyst/designer's view of the Contrast–Adjustable development life cycle

9.4.5 The Master Gestalt: The Integrate–Adjustable Relationship

The Integrate–Adjustable relationship (relationship (E) in Figure 9.3 & Table 9.) between Conception Category 5 (Integrate) and Approach Category 4 (Adjustable) was constituted by interpreting a correspondence between the Gestalts of the categories. In contrast to the previous four selected relationships, the Integrate–Adjustable relationship is an alignment of Gestalts at the theme level as shown in Figure 9.12. The theme level Gestalts of Conception Category 5 and Approach Category 4 have a similar phase of achievement. Conception Category 5 describes knowledge of the explorative and creative nature of analysis/design. This knowledge entails belief that doing analysis/design is selecting and using tools–and–techniques and portions of development–methods during constant and empathetic interaction with clients. This belief, combined with the desire to share an understanding of the problem and a vision of the solution to satisfice stakeholders result in an intention to do analysis/design as an adjustable process while taking into account the available resources. Skill is needed for the process to be appropriately adjusted and communication to be facilitated by the choice of tools–and–techniques and development–methods. The adjustable process is the resulting action performed intentionally. When a hypothetical analyst/designer knows analysis/design as Conception Category 5 then she will take Approach Category 4 when the organisational, project, and personal factors support her. Her goals include sharing an understanding of the problem and a vision of the solution to satisfice stakeholders. Approach Category 4 is the rational choice for the hypothetical analyst/designer whose conception is Conception Category 5 and organisational, project, and personal factors favour it.

The identification of the Integrate–Adjustable relationship as the master comes from the definition of master as a noun “a skilled practitioner of a particular art or activity” and an adjective “having or showing very great skill or proficiency [or] denoting a person skilled in a particular trade and able to teach others” (*Master noun* 2010).

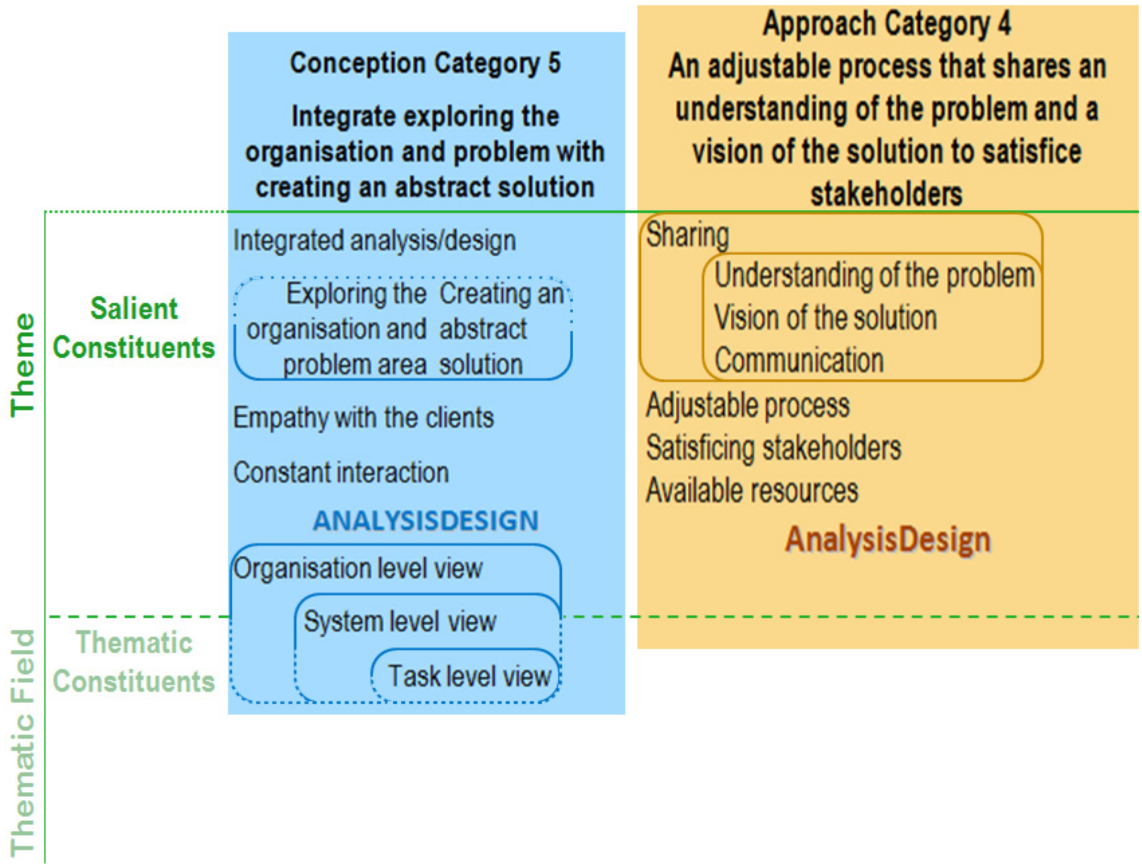


Figure 9.12: The Integrate–Adjustable relationship showing a parallel in the Gestalts at the theme level

Figure 9.13 shows the hypothetical analyst/designers view of the development life cycle that I synthesised from Conception Category 5 (Integrate), Approach Category 4 (Adjustable), and the Integrate–Adjustable relationship. Six segmented circles and five pairs of curved arrows connecting the segmented circles represent the Integrate–Adjustable development life cycle. Each segmented circle has a circumference of arrows, one arrow per segment. The first five segmented circles represent parts of analysis/design. The sixth segmented circle represents the activities downstream of analysis/design. The segmented circles' circumferential arrows and the pairs of curved arrows represent communication of data, information, and knowledge about the organisation, system, and task. The communication can be the mental flow of data, information, and knowledge within the mind of the analyst/designer. The communication can be the physical flow of data, information, and knowledge as the movement of artefacts between stakeholders. The communication can be the verbal flow of data, information, and knowledge between stakeholders. When people in the organisation decide that organisational change is needed, the Integrate–Adjustable development life cycle is initiated. The analyst/designer starts the Integrate–Adjustable development life cycle by developing an understanding of the organisation and system, which are the first and second segmented circles in Figure 9.13. From the analyst/designer's perspective, all stakeholders are part of the development life cycle. Understanding the organisation and system are two tasks that engage the third and fourth segmented circles. The analyst/designer may cycle through each segmented circle and flow along each curved arrow, round and round each circle, back and forward along the curved arrows, until a satisficing agreement is reached at the organisation, system, and task levels. The analyst/designer will select and use an appropriate tool, technique, or portion of a development method to perform tasks. The analyst/designer will document a satisficing agreement as required. Task outputs can be the satisficing agreements, for example, a satisficing agreement of the system may be represented as a storyboard of user interfaces. Another example of a task output might be a photo of sketches on a whiteboard that captures a discussion about a business process. When the task output is of use to a programmer, the analyst/designer engages the fifth segmented circle in Figure 9.13, and the activities in the sixth segmented circle follow. During the Integrate–Adjustable development life cycle, the analyst/designer attempts to work within the limits of the resources allocated for the organisation change to take place. How much the time and money is available determines the duration of this development life cycle. A single pass through the development life cycle to perform a task might be as little as an hour to as much as all the time allocated.

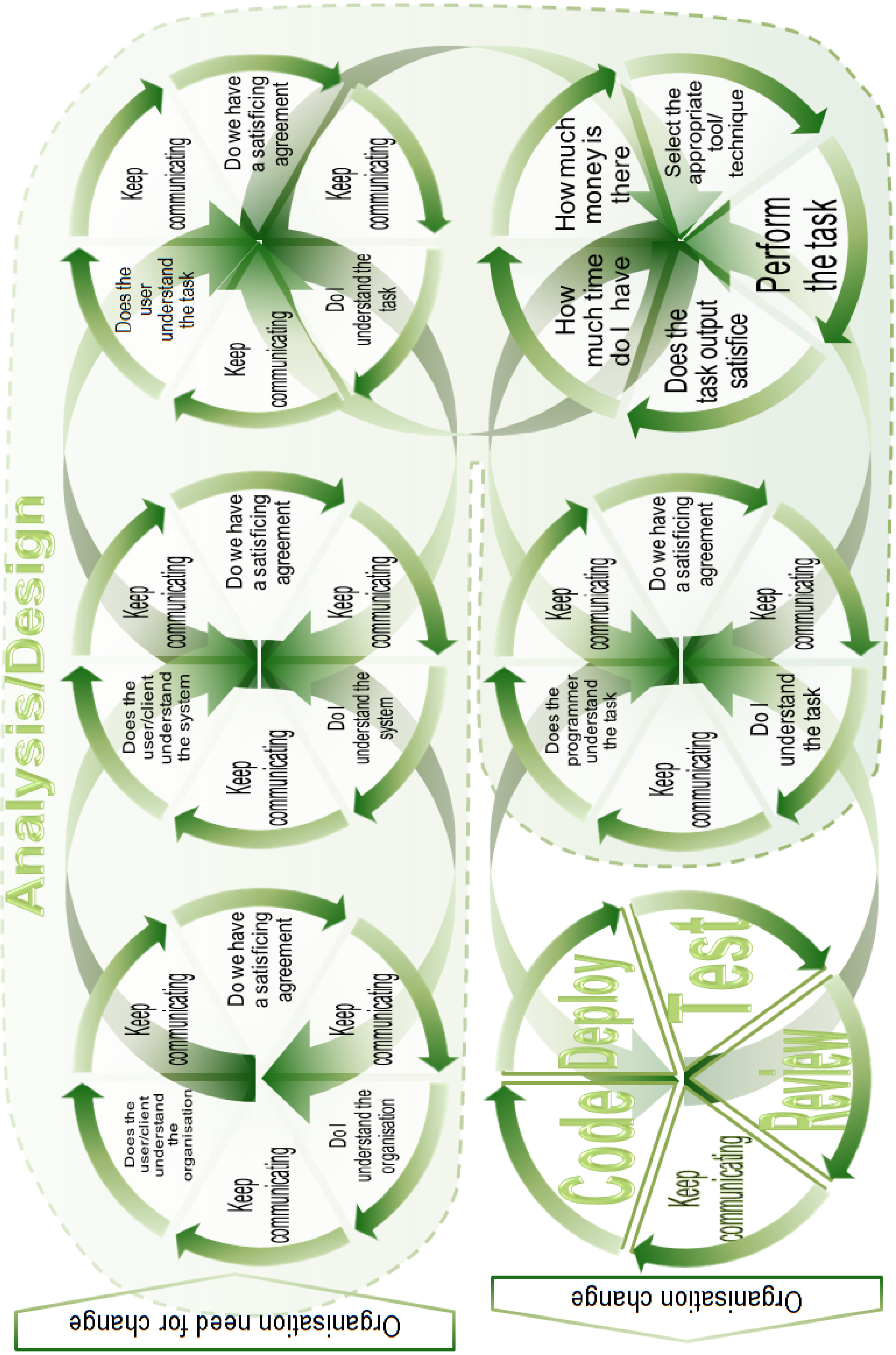


Figure 9.13: The hypothetical analyst/designer's view of the Integrate–Adjustable development life cycle

9.5 Summary

The research process used to constitute and describe the relationships between conception categories and approach categories was in two phases. The first phase was the application of an analytical framework to constitute relationships between conception categories and approach categories. The relationships analytical framework operates on the theory that a conception category and an approach category are related because having particular knowledge (conception) will determine the kind of action (approach) taken. Organisational, project, and personal factors influence taking an equal or less sophisticated approach category in relation to a conception category. For the lesser sophisticated conception categories, the knowledge described in the conception category is a stronger influence than organisational, project, and personal factors in determining which approach category is related to a conception category. For the more sophisticated conception categories, the knowledge described in the conception category is a weaker influence than organisational, project, and personal factors in determining which approach category is related to a conception category.

The second phase of the research process involved me imagining a hypothetical analyst/designer and her view of the development life cycle. I understood that each conception category, approach category, and corresponding relationship has a different impact on the development life cycle.

Of the 10 conception and approach relationships, five were described in detail. I presented the Other-than-programming–Ad hoc, Catalogue–Atomistic, Idealise–Circumscribed, and Contrast–Adjustable relationships as parallels at the field level of the Gestalts of the respective conception and approach categories. I presented the Integrate–Adjustable relationship as a parallel at the theme level of the Gestalts of Conception Category 5 and Approach Category 4. Each of the five selected relationships was also presented as a hypothetical analyst/designers view of the development life cycle.

10 Discussion

For me, this study began before I enrolled to do a PhD. This study began when my students asked me:

Why is what you are teaching not used in industry?

(i.e., to stop projects failing). At the same time, people in industry asked me:

Why don't the students we employ know how to do analysis/design?

(i.e., and thus reduce the risk of project failure).

Motivated by these two questions, and by my own interest in improving analysis/design, I asked a more tractable question:

What are analyst/designers thinking and doing when they are working?

I began this research study focused on this question expressed in the language of phenomenography as:

What is the variation in awareness that analyst/designers have of analysis/design?

I began by collecting data, conducting some initial data analysis, and learning about phenomenography. From these initial activities, I realised there were three questions I was trying to answer:

1. *What is the variation in analyst/designers' qualitatively different conceptions of analysis/design?*

2. *What is the variation in analyst/designers' qualitatively different approaches to analysis/design?*

3. *How are the qualitatively different conceptions of, and approaches to, analysis/design related?*

I answered the first two of these three questions with my five conception categories, four approach categories, and the two outcome spaces for these two sets of categories of description (see Ch. 7 & 8). The answer to the third question is a set of 10 relationships (see s. 9.2). From the set of 10 relationships, I selected the five relationships between the highest approach category to which a conception category is related. The five selected relationships are the cowboy, the cataloguer, the methodist, the magician, and the master. I described these five selected relationships as Gestalts of analysis/design (see Ch. 9). I discuss these Gestalts in Section 10.1.

I revisit the profiles of stereotypical analyst/designers based on the alignment of the outcome spaces from the phenomenographic studies of Boustedt (2010), Cope (2000), Davey and Cope (2009), Isomäki (2007), and Rose et al. (2005) (see s. 3.3). Section 10.2 discusses the addition of my conception and approach categories and the changes to the alignment of these outcome spaces and the profiles of the stereotypical analyst/designers.

Revealing different ways in which analyst/designers conceive and approach analysis/design is interesting in itself (Marton 1981a). The results contribute to satisfying our interest in what analyst/designers think analysis/design is and what they say they do when doing analysis/design. If the reader finds the results familiar then the results have formalised what we already know. However, I discuss, in Section 10.3, whether the results reflect the formal stages of an analyst/designer's professional development.

In the introductory chapter, I stated that, at a practical level, the lack of knowledge about analyst/designers' experiences of analysis/design limits the development of IS education and the development of professional competence (Sandberg 2000). My answers to the three research questions have increased our knowledge of analyst/designers' experiences of analysis/design. I discuss the implications of this increase in knowledge for the profession, education, and IS research in Section 10.4.

I have also contributed to the knowledge about phenomenographic research methods. Some of these contributions are small, while others are significant advances. I discuss these contributions in Section 10.5.

While this thesis is the presentation of a study about the variation in analyst/designers ways of experiencing analysis/design, it is also a representation of my experience as a researcher. As a representation of my experience, what is captured in this thesis is my understanding of what I was writing about at the time I was writing about it. Therefore, there are limitations to this study, which I discuss in Section 10.6.

Any reader, however, needs to be convinced that my experience was sufficiently sophisticated and complex so that he or she may judge the validity, reliability, and generalisability of the research. In Section 10.7, I discuss the validity and reliability of my research. I follow that section with a discussion about the generalisability of the results, in Section 10.8.

In the closing remarks, in Section 10.9, I return to the original questions that motivated my study of analyst/designers' ways of experiencing analysis/design. While I do not have all of the answers that stem from these questions, I can give a better answer than the answer I gave before this study.

10.1 Gestalts of Analysis/Design

This phenomenographic study has revealed the variation in analyst/designers' conceptions of analysis/design, their approaches to analysis/design, and the relationships between their conceptions of, and approaches to, analysis/design. The ultimate outcome is a description of five Gestalts of analysis/design: the cowboy, the cataloguer, the methodist, the magician, and the master.

Paraphrasing the quote from Couger (1996, see Ch. 1) provides a sense of the significance of the Gestalts. The Gestalts of analysis/design act as filters. When an analyst/designer is in a moment when she experiences analysis/design as a particular Gestalt, any data that exist that do not fit that Gestalt are outside her awareness. At any moment, what may be perfectly visible, perfectly obvious, to an analyst/designer experiencing one Gestalt, may be quite literally beyond the consciousness of an analyst/designer experiencing a different Gestalt.

The five Gestalts, in a way similar to categories of description, are descriptions at the collective level, not at the level of the individual. In the following, mention of an analyst/designer is in the sense that she is hypothetical, in the same way that I developed the development life cycles (DLCs), in the previous chapter, by imagining a hypothetical individual.

10.1.1 The Cowboy

When an analyst/designer experiences analysis/design as the cowboy Gestalt, she approaches analysis/design with the conception that she must do something other than programming. When Conception Category 1 (Other-than-programming) is the extent of her conception of analysis/design, her focus is on getting to a solution, writing code, and delivering something to the customer (see Figure 9.5). The rules of development methods or documenting (i.e., "the law" (Punter 2007, p. 9)) are not relevant to an analyst/designer working in the cowboy Gestalt. She derides the rules, regarding them as "crap" (I18). The cowboy metaphor captures the lack of sophistication of this Gestalt. An analyst/designer who is not aware of the mental activity required of analysis/design undertakes her analysis/design task with an ad hoc approach. She does a minimal amount of analysis/design, focused as she is on getting the solution to the customer as quickly as possible. She recognises the terms analysis and design and understands that analysis/design is something separate from programming. She does not work in a more sophisticated way as she is not aware of anything more. An analyst/designer working in the cowboy Gestalt focuses on the task, at the level of the task.

The strength of the cowboy Gestalt is the consequence of Approach Category 1. Solving as quickly as possible the problem lends an appearance of being fast and efficient to the analyst/designer, which are desirable traits when subject to time pressure. The weakness is in the quality of the analysis/design. When experiencing the cowboy Gestalt, there is not an awareness of the Gestalts of the cataloguer, the methodist, the magician, and the master.

The cowboy Gestalt may produce a system from the products of the tasks. The products from completed tasks may be incorporated into an existing system. However, can such products, created only with a view at the level of the task, result in success? perhaps, if the system is small. I imagine that any system would be of low quality when the cowboy dominates the analyst/designer's Gestalt. When the cowboy Gestalt determines the quality of the analysis/design, I think the project is likely to cause customer discontent, that is, be a failure (see Table 2.1). In addition, with no or little record of the analysis/design that took place, the analyst/designer may have difficulty even minimally applying what she learnt from the project. For the analyst/designer acting through the filter of the cowboy Gestalt, I would expect ignorance to be a likely cause of failure (see left hand column of Table 2.2) for the product and the project.

10.1.2 The Cataloguer

When an analyst/designer experiences analysis/design as the cataloguer Gestalt, she has become aware of what something-other-than-programming can be: where programming produces code, analysing/designing produces documents. A cataloguer Gestalt results in perfunctory analysis/design. There is an appearance of analysis/design taking place because she has produced analysis/design artefacts. However, the cataloguer Gestalt produces artefacts that are a superficial treatment of analysis/design. As shown in the Catalogue–Atomistic DLC (Figure 9.7) the primary products of development are the artefacts rather than the system. The lack of awareness of the complex mental activity required for more than the superficial treatment of the analysis/design means the analyst/designer does not understand the purpose of producing artefacts beyond showing that analysis/design took place.

The strength of the cataloguer Gestalt is the demonstrability that analysis/design took place. Having tangible products of analysis/design imparts the appearance of productivity. The weakness is the low quality of the content of the artefacts produced. While experiencing the cataloguer Gestalt is being aware of more than the cowboy Gestalt, there is not an awareness of the Gestalts of the methodist, the magician, and the master.

Where the cataloguer Gestalt dominates the analysis/design of a project, a system may be produced. When the cataloguer Gestalt determines the quality of the analysis/design, I think the project is likely to cause customer discontent, that is, be a failure (see Table 2.1). However, from the analyst/designer's perspective, the project may be as much as a high success (see Table 2.1). The analyst/designer may be able to apply what she can learn from the artefacts produced to future projects and reuse several of these artefacts in the future. For the analyst/designer acting through the filter of the cataloguer Gestalt, I would expect ignorance to be a likely cause of failure (see left hand column of Table 2.2).

10.1.3 The Methodist

When an analyst/designer experiences analysis/design as the methodist Gestalt, she copes with analysis/design by adhering to a method, thus controlling the process. The methodist Gestalt restricts system development within the bounds of a method. The process is orderly. Unlike the cataloguer Gestalt, where sequentially completing separate tasks keeps analysis/design orderly, the orderliness of the process for the methodist Gestalt is derived by imposing the method onto what analysis/design is done, how it is done, and when. Confining analysis/design within a method simplifies what analysis/design is for the analyst/designer. The analyst/designer does not decide what she can do because the decision is made for her: she must follow the method. The requirements are also controlled and fixed by the adherence to the method; another means of simplifying analysis/design. The analyst/designer does not want to be the cowboy; she wants to work within the protection of the law. Nor are the artefacts the primary products of analysis/design, as they are for the cataloguer. Adhering to the method produces the best solution for the analyst/designer experiencing the methodist Gestalt.

The strength of the methodist Gestalt is the predictability of the process. Following the rules of the method moves the project away from uncertainties. The weakness is the rigidity of the process. Following the method overrides consideration of the stakeholders needs. The methodist is aware of the cowboy and cataloguer, but those Gestalts are seen as being inadequate, while the magician and master are not part of the methodist's awareness.

An analyst/designer who has a methodist Gestalt believes that when she follows the method, the system development project will succeed and the product will be the best solution. However, the system development project is a success in terms of the new system meeting the fixed initial requirements. The new system is not likely to meet the need of the client's requirements, if those requirements evolve during the system development process, as requirements often do. Therefore, the system development project is likely to be a failure (see Table 2.1). However, the analyst/designer may apply what she learnt to future projects thus becoming more skilled at adhering to the method. From the analyst/designer's perspective, the project may be as much as a high success (see Table 2.1). For the analyst/designer acting through the filter of the methodist Gestalt, I would expect ignorance to be a likely cause of failure (see left hand column of Table 2.2).

10.1.4 The Magician

When an analyst/designer experiences analysis/design as the magician Gestalt, she believes in her own ingenuity to get her from the beginning to the end of the project. The analyst/designer is aware of her mental activity as a special quality she possesses, which allows her to do analysis/design. When an analyst/designer works with a magician Gestalt, she is aware of choosing to do things in certain ways because she has skill and imagination, she regards what she does as clever, ingenious, and inventive. Her ingenuity is her justification for adjusting the process during the project. Rather than believing that the method controls the process, as does the methodist, an analyst/designer with the magician Gestalt believes she controls the process. Her process is not ad hoc; she regards the ad hoc process as unskilled analysis/design. She has a catalogue of methods, method fragments, tools, and techniques that she will use in any order she invents to support her analysis/design process. She is aware of methods as being useful to manage a project, but does not impose a method to develop the system.

The strength of the magician Gestalt is the flexibility of the process. Being flexible affords an appearance of exceptional skill to the analyst/designer. The weakness is the magician Gestalt does not include revealing to other stakeholders how an understanding is resolved or how she makes decisions as to what to do. The analyst/designer acting from the magician Gestalt resolves misunderstandings by relying on her own ingenuity and keeping her means to do so concealed from the other stakeholders. For the magician, the cowboy and cataloguer are inadequate, she dissents from being a methodist, and the master is not part of her awareness.

The magician Gestalt is successful at producing systems that satisfy and are sufficient for the user and client. However, there is a risk the user or client will reject the system, as the client is not integrated into the system development process and thus the project is likely to be a failure (see Table 2.1). The new system may meet the evolving client requirements. Therefore, the system development project is likely to be a low to exceptional success depending on performance on cost, effort, and schedule expectations (see Table 2.1). The analyst/designer does apply what she learns to future projects, thus increasing the skill associated with the magician Gestalt. From the analyst/designer’s perspective, projects are successful. For the analyst/designer acting through the filter of the magician Gestalt, I expect it is possible for ignorance to be a likely cause of failure, though lapses, or carelessness, are more likely causes (see left hand column of Table 2.2).

10.1.5 The Master

When an analyst/designer experiences analysis/design as the master Gestalt, she has an excellent understanding of and skill in analysis/design. She has accepted and embraced the intense mental activity that is required to come to understand what she is doing, who she is doing it for, and when, how, and why it needs to be done. She can mentally shift as she works from a coarse grain view to fine grain detail, from the organisation, to the system, to the task, and back again. She keeps the other stakeholders inside the process, keeping them involved in reaching satisficing agreements. She can learn from and teach others as she works to deliver a system that will satisfice. She teaches others by sharing what she learns from exploring the organisation and problem and the vision of the solution. She comes to know what to sacrifice from the requirements and during the development process to create a satisficing path for the project. She will explore the organisation and create change in the organisation. She will recognise her situation for what it is and work to satisfice in that situation. She will use other approaches when she does not have the supporting factors to do otherwise. She will have in mind her conception, but adjust her approach to that imposed upon her. She is the master analyst/designer.

The strength, and weakness, of the master Gestalt is the teachability of the analyst/designer. As a strength, teachability is the analyst/designer's acceptance that the process is about change and that her response to change improves the product and process. As a weakness, teachability lends an appearance of obtuseness and naivety to the analyst/designer. The constant interaction and asking questions may not appear as if the analyst/designer is productive.

The master Gestalt is successful at producing systems that satisfy and are sufficient for the user and client. The new system will meet expectations, that is, the evolving specified level at which all the needs of the people involved would be met. Therefore, the system development project is likely to be an exceptional success as it will meet all quality, cost, effort, and schedule expectations (see Table 2.1). The analyst/designer does apply what she learns to future projects thus increasing the skill associated with the master Gestalt. From the analyst/designer's perspective, projects are successful. For the analyst/designer acting through the filter of the master Gestalt, I expect it is possible for lapses, or carelessness to be causes of failure (see left hand column of Table 2.2).

10.2 Profiling Analyst/Designers

In Section 3.3.8, I aligned the outcome spaces from five phenomenographic studies (Boustedt 2010; Cope 2000; Davey & Cope 2009; Isomäki 2007; Rose et al. 2005) of people's relationships with IS and ISD phenomena (see Figure 3.7). The alignment of the outcome spaces allowed me to extrapolate profiles of stereotypical analyst/designers based on the variation described in the categories from each study.

Figure 10.1 shows the alignment of the outcomes spaces from the conceptions of, and approaches to, analysis/design categories of description from my study with the outcome spaces from these five studies. I aligned the outcome spaces on two assumptions: (1) the analyst/designers interviewed for this study are part of a larger group of people who are involved in ISD, and (2) the experiences described in the studies overlap in a similar way to that depicted in Figure 3.6. The four bands from white to the darkest tan indicate the view or level of the categories in the outcome spaces as educational, lower professional, middle professional, and higher professional.

Figure 10.1: The logical relationships between the conception and approach categories from this study and the categories from phenomenographic studies of ISD and IS phenomena. (Overleaf)

The Logical Relationships between the Conception and Approach Categories and the Categories from Phenomenographic Studies of ISD and IS Phenomena

	Professionals				Students		
	Conceptions of Analysis/Design	Approaches to Analysis/Design	Humans as Users of IS (Isomäki 2007)	Requirements Elicitation Interviews (Davey & Cope 2009)	Software Development (Boustedt 2010)	IS Design (Rose, Heron &Sofat 2005)	Information Systems (Cope 2000)
Educational view					1 Solve a problem by building a computer program that solves a problem, meets a need, or realizes an idea	1 IS design as a course 2 IS design as building an IS	1 A personal search of a static informatio n source 2 A simple information retrieval system
Lower professional view	1 Differentiate analysis/design as something other than programming	1 Ad hoc process that as quickly as possible delivers something to the client and solves the problem	1 Separate: Users are ignorant of technology; focus is on technology, job titles, and market mechanisms	1 Domination: Conflict, needed for client sign off	2 Design a program by finding out which functions and parts to include in a program to meet the need	4 IS design as models for planning an IS (product dimension)	3 A data manipulation system supporting an individual within a single organisational function
Middle professional view	2 Catalogue separate analysis/design tasks into a sequential and orderly activity 3 Idealise analysis/design as how to deliver what the client wants 4 Contrast actual and ideal analysis—what and design—how	2 An atomistic process that produces artefacts to show that some analysis and design took place 3 A circumscribed process that produces the best artefacts and solution	2 Functional: Users just use the system to do their work tasks	2 Manipulation: A one way presentation to and a manipulation of the client, who should feel happy and considered when signing off 3 Problem Resolution: An exchange of information 4 Bargaining: A two-sided bargaining around a contract	3 Design for future ensuring software handles future changes, be reused and the design is documented so it can be understood	3 IS design as a method of planning an IS (process dimension)	4 A computerised data manipulation system supporting many people within a single organisational function 5 A computerised data manipulation system *and* all the people and the data-related procedures they perform to support a single organisational function
Higher professional view	5 Integrate exploring the organisation and problem with creating an abstract solution	4 An adjustable process that shares an understanding of the problem and a vision of the solution to satisfice stakeholders	3 Holistic: Taking another's perspectives into account in a reciprocal relationship	5 Partnership: Aimed at creating a greater whole and maintaining an ongoing relationship	4 Understanding need and whole by designing software on time, within budget, and which methods to use	5 IS design as providing IS skills for the student to become a professional 6 IS design as meeting future clients' goals (functional requirements, non-functional requirements, or both)	6 A number of communicating information systems within the one organisation which includes all people, computer hardware, data and information related processes

The white band in Figure 10.1 is the educational view as interpreted by those researchers who studied students (Boustedt 2010; Cope 2000; Rose et al. 2005). This educational view, which includes Boustedt's Category 1, Rose et al.'s Categories 1 and 2, and Cope's Categories 1 and 2, is not aligned with any of the categories from my study.

10.2.1 The Lower Professional View

The lower professional view is the lightest tan band in Figure 10.1. My regard for the lower professional view is that it is the least desirable profile for an analyst/designer. Some of my interviewees expressed a similar sentiment. Analyst/designers with the lower professional view have a minimal conception of analysis/design, do the minimum amount of analysis/design, keep humans as users separate from their work, emphasise technology and technical issues, appear not to conduct requirements elicitation interviews, and favour construction over analysis/design.

Communication with the business/client lies in the remote zone of the thematic field of Approach Category 1 (Ad hoc), meaning it is of little concern to the analyst/designer. I aligned this category with Isomäki's Category 1 (Separate), where the users are seen to be unable to articulate their requirements. An analyst/designer with the lower professional view does not need to be concerned with communication with the client when there is little gained from doing so. This lower professional view does have a focus on technology, which aligns Isomäki's (2007) Category 1 (Separate) with the focus on technical issues in Approach Category 1 (Ad hoc). The addition of my categories of description to Figure 10.1 has changed the alignment of Davey and Cope's (2009) categories describing experiences of requirements elicitation interviews. Approach Category 1 (Ad hoc) does not appear to include requirements elicitation interviews. The emphasis on programming in Boustedt's (2010) Category 2, aligns with the way programming tends to push the focus away from something–other–than–programming, that is, away from the analysis/design (and onto programming) in Approach Category 1 (Ad hoc).

10.2.2 The Middle Professional View

The middle professional view is the middle tan band in Figure 10.1. I regard the middle professional view as mediocre. Some of my interviewees also recognised the mediocrity of the middle professional view. Analyst/designers with a middle professional profile conceive of humans just as users of the system that is, Isomäki's Category 2 (Functional). Analyst/designers with a middle professional profile have qualities that span the gap between the lower and upper professional views. Toward the lower professional view, the middling analyst/designers have an outline of what analysis/design entails, produce artefacts, and appear to participate in requirements presentations. In the middle of the middle professional view, analyst/designers have an idealised conception of analysis/design, a focus on the method, and appear to dominate and manipulate stakeholders during requirements elicitation interviews. Closer to the upper professional view, middling analyst/designers have a pragmatic and adjustable analysis/design process, and appear to exchange information or bargain with stakeholders during requirements elicitation interviews.

Toward the lower professional view, the middling analyst/designers view includes Conception Category 2 (Catalogue) and Approach Category 2 (Atomistic). They do not appear to conduct requirements elicitation interviews. Rather they participate in requirements presentations, which is part of Davey and Cope's Category 2 (Manipulation). The client presents the requirements to the analyst/designer. The analyst/designer presents artefacts to the client. Toward the lower professional view the middling analyst/designers view of modelling or documenting aligns with Boustedt's Category 3 and Rose et al.'s Category 4 with Approach Category 2.

The middle of the middling analyst/designer's profile includes Conception Category 3 (Idealise) and Approach Category 3 (Circumscribed). The analyst/designer may either dominate, Davey and Cope's Category 1, or manipulate, Davey and Cope's Category 2, the stakeholder during the requirements elicitation interviews to achieve client sign off. In this part of the middling analyst/designer's view, there is structure to the process, which is present in Boustedt's Category 3, and in Rose et al.'s Category 3 as phases. Also in Rose et al.'s Category 3 is a focus on method and process that, as with the structure to the process, aligns with Approach Category 3.

Closer to the upper professional view, the middling analyst/designer includes Conception Category 4 (Contrast) and Approach Category 4 (Adjustable). During requirements elicitation interviews, the analyst/designer may exchange information or bargain around a contract, Davey and Cope's Categories 3 and 4. Part of Approach Category 4 is to satisfice stakeholders. The focus on meeting future goals or requirements in Boustedt's Category 3 and Rose et al.'s Category 6 could be part of satisficing stakeholders. Boustedt's Category 4 aligns somewhat with the adjustable process from Approach Category 4. Toward the upper professional view the middling analyst/designer tries to understand clients' needs and the whole system, but will use ingenuity to resolve misunderstandings, possibly bargaining with the client to settle those misunderstandings.

10.2.3 The Higher Professional View

The higher professional view is the darkest tan band in Figure 10.1. I regard the higher professional view as the most desirable. Some of my interviewees described developing their analysis/design skills in this direction, which indicates they also consider this view more desirable. Analyst/designers with a higher professional profile explore the organisation and problem, create an abstract solution, share their understanding of the organisation and problem and vision of the solution, have a holistic view of humans as IS users, and appear to enter into a partnership with the client during requirements elicitation interviews.

The higher professional view includes Conception Category 5 (Integrate) and Approach Category 4 (Adjustable). The higher professional view incorporates users of IS as coexisting and intertwined in a holistic way with the IS, that is, Isomäki's Category 3 (Holistic). The analyst/designer's empathy with the client aligns with the holistic conception that they must consider another's perspective. Davey and Cope's Category 5 (Partnership) confirms that consideration is shown to the client and that the analyst/designer has a holistic conception of the user. Requirements elicitation interviews are a partnership between the analyst/designer and client. The partnership is a manifestation of the reciprocal relationship in Isomäki's Category 3 (Holistic) and mutual respect in Davey and Cope's Category 5 (Partnership). The higher professional view's focus on the whole seeks to elicit the real needs of the business during requirements elicitation interviews. Also, according to Boustedt's Category 4, achieving that greater whole requires being on time, within budget, and having the right process, which aligns with Approach Category 4. A higher professional view may also focus on the professional development of the analyst/designer, which Rose et al.'s Category 5 suggests.

Aligning Cope's conceptions of an IS to the three professional levels in Figure 10.1 is complicated. Conceptions of an IS are absent from the data and my categories of description. As shown in Figure 10.1, Cope's Categories 3, 4, 5, and 6 could be part of any of the three professional profiles. However, I suspect, at least for the higher professional view, that Cope's categories may not provide a sufficient description of an IS that aligns with this higher view.

While my alignment of categories shown in Figure 10.1 is reasonable, it is also speculative. While I have access to my complete set of data, I have access only to what the other researchers have published, which are minute portions of their data. Perhaps a better way to create such an alignment would be for the respective researchers of each study to collaborate. Each researcher's knowledge of his or her complete set of data would be the point of departure for such a discourse. The discourse could resolve issues such as, the apparent lack of requirements elicitation interviews for analyst/designers with the lower or lower-middle professional view. The appropriate alignment of outcome spaces from studies of students with outcome spaces from studies of professionals could also be a topic of discussion.

10.3 Gestalts and Stages of Development

During the synthesis of the DLCs (described in Ch. 9), I compared each DLC to the preceding or succeeding DLC. As part of the synthesis process, I looked for a manifestation of the "phase of a process" (Gurwitsch 1964/2010, p. 200). This might suggest I regard each Gestalt as a phase in the development process of an individual toward an increasingly complex experience of analysis/design. For such a development, an analyst/designer would develop her analysis/design Gestalt first as the cowboy, then the cataloguer, then the methodist, then the magician, and, finally, the master. I do not regard this stepwise, cumulative development as how an analyst/designer would develop.

Figure 10.2 is Dall'Alba and Sandberg's (2006) alternative model of professional development. Dall'Alba and Sandberg combined their phenomenographic research (e.g., Dall'Alba 1998; Dall'Alba & Hasselgren 1996; Sandberg 1997, 2000) with their (and others) research on professional development (e.g., Dall'Alba & Sandberg 1996) to propose an alternative to stepwise, cumulative stage models of professional development. Their model of professional development builds on these "contemporary stage models that are typically applied across professions" (Dall'Alba & Sandberg 2006, p. 383). The stage model of professional development is the horizontal dimension of skill progression in Dall'Alba and Sandberg's model. They refer to skill as the skilfulness with which professionals engage in practice (p. 383). The vertical dimension is the embodied understandings of practice, that is, (in my terms) Gestalts of practice. The values of the vertical dimension could be the phenomenographic categories describing the conceptions of, approaches to, or Gestalts of the relationships between conceptions of, and approaches to, a phenomenon.

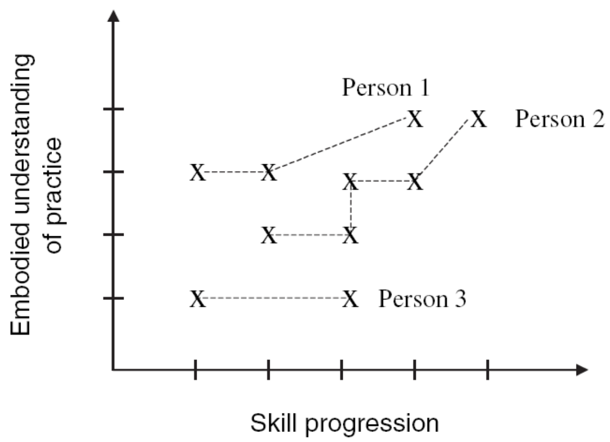


Figure 10.2: Dall'Alba & Sandberg's (2006) alternative professional development model with hypothetical development trajectories. (Reproduced from Dall'Alba & Sandberg 2006, p. 400)

Dall'Alba and Sandberg's (2006) addition of the vertical dimension to stage models is a result of questioning which professional skill is being developed in a "stepwise [and] cumulative manner" (p. 384). Decontextualised professional skill is the formal content of courses taught in professional education. This formal content is "often seen as an objective structure consisting of [fixed or static] institutionalised social rules and norms" (p. 383). A new graduate of professional education enters their profession, having learnt these rules and norms, expecting to be able to use their professional skill in practice. Dall'Alba and Sandberg propose that the new graduate, on entering their profession, does not move stepwise through a single dimension of stages of development. Rather the new graduate might develop her professional skill along two dimensions of embodied understanding of practice and skill progression. The new graduate's development trajectory might then be along one of the hypothetical development trajectories shown in Figure 10.2.

Figure 10.3 represents how I do think analyst/designers might develop their analysis/design Gestalts. I inserted the five Gestalts of analysis/design as the vertical dimension in Dall'Alba and Sandberg's professional development model. I set the horizontal dimension to a skill progression from negligible to comprehensive. The multiple hypothetical development trajectories are illustrative of possible paths by which an analyst/designer might develop her analysis/design Gestalt.

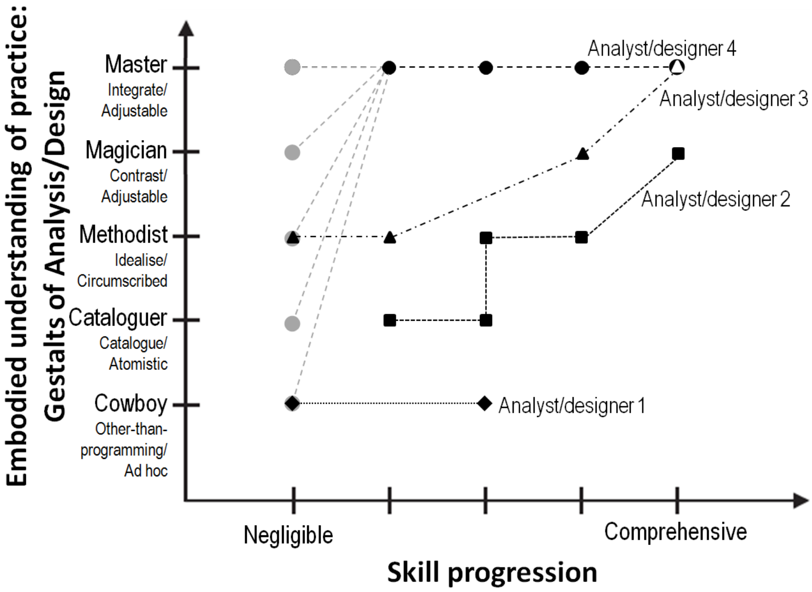


Figure 10.3: Dall'Alba & Sandberg's alternative professional development model with Gestalts of analysis/design as the vertical dimension and hypothetical development trajectories (Based on Dall'Alba & Sandberg 2006)

To explain how the hypothetical development trajectories in Figure 10.3 may come about I need to briefly mention variation theory. Variation theory is the theoretical elaboration derived from phenomenography. Marton, Runesson, and Tsui (2003) propose the key concepts of variation theory to be:

1. *We can only experience simultaneously that which we can discern.*
2. *We can only discern what we experience as varying.*
3. *We can only experience variation if we have experienced different instances previously.*
4. *[We can only experience variation if we] are holding [previously experienced different instances] in our awareness simultaneously (in the diachronic sense).* (p. 20)

If I incorporate variation theory with Dall'Alba and Sandberg's professional development model, then I can explain the hypothetical development trajectories in Figure 10.3.

What I suggest in Figure 10.3 is that a level of skill may apply to any one of the five Gestalts of analysis/design. A negligible level of skill is not always the first experience of analysis/design for an individual. Once an individual has experienced analysis/design for the first time, the subsequent path of professional development will depend on the variation in an analyst/designer's experience. What the analyst/designer is capable of simultaneously discerning as the critical aspects of analysis/design will determine the development trajectory. For instance:

- Analyst/designer 1, in Figure 10.3, begins her experience of analysis/design as the cowboy Gestalt. As her experience continues, her skill increases, yet her Gestalt remains the same. The change in skill level occurs when she becomes aware of variation in critical aspects of skill level. She may, for example, become faster at analysing the request to fulfil the requirement (see Figure 9.5). Becoming faster at analysing the request increases her skill level but does not change her Gestalt.
- Analyst/designer 2, in Figure 10.3, begins her experience of analysis/design as the cataloguer Gestalt slightly above a negligible skill level. She progresses to the next level of skill, experiencing variation in skill level rather than Gestalt, as did Analyst/designer 1. Analyst/designer 2 then comes to experience analysis/design in a different way by experiencing variation in what is and how to do analysis/design. While her skill level remains the same, her Gestalt changes from cataloguer to methodist. Then, once again, her skill level improves, while her Gestalt remains the same. When she develops to the magician Gestalt, she has experienced variation in both skill level and Gestalt.
- Analyst/designer 3, in Figure 10.3, begins with a methodist Gestalt. She maintains her Gestalt, but improves her skill level. Then, she experiences variation in what is and how to do analysis/design. She also experiences variation in skill level. She simultaneously discerns variation in critical aspects of analysis/design and skill level. She experiences more variation and again her Gestalt and skill level change.

- Analyst/designer 4, in Figure 10.3, begins with a master Gestalt slightly above an entry skill level and progressively improves her skill until it is at a comprehensive level.

Each change in analysis/design Gestalt, or development in skill level, changes the internal relation (see s. 6.2). A change in analysis/design Gestalt is a change in the analyst/designer–analysis/design internal relation. A development in skill level is a change in the analyst/designer–analysis/design-skill-level internal relation.

The implications of these development paths, and the multiple grey lines connecting to the development path of Analyst/designer 4, in Figure 10.3, are discussed in the next section.

10.4 Implications for the Profession, Education, and IS Research

My results add to the knowledge from other phenomenographic studies of computing phenomena, such as in the profiling of analyst/designers (s. 10.2). In addition, my results have implications for the profession, education, and IS research.

10.4.1 Implications for the Profession

This thesis helps analyst/designers better understand their work. Becoming aware of different ways of experiencing analysis/design may change the way analyst/designers think about and do analysis/design, thus improving their professional skills.

For example, my study has changed the way I experience analysis/design. The structural and referential character of the internal relation of myself–analysis/design has changed, and thus, my Gestalt of analysis/design has changed. When I wrote *Object-Oriented Software Development Step by Step* (Box & Ferguson 2002), I conceived analysis/design as Conception Category 5 (Integrate) and wrote about an approach that was similar to Approach Category 3 (Circumscribed). If I wrote a new book, I would write about the master Gestalt.

While the results can improve an analyst/designer's own understanding, they can also improve their understanding of other analyst/designers. When analyst/designers discuss the way they work, my results provide a nomenclature and taxonomy to support their discourse.

The identification in earlier studies of characteristics of highly competent analyst/designers has changed the hiring and training of analyst/designers (Hunter & Beck 1996). My results could lead to further changes. Organisations could use my results to design hiring procedures and develop instruments for the assessment and selection of analyst/designers.

If Dall'Alba & Sandberg's (2006) professional development model (see Figure 10.2 & Figure 10.3) is a valid model of the professional development of analyst/designers, then my results also enlighten possible alternatives to models of one dimensional stage development of analysis/design professional skill. My results can also contribute to the development of alternative workplace training. For example, providing training to instil the conception of Conception Category 5 (Intergrate) might be a better focus than trying to inculcate analyst/designers in Approach Category 4 (Adjustable).

10.4.2 Implications for Education

Dall'Alba and Sandberg (2006) questioned whether the decontextualised professional skill that is the most common content of formal courses is appropriate when educating students for entry into a profession. While the teacher may have no control over which analysis/design Gestalt is the first a student experiences, the teacher can decide those conceptions and approaches the student experiences after that first experience. For example, the grey lines in Figure 10.3 are a suggestion that the student may first experience analysis/design as any one of the analysis/design Gestalts. The teacher may then choose to expose the student to the variation in analyst/designers' experiences of analysis/design in such a way to encourage the students to adopt the master Gestalt as early as possible (i.e., join the path of Analyst/designer 4 in Figure 10.3).

The cataloguer and methodist Gestalts reflect the pedagogical emphasis on decontextualised professional skills, rules, and norms. For example, Royce's (1970/1987) waterfall development *concept*, as shown in Figure 10.4, has become a decontextualised rule that students learn. However, Royce's waterfall development *method*, shown in Figure 10.5, involves far more than his concept. Even though he stated that realising his concept as a process "is risky and invites failure" (p. 329), his concept has been widely adopted as a method. The Idealise/Circumscribed DLC of the methodist Gestalt reflects the resilience of this learnt decontextualised rule.

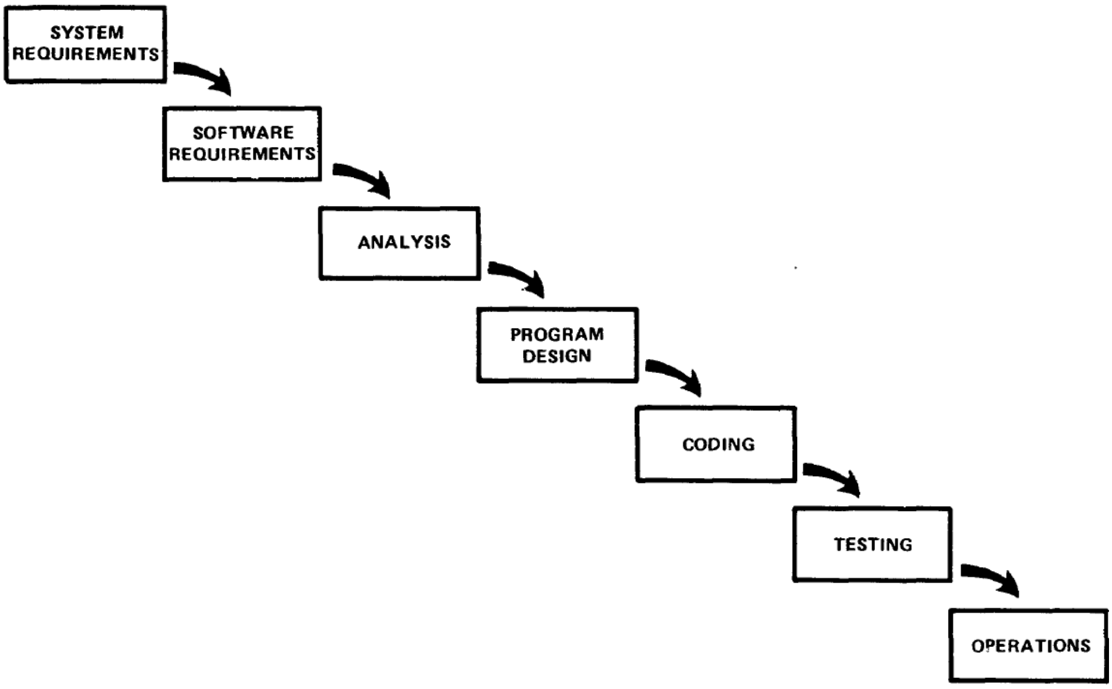


Figure 10.4: Royce's waterfall development *concept* (Reproduced from Royce 1970/1987, p. 329)

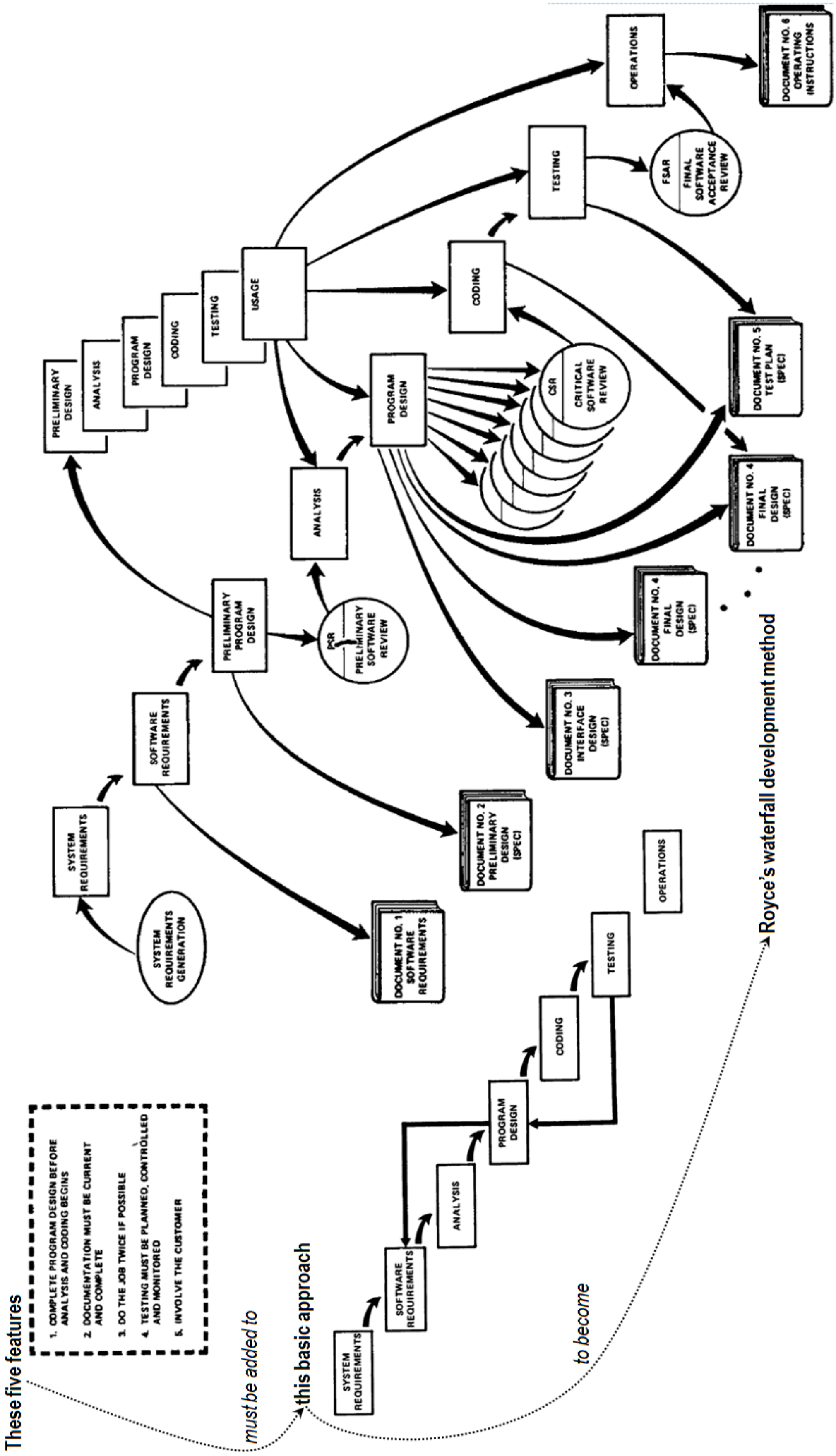


Figure 10.5: Royce's waterfall development method (Adapted from Royce 1970/1987, p. 338)

Another example of the consequences of the pedagogical emphasis on decontextualised rules is manifested in the cataloguer Gestalt. Documenting in Conception Category 2 (Catalogue) and producing artefacts in Approach Category 2 (Atomistic) reflect the resilience of another learnt decontextualised rule, that is, that documentation must be current and complete (e.g., the second feature of Royce's waterfall development method in Figure 10.5).

Teachers of analysis/design may provide an understanding of professional practice by directing the attention of students to the differences between the master Gestalt and other Gestalts. They may also direct students' attention to the difference between the master Gestalt and formal ISD methods. For example, they could direct students' attention to the difference between the Integrate/Adjustable analyst/designer's view of the DLC, shown in Figure 9.13, and the DLCs of software development methods. Ambler (2011) presents several DLCs that are applicable to an agile ISD method. The detail of each DLC depends on its scope, such as an iteration, the project, or the product. These DLCs are aimed at managing the process, rather than the analyst/designer's view of the DLC.

From my experience of teaching analysis/design and selecting a text to do so, there is an emphasis on teaching an approach to analysis/design more than a conception of analysis/design. For example, client/user involvement in ISD is recognised as important to the success of a product and project (e.g., Beck 1999; Boehm 1981; Gane & Sarson 1977; Isomäki 2002; Royce 1970/1987). The presence of empathy–with–the–clients as a salient constituent in the theme of Conception Category 5 (Integrate) is a notable difference between this category and the other conception categories. My synthesis of Conception Category 5 as part of the Integrate/Adjustable DLC leads to the inclusion of the stakeholders in the DLC (see Figure 9.13). This contrasts with my other DLCs and the many DLCs of ISD methods that depict the client/user outside the cycle. The implication is that client involvement is not only about the physical presence of the client. Involving the client is about the analyst/designer's conception of the client and the client's integration into the analysis/design process.

It is challenging to teach the conceptions of analysis/design Gestalts without emphasising a particular approach to analysis/design. I agree with Dall'Alba and Sandberg (2006), that "given the breadth and complexity of professional practice [in this case, analysis/design], no single pedagogical method can be a panacea" (p. 403).

10.4.3 Implications for IS Research

My results improve our understanding of the complex human behaviour of the analyst/designer. The immediate benefit of my results to IS research is the provision of a description of the variation in analyst/designers ways of experiencing analysis/design. My results extend the description of analyst/designers in the literature (see s. 2.3), which, with my nomenclature and taxonomy, may be useful to other IS researchers.

My results contribute to developing a people-centred foundation for research on increasing BISD project success. This study sets an example by which other researchers may conduct studies of other IS professionals. These other studies could investigate, for example:

- What is the variation in IS professionals' conceptions of and approach to other phenomena that comprise their profession, for example, IS, ISD, construction, deployment, testing, ISD methods in general and specific methods, DLCs, stand-up meetings and documentation?
- What are IS professionals' conceptions of project success?
- What are the IS professionals' skill levels that are associated with the conceptions of and approaches to ISD that are related to project success?
- What are the professional development trajectories of IS professionals that are related to project success?

Studies such as Isomäki (2002, 2007), Davey and Cope (2009), and my study are the beginning of constituting answers to these broad questions. More specific questions that I raise as a result of completing my study include:

- What is the relationship between conceptions of, and approaches to, analysis/design (i.e., my results) and, for instance, level of education, years of experience, organisation and project size and type, cognitive load, and project and team management practices?
- Which conceptions of, and approaches to, analysis/design are related to project success?
- What are the skill levels associated with these conceptions of, and approaches to, analysis/design of analyst/designers and how are these skill levels related to project success?

- What are the professional development trajectories of analyst/designers and how are these trajectories related to project success?
- What are the conceptions of and approaches to analysis/design embedded in ISD methods and how do they align with my results?
- What are the differences between analyst/designers' experiences of analysis/design and other stakeholders experiences of analysis/design?

A number of studies have found answers to similar questions for other professional–phenomenon internal relations. In combination with my study, these other studies could provide the base for further IS research. For example, the study by McKenzie (2003), of change in university teachers' experience' in teaching, could guide a similar study of analyst/designer's development trajectories. Another example is the Approaches to Teaching Inventory (ATI), which is based on phenomenographic studies of teachers (Prosser & Trigwell 1999; Trigwell & Prosser 2004; Trigwell, Prosser & Taylor 1994). My results could be used to develop an analogous instrument for analysis/design. Such an instrument would identify the degree to which each analysis/design Gestalt is part of an analyst/designer's experience of analysis/design.

Another interesting direction for future work is ISD team composition. My study was of analyst/designers as individuals. An analyst/designer rarely does analysis/design on her own. Does productive analysis/design (i.e., project success) come from teams where all the analyst/designers have master Gestalts? Some argue that the most effective ISD teams are comprised of professionals with various personality, temperament, cognitive styles, and expertise (e.g., Faraj & Sproull 2000; Gorla & Lam 2004; White 1984). To illustrate, Cockburn (2003) reports of a programming team composed of four expert programmers who stalled the project's progress. By replacing three of the expert programmers with three "less excellent ones" (p. 80) the project was then completed. What would be the most effective combination of analysis/design Gestalts for an ISD team?

Another interesting research direction is the relationships between analyst/designers and other stakeholders. Studies such as Isomäki's (2002, 2007), of humans as users of IS, and Stewart and Klaus (2000), of the relationship between senior business managers and IT managers, are examples of such studies. Researchers could use my Gestalts of analysis/design to characterise analyst/designers in future studies.

10.5 Contributions to Phenomenographic Research

This thesis also contributes to our understanding of phenomenography and phenomenographic research methods. Over the course of this study, my experience of phenomenography changed. For instance, I now see that every method is embedded in a philosophy, even ISD methods. For example, Royce's (1970/1987) waterfall development concept embodies an objectivist and positivistic philosophy, which is reflected in the methodist Gestalt.

While I was conducting the initial data analysis and constituting the initial results, I realised that my conception of phenomenography and my approach to doing a phenomenographic study were in conflict. I resolved this conflict by going beyond the orthodoxy of phenomenography: I elaborated my non-dualistic–experientialist–interpretivist/descriptivist research position as:

- an ontology of being-in-the-world
- an epistemology based on intentionality
- a connection between this ontology and epistemology based on the internal relation
- GIFTed data analysis, which incorporates Gestalt theory, intentionality, and Gurwitsch's field theory of consciousness.

The three major contributions to phenomenography from my study are:

1. *GIFTed data analysis* (Ch. 6): This is a significant advance in the evolution of phenomenography. It provides a data analysis and interpretation technique based on *G*estalt theory, *i*ntentionality, and Gurwitsch's *f*ield *t*heory of consciousness.

   Rather than accepting intentionality as a special case of Brentano's intentionality (Marton & Booth 1997, p. 84), I varied the type of intentionality I used for data analysis and interpretation. I used: intentionality as a theory of mind for the data analysis and interpretation of conceptions of analysis/design; intention as a theory of action for the data analysis and interpretation of approaches to analysis/design, and; the folk concept of intentionality to relate conceptions of and approaches to analysis/design.

2. *A generic conception-of analytical framework* (s. 6.3.1). From my use of intentionality as a theory of mind, I developed a generic conception-of analytical

framework comprising what and how elements (Figure 6.5). The what element is the content of consciousness. The how element is how the content of consciousness is brought to mind.

3. *A generic approach-to analytical framework* (s. 6.3.2). From my use of intention as a theory of action, I developed a generic approach-to analytical framework comprising, on the first level, intended action and purpose elements and, on the second level, below purpose, outcome and consequence elements (Figure 6.6).

The generic nature of my two analytical frameworks aids the application of the frameworks. The conception-of-analysis/design and approach-to-analysis/design analytical frameworks are examples of how the generic frameworks may be applied. The generic analytical frameworks may be used to guide the initial coding of salient constituents during the first stage of my phenomenographic constant comparison method. As data analysis and interpretation continues the analytical framework could be modified to suit the data, such as the way the approach-to analytical framework was modified for my study (Ch. 7). Of course, the generic conception-of and approach-to analytical frameworks should only be used in the early stages of data analysis as a guide and not to set what must be found in the data.

Other contributions that may improve the research process and results when incorporated into a phenomenographic research method, in the order of appearance in the preceding chapters, are:

1. *Reporting my awareness of analysis/design by describing the potential overlap with other phenomenographic results* (s. 3.3.7). While I did define analysis/design in Section 1.1, my use of other, related, phenomenographic results is a means of reporting my awareness of analysis/design in a different way. As more is learnt about IS and ISD, via phenomenographic studies, researchers may choose to report their awareness of the phenomena they are studying in a similar fashion.

2. *Profiling analyst/designers before* (s. 3.3.8) *and after (s.* 10.2) *reporting my results*. Presenting profiles of analyst/designers as stereotypical lower, middle, and upper professional views based on other studies before presenting my results presented profiles of what was known. Revisiting those profiles with my results

included shows a change in these stereotypes as a result of my study. Profiling is a way of making use of several related phenomenographic studies.

3. *An example of the separation of the research method from the research process* (Ch. 4, 5, & 6). My separation of the research method from the research process helps codify (Merton 1968) phenomenographic research methods (see s. 4.5).
4. *An example of the separation of phenomenography from educational research content* (Ch. 4, 5, & 6). Dunkin (2000) argue that in order to understand phenomenography, it is necessary to separate it from its educational research content. As an example of such a separation, my study contributes to our understanding of phenomenography outside the educational research setting.
5. *Saturation of knowledge* (s. 4.1). Saturation of knowledge (Bertaux 1981, p. 37) is the term I chose to use to describe the point at which I ceased data collection. I propose that saturation of knowledge is an alternative, and perhaps a better term, than theoretical saturation (Glaser & Strauss 1967, p. 61) to describe the point at which data collection may cease.
6. *My phenomenographic constant comparison method* (s. 4.5.1). Based on Glaser and Strauss's (1967) constant comparative method for grounded theory, my phenomenographic constant comparison method describes a data analysis and interpretation research technique specific to phenomenographic studies. Basing the data analysis and interpretation for a phenomenographic study on Glaser and Strauss's constant comparative method is not unique. What is new is the explicit customisation of Glaser and Strauss's method for a phenomenographic study without embedding the data analysis technique within the process.
7. *A graph of anecdotal comparison* (s. 5.1). From my reading of the literature, it was unclear how to justify the decision to cease data collection for a phenomenographic study. I suggest creating a graph of the interviewees' experiences of the phenomenon based on anecdotal comparison (e.g., Figure 5.1). Developing an ad hoc graph during data collection provides a demonstrable path of maximum variation sampling and a justification to cease data collection.
8. *Analysis of interview questions* (s. 5.2). There is little analysis of the quality of the interviews used for phenomenographic research. I presented some quantitative measures, the ratios of question types, the proportion of the number

of words uttered by the interviewer and interviewee, and the number of questions asked per minute in an interview. These measures may be useful for comparison with other phenomenographic studies.

9. *An evaluation of several analytical frameworks* (s. 5.5.1). My evaluation contributes to the separation of phenomenography from its educational research content. My evaluation also provides an interpretation of several analytical frameworks and, consequently, suggests the appropriate analysis, interpretation, and theoretical support required before adopting an analytical framework.
10. *An example of the theoretical underpinnings of a phenomenographic study* (Ch. 6). My illumination of the theoretical underpinnings supporting this study contributes to clarifying the philosophical foundations on which phenomenography rests.
11. *An application of the stream of consciousness metaphor* (s. 6.4.1). I used James' (1892/1972) stream metaphor to understand the transition from an individual's stream of consciousness to the researcher's analysis of the uninterruptable stream. As the researcher, I transect the stream and look at the cross-section as a field. The field metaphor connects to Gurwitsch's field theory of consciousness as used in GIFTed data analysis.
12. *Some clarification of phenomenographic terminology*. In several places in my thesis, I have clarified explicitly the meaning of phenomenographic terms in the context of my study. An example is the differentiation of aspect and constituent (s. 6.6.2). This clarification may assist researchers who are new to phenomenography.

10.6 Limitations of the Results

The results presented in this thesis are "not one final and unambiguous truth" (Sandberg 2005 p.52) that sets out all possible categories of description and their relationships for the variation in analyst/designers ways of experiencing analysis/design. Rather the results contribute to the "ongoing and open process of knowledge claims" (Sandberg 2005 p.52) that may be made about ways of experiencing analysis/design. Furthermore, as Stolterman (1991) concluded, analyst/designers' "own picture of their role and skill is very complex and not consistent and complete" (p. 147).

I acknowledge that whether I have captured a sufficient description and whether I have made the necessary differentiations between categories is a subject for further research. Other parts of the results would also benefit from further investigation, such as the rationality of the relationships between conception and approach categories, the factors influencing which approach is taken for a given conception, and the DLCs.

My interpretations were possible because the intentionality of our conscious acts is revealed in the manner in which we express ourselves (Dennett & Haugeland 1987). My representation of the how element from the conception-of analytical framework (Figure 7.2) in the conception categories is, I believe, based on my interpretation of the data. I acknowledge that the how in each conception category might instead be an inference that I have imposed. In the future, I would make a point of probing my interviewees on how the content of consciousness is brought to mind by getting them to describe their way of thinking.

An observation made of some phenomenographic results is that the results are a reflection of the historical development of the phenomenon (Ashworth & Lucas 1998; Bruce 2003; Marton 1981a); the lowest category being the earliest phase of people's experiences of the phenomenon; the highest category being the most recent phase. In part, some Gestalts of analysis/design presented here do mirror stages in the evolution of analysis/design. Analysis/design was once not differentiated from programming (Yourdon & Constantine 1975). Once differentiated from programming, analysis/design, the system development methods, as described in Section 1.1, evolved after a stage of turmoil. Some similarities between the categories and the evolution of analysis/design do exist. For instance: the cowboy Gestalt is similar to the early days of analysis/design during that stage of turmoil; the methodist Gestalt is similar to structured analysis/design. However, the results are not a perfect reflection of the historical development of analysis/design. For instance, the master Gestalt is not the same as an agile ISD method.

As Hirsch (1967) stated (see s. 4.7), it may be impossible to be certain, but it is certainly possible to understand. In this study "correct understanding has probably been achieved" (p. 17).

10.7 Validity and Reliability

I presented my research process in a way that maintained the tenets of phenomenography: investigating variation, taking a second order perspective, looking at the collective level, and constituting a limited number of categories. I maintained the connection with the existing theoretical underpinnings of phenomenography.

In the Section 10.2.3, I claimed that an analyst/designer who's Gestalt includes the master Gestalt is more desirable as an analyst/designer than one who has another Gestalt. For such a claim to be credible, it is requisite that the reader sees the results of this study as valid and reliable. In Chapter 4, I presented three criteria that are based on Sandberg's criteria (2005) by which the reader and I can judge the validity and reliability of this study:

- the *confidence* the reader and I have in my approach to the study and the results that I report
- the *congruence* between the research method, the research process, the results, and theoretical basis of the work
- the *interpretive awareness* that I brought to bear on the study

These three criteria are discussed in the following three subsections.

10.7.1 Confidence

My confidence in this study was instilled over several years. If this thesis is a fair testament of what I have achieved, then it should inspire confidence in the reader as well.

The reader from an IS background may recognise the results as something they have experienced. The results have formalised what the reader may have intuited. The reader may have analysis/design experiences that are outside those reported here. The results are not expected to be a complete description of the ways that analyst/designers experience analysis/design. The reader need not lose confidence for this reason. The results, as I had constituted them, are a complete representation of the *variation* in ways of experiencing analysis/design *within* the dataset of this study. Within this same dataset, another researcher may constitute a different set of categories, especially if they work with a different analytical framework. Beyond the dataset of this study, it is possible there are other categories. Neither of these points should lessen the reader's confidence in this study; rather these points reinforce the epistemology of phenomenography: we come to know phenomena by experiencing variation of the phenomena.

The reader from a phenomenographic background may understand my research method and process as a credible phenomenographic study. The report of the means of achieving the results is aimed at inspiring the reader's confidence in the results. However, each reader must judge if my report is adequate.

The reader, from the beginning of this thesis to the end may witness evidence of my acquisition of a breadth and depth of knowledge. The reader may see that there is reflection, understanding, evaluation, and connections throughout my work (Weber 2003).

10.7.2 Congruence

I have worked at making the research method, the research process, the results, and theoretical basis of the work congruent. Just as an analyst/designer with a master Gestalt adjusts the development process, I adjusted my research process to achieve that congruence. An example of how I worked at making the research process and theoretical underpinnings congruent is my reconciliation of the differences between the initial analytical frameworks. The initial approaches analytical framework (Figure 5.8) has scant detail. The initial conception analytical framework (Figure 5.10) has too much detail. The final two analytical frameworks (Figure 7.2 & Figure 8.2) are of equal detail, workability, and have strong connections to the theoretical underpinnings. Furthermore, the analytical frameworks are congruent with the GIFTed data analysis process. This example can be extended to how I worked at making the results congruent with the process. In the category descriptions, the elements in the two analytical frameworks are traceable. The way I worked with the analytical frameworks appears as these traceable elements in the category descriptions.

Another example of the congruence of my study, which is evident in this thesis, is the change from initially relying on other phenomenographic literature to determine parts of the research process, and separating phenomenography from its educational research ancestry references, to my development and use of GIFTed data analysis, along with the conception-of and approach-to analytical frameworks.

There is also congruence between the sample and the results. The background characteristics of the interviewees are truthfully represented (Marton & Booth 1997). The sample is a reasonable representation of analyst/designers.

10.7.3 Interpretive Awareness

I developed and described an interpretive awareness of what I was trying to achieve and how I was achieving it (Sandberg 1997, 2005) and thus established the validity and reliability of the research as I worked (Åkerlind 2003; McKenzie 2003). I learnt and acquired a breadth and depth of knowledge; I reflected on, understood, evaluated, and saw the interrelationships among the deep assumptions that underlie my work. I was aware of what I was doing, while I was doing it, by being interpretively aware (Sandberg 1997, 2005) or reflexive (Weber 2003). The quality of my interpretive awareness/reflection is shown in the breadth and depth of the knowledge recorded in this thesis.

This report reflects the discipline with which I conducted my research. The explicitness of the report allows the reader to judge on what grounds and in what sense the results are satisfactory.

10.8 Generalisability

When it comes to the generalisability of my results it is beneficial to consider Lee and Baskerville's (2003) essay on the generalisability of all IS research. Statistical, sampling-based generalisability is not a valid concept to apply to this study. To echo Lee and Baskerville, there is only one scientifically acceptable way to establish the generalisability of my study's results to other analyst/designers and that is for the results to survive an empirical test involving those analyst/designers (p. 241). An empirical test might be presenting the results to analyst/designers and asking for their degree of agreement with the results.

Phenomenographers need to be cautious about generalising their results. The categories of description are not generalisable beyond the sample that the phenomenographer has actually interviewed (Lee & Baskerville 2003).

While I cannot establish the generalisability of my study to the population of analyst/designers, it is worth considering whether this study is of interest to other cultures. Western culture dominates my sample. However, a Western culture dominates within computing: the language of computing tends to be English, non-English speakers use English computing phrases, and universities in non-English-speaking countries use analysis/design texts written in English. In cross-cultural studies of analyst/designers, what analyst/designers do has been found to be similar (Cusumano, MacCormack, Kemerer & Crandall 2003; Hunter & Beck 1996). What analyst/designers do is filtered by what they think; therefore, the descriptions of the variations in the conceptions of and approaches to analysis/design from this study may be of interest to non-Western cultures.

10.9 Closing Remarks

I finish where I began. If students, or people in industry, were to asked me now, why what is taught as analysis/design is not used in industry to help projects succeed, or why analyst/designers beginning their career do not know how to help projects succeed, my answer would be:

> We do not know enough about the human factors of ISD to say it is what analyst/designers know or do as IS professionals that causes project failures. What I do know of analyst/designers' is that their ways of thinking about and doing analysis/design are as different as they are. Students may be missing parts of analysis/design professional practice when they begin their careers. Industry may not realise that parts of analysis/design professional practice need to be encouraged in early career analyst/designers.
>
> As an analyst/designer, it is important to become aware of your own and other analyst/designers conceptions of analysis/design. Understanding how an analyst/designer thinks about analysis/design can go a long way to understanding what an analyst/designer does. Are you an analyst/designer that thinks analysis/design is about doing your own thing or are you an analyst/designer that likes to stick to the rules? Are you an analyst/designer that thinks the rules apply to all situations or are you an analyst/designer that thinks the situation determines what you do?
>
> I think analyst/designers who have mastered analysis/design work hard at understanding the organisation, the system, each task they perform and the reasons behind performing the task. Those analyst/designers asks questions

to the point where they may appear as if they do not know what they are doing. Those analyst/designers are trying to get into the mind of the client and to share what they see as the solution. Those analyst/designers embrace the constant change that is ISD, adapting and adjusting what they do and, importantly, the specified level to which they work. Those analyst/designers have a repertoire of methods, tools, and techniques that they use, depending which best serves the purpose of the task they are performing. Those analyst/designers have come to know that analysis/design is more than programming, more than documentation, more than methods, tools, techniques, and much more than magic. Those analyst/designers are people who value other people as integral to the analysis/design process, the systems, and the organisation. Perhaps if we were to do the same, we might also master project success.

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