

Chapter 2

What Is This Thing Called “Design” in Instructional Design Research?—*The ABC Instant Research Question Generator*

Johannes Cronje

Introduction

The traditional “Addie” (Analysis, Design, Development, Implementation, Evaluation) model of design, first introduced in 1975 (Branson et al., 1975) is often criticised for being a process model, rather than a design framework (DeSimone, Werner, & Harris, 2002). This is confirmed in the work of Branch (2009) who provides a comprehensive inventory of activities to be executed during the “Design” phase, without actually clarifying what really happens in the execution of these activities.

This chapter considers four positions of design thinking, specifically as described by Rowe (1987). It compares these elements with Burrell and Morgan’s (1979) four paradigms of social research and then propose a model for the development of research questions that are aligned with the basic aims of each paradigm. The model will be called the *ABC instant research question generator*. This model is designed to assist in conceptualising design research studies and ensuring their conceptual design integrity by aligning the research questions and the research aims.

Theoretical Underpinnings

Tom Reeves (2001) suggested that socially responsible research took place in what Stokes called Pasteur’s quadrant. For Stokes (1997) there are two dimensions of research—research inspired by a quest for fundamental understanding, and research

J. Cronje (✉)
Cape Peninsula University of Technology,
80 Roeland Street, Cape Town, 8000, South Africa
e-mail: cronje@cput.ac.za

Applied and Basic research			
Quest for fundamental understanding?	Yes	Pure basic research (Bohr)	Use-inspired basic research (Pasteur)
	No	--	Pure applied research (Edison)
		No	Yes
		Considerations of use?	

Fig. 2.1 Pasteur’s quadrant (Stokes, 1997)

influenced by considerations of use. Research which is aimed both at understanding and usefulness falls into Pasteur’s quadrant (Fig. 2.1).

Working in Pasteur’s quadrant Peter Rowe sees design essentially as a form of problem solving. This could be a limiting view given that there may well be designs that were not overtly aimed at solving a specific problem but were even the result of some serendipitous happy coincidence. Roger Martin (2009:8) hints at a link between design and research when he envisages a three-stage “knowledge funnel” (Fig. 2.2) that leads to elegance in the design of businesses.

For Martin design involves identifying the mystery by asking the appropriate research question, then developing a set of heuristics or rules of thumb that address the problem, and finally to develop an algorithm that will solve the mystery every time. Design for Martin, therefore, is an on-going process of improvement, rather than once-off problem solving.

In this way Martin (2009:45) regards *design thinking* as a 50/50 mix of analytical thinking and intuitive thinking, where analytical thinking is considered to be aimed 100% at reliability and intuitive thinking as 100% validity driven (Fig. 2.3).

Burrell and Morgan’s (1979) four paradigms of social science research, first published in 1962, are postulated on two dimensions along which social science research is conducted. These are the nature of social science and the nature of society. They place these two dimensions at right angles, and thus create four mutually exclusive paradigms. The nature of social science research varies between positivist and anti-positivist. The nature of society varies from a society of regulation to a society of radical change. The end result is a two-by-two matrix.

Figure 2.4 shows the four quadrants identified by Burrell and Morgan. The following section will describe each of the paradigms in one sentence, and give my interpretation of the *aim* of each of the paradigms.

Radical Humanist

Radical humanists are interested in the subjective world, but feel the need to transcend or even overthrow current societal arrangements. Their aim is to *explore* alternatives.

Fig. 2.2 The knowledge Funnell (Martin, 2009:8)

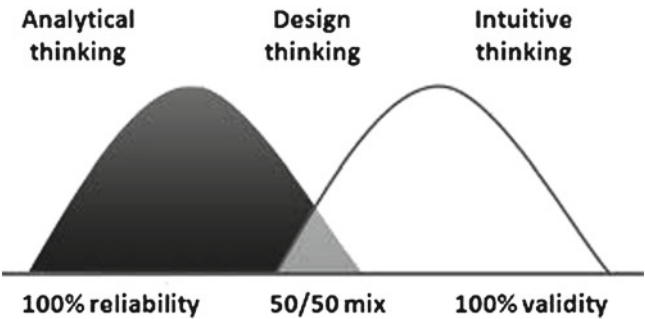
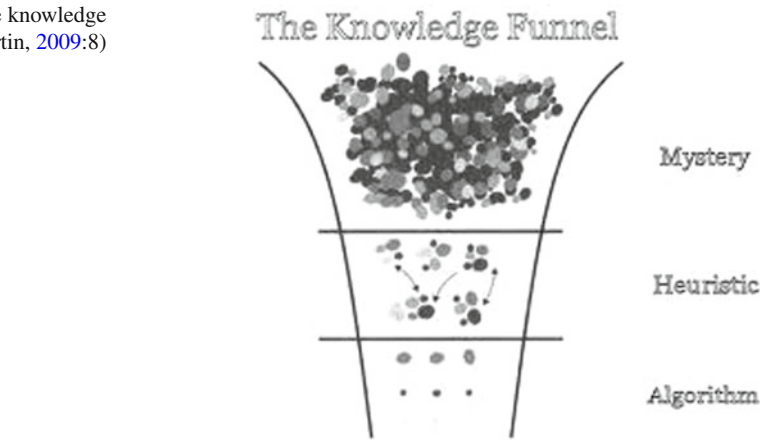


Fig. 2.3 Design thinking—reliability and validity (Martin, 2009:54)

Sociology of radical change			
Anti-positivist	Radical Humanist	Radical Structuralist	Positivist
	Interpretive	Functionalist	
Sociology of regulation			

Fig. 2.4 Four paradigms for the analysis of social theory. Source: Burrell and Morgan (1979:22)

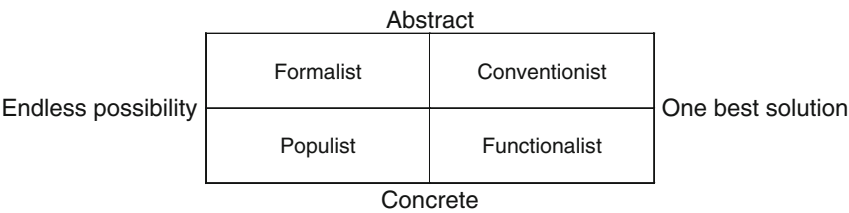


Fig. 2.5 Four design positions—developed from Rowe (1987)

Interpretive

Interpretivists believe that the human experience of the world is subjective, and they have a concern to understand it as it is. Their aim is to *explain* situations.

Functionalist Paradigm

Functionalists believe that the world is objectively discoverable, and that things can be improved by “tightening up” the rules. Their aim is to *develop* solutions.

Radical Structuralist

The radical structuralist view is based on an objective world view. They concentrate on structural relationships, believing that radical change is built into the very nature of society. Their aim is to *describe* the position as it is.

Peter Rowe (1987) presents a very useful analytical framework based on the *purpose* of design. He identifies four positions that architects take in their design of spaces: “First there is a *functionalist* position, distinguished by an emphasis on the accommodation of activities and the influence of building technology. Second there is a *populist* position, characterised by an acknowledgement and interpretation of contemporary commonplace building practices and user preferences. Third, there is a *conventionist* position, using a largely historical reference; and finally, a *formalist* position, using an architecture of formal possibilities for their own sake” (Rowe, 1987:124).

Rowe stresses that the four positions he describes are but four out of a much greater number of instances. A researcher working in Pasteur’s quadrant needs to take a very clear stand in terms of one’s belief in what constitutes fundamental understanding, as well as the nature of usefulness. In other words, is my position regarding the nature of fundamental understanding primarily objective, or primarily

subjective? Furthermore one needs to establish whether one’s concern is for the use to be abstract or concrete. I propose that if Rowe’s four positions are analysed thus, then they can be placed on a 2×2 matrix, as is shown in Fig. 2.5.

The first dimension relates to the existence or not of a “best way”. At the one extreme of the dimension is the belief that there is one implied best way to do something and that whether or not that ideal can be realised, reaching it remains the ultimate goal. At the other extreme lies the belief that there may be an infinite number of solutions and that these solutions are dependent on an infinite number of contexts. This dimension corresponds with Burrell and Morgan’s positivist/anti-positivist dimension.

The second dimension relates to the abstract or concrete nature of the design problem or message. This dimension relates to Burrell and Morgan’s dimension of radical change vs. regulation. The extreme of regulation is concrete, while radical change is abstract.

The Adaptation of the Model to Embrace Socially Responsible Research in Educational Technology: *The ABC Instant Research Question Generator*

The purpose of the *ABC instant research question generator* is to assist relatively inexperienced researchers to reach an initial understanding of what it is that they wish to do. In order to help them understand the relatively complicated terms used by Burrell and Morgan (1979) and Roode (1993), it was simplified in the following way. On the horizontal level students are asked to position themselves in terms of their belief of the role of scientific knowledge and the role of technology. They have to choose between a subjective or an objective approach. To refine this they should consider the envisaged answer of their research question. Are they hoping for one definite, final objective answer—such as “yes/no” or “75.09%”, or are they hoping for a more complicated subjective answer such as “it depends...”? Burrell and Morgan’s concepts of a Society of Radical Change and a Society of Regulation are reduced to a conceptualisation of the role of the research in society. Students have to decide if their eventual research output will be a primarily abstract picture of what a situation looks like (that requires radical change) or a set of rules or heuristics that show how something works, and may therefore be the first steps towards regulation.

In this way students are able very quickly to plot their beliefs in the scientific nature of the truth as Subjective/Objective and their conceptualisation of society as Abstract/Concrete. Once they have plotted themselves, we automatically know the answers that they are looking for. There are two sets of answers. The first set is “yes/no or it depends”. The second set is “It looks like this” or “It works this way”. So when we have the answers, then it is really easy to derive the questions. If the answer is “Yes/no”, then the question is “Should we do it this way?” If the answer

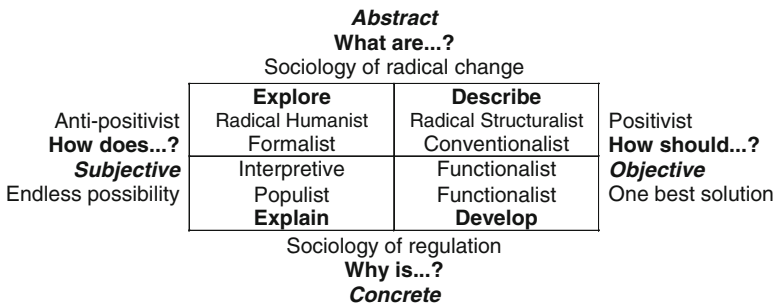
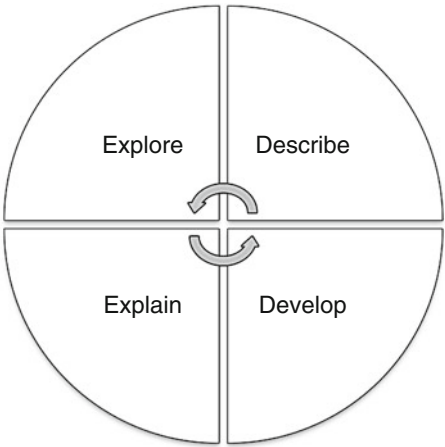


Fig. 2.6 Research aims and research questions

Fig. 2.7 The design research cycle



is “It depends” the question is “How do we deal with this?” If the outcome is a picture, then the question is “What is the composition?” If the outcome is a set of rules, then the question is “Why is this happening?”

Four Research Questions to Achieve the Aims

Roode (1993) identifies four research questions: *What is; how does; why is; and how should?* For Roode these questions are not structurally related and, depending on a given situation, researchers may select any combination of questions. I argue that the questions are, indeed, related. Questions may be either subjective or, objective; or concrete or abstract. Objective questions have only one possible answer. In a sense they are therefore normative—things are correct or they are not. Thus the stem of an objective question is likely to be “How should...?”

Subjective questions, on the other hand can have any number of answers, the answers are most likely to be “It depends...” Thus, the stem of a subjective question is likely to be “How does...?”

The second pair of questions are on the “radical change/regulation” dimension. In a world of regulations it is essential to know what the rules are meant to achieve, thus the question should be “Why is...” In a society of radical change it is essential to know what the current situation is, so that it might be overthrown or transcended, thus the question would be “What is...?” In my model I add the concepts of abstract and concrete to this dimension. Radical humanists and radical structuralists are primarily interested in the abstract concepts underlying society, while interpretive researchers and functionalists are interested in concrete understanding, or concrete solutions.

If one were to combine these research question stems with the research aims, then the four paradigms look like Fig. 2.6. It would seem possible to map Burrell and Morgan’s four quadrants onto Rowe’s four positions. Functionalist appears in both, and they seem to be pretty much aligned.

To achieve each of the four research aims it is necessary to answer two research questions. One question will be about the nature of research into science and technology and the other about the nature of society. Figure 2.7 shows how the four research aims can be achieved by the four research questions. If the research aim is to *develop* a solution, then the researcher needs to ask “Why is this not working?” and “How should it be fixed?” If the researcher wishes to *explain*, then the questions are “How does this work?” and “Why is it working?” If the purpose is to *explore* the questions are “What is going on here?” and “How does it affect those involved?” Finally if the aim is to describe, then the questions are “What are the elements of this model?” and “How should they be combined or related?”

In formulating the research questions it is important not to phrase questions using incorrect stems. In other words a question “What are the reasons for...?” is not a correct question. The question should be “Why does...?” Similarly, “What is the best way to...” is another way of asking “How should...?”

Given that one is either subjective or objective, or one supports either regulation or radical change, it holds that one cannot conduct research in more than one quadrant at a time. Diametrically opposed questions are mutually exclusive. One cannot ask “How does and how should...?” This is simply because one cannot be both objective and subjective at the same time. Should a researcher have more than one aim, then those aims should be achieved separately. Thus, if one wishes to explore and explain, it holds that the research should be conducted in two cycles, firstly a cycle that explores, then one that explains. Similarly one could explain a problem, then develop a solution, or one could develop a solution and then describe it. In the case of development research, of course one can go the full circle. Describe a situation, explore its parameters, explain its causes, and develop a solution. The key remains to work in one quadrant at a time.

Research projects aim to achieve an outcome. The outcome is the result of the answered questions. The relationship between the aims and the outcomes are best described metaphorically. In other words, if the aim of research is to explore, then the result of the exploration will be typographic representation. Traditionally an

explorer would be armed with a map, compass and binoculars, and would be expected to return with a topographic chart of the area. Likewise if the aim is to explain, the outcome will be a set of laws, rules, heuristics or algorithms. Newton, for instance, was able to explain the fall of the apple by formulating the law of gravity. If the aim is to develop, then the outcome will be a solution. If the aim is to describe, the outcome will be a model.

What Next? The Aim and the Rationale

The word “rationale” means “reason”. As has been indicated the full development research cycle, involves working anti clockwise through all four quadrants. The rationale tells people what you hope to do once the outcome has been delivered. Thus, if your research has a certain aim, the rationale will be found in the previous (anti-clockwise) quadrant. If your aim is to describe, then the rationale will be that, once you have a description, you would want to explore that field. Similarly, once you have explored certain tendencies, you would want to do further research to explain them. Once you have an explanation for a problem you would want to develop a solution, and once you have a solution, you would like to describe it in the form of a model so that other people could use it too.

Worked Examples: Four Case Studies

Over the years a number of doctoral students have used the model described here to refine their research questions. This section will briefly describe one from each quadrant. For the sake of brevity and clarity the research aims and questions may be paraphrased from the more florid versions in the various theses.

Explore (Radical Humanist/Formalist)

Linda van Ryneveld (2005) set out ‘to explore the complexities involved in teaching and learning in an adult online learning community that had adopted a metaphor of the television reality show, *Survivor* © (2005:2). Her research questions were “How do learners construct meaning via online communication?” “How does participation in computer-mediated collaborative work affect learners’ motivation and identity? [and] What is the right role for teachers to play in the computer-mediated learning environment?” (Van Ryneveld, 2005:2)’. The rationale for her research is to enable us to understand (interpretive) the dynamics that she identifies in her research. In terms of her design, she is exploring the metaphor of the reality television show, and considering the implications of modifying this form and applying it to a distance education setting.

Explain (Interpretive/Populist)

Salome Meyer (2005) wanted to explain some elements of the behaviour of online adult learners. Here research objectives were to determine “How online students cope in an online learning environment; why online students ask for help; why online students offer help; the principal causes of motivation and frustration; the nature of the cooperation between students (the nature of peer support); how (and to what extent) affective experiences of students contribute towards the successful completion of an online course; [and] what could make a student drop off a course regardless of volition” (Meyer, 2005:7). This collection of how and why questions place Meyer’s study firmly in the interpretive quadrant. (What could make a student drop off... could be rephrased as Why do students...). Meyer’s rationale is, once again, in the next quadrant anti-clockwise: “Should it be possible to determine the affective experiences of students in an online environment, mechanisms could be built into future courses to improve the affective support of students in such an environment (Meyer, 2005:9)”. This obsession with how people do things, and why people do them also confirms the populist nature of her design.

Develop (Functionalist)

Linda Cloete (2006) has 11 research questions, sub-divided into four categories. For the sake of this article only a two of these will be extracted and discussed. Question 7 states “What are the problems and limitations in the education of cataloguers in distance education?” (Cloete, 2006:14). This is an example of a “Why” question that has been phrased as a “What is...?” question. In essence what she is really asking is “Why is it so hard to train cataloguers at a distance?” Question 11 is “How should training by means of a mix of media and technology be designed to serve as an appropriate training mode?” (Cloete, 2006:14). The combination of why and how questions put Cloete’s research in the Functionalist quadrant where the aim is to develop. This resonates with her stated objective “to investigate the improvement of cataloguing courses, especially by utilising computer-assisted training and web-based training applications” (Cloete, 2006:12). Essentially her aim is to develop an improved course for cataloguers using multimedia and web-based technology. This is confirmed by her anticipated results, that include: “A self-paced flexible learning course, a training resource using a mix of media and technologies, interactive distance learning web utilisation, and a cataloguing laboratory or virtual classroom in the Web environment” (Cloete, 2006:18). Functionalist design can result in an artefact. However, once she has done developing her programme and evaluating its success, she hopes to provide a description of what she had found—in other words, the rationale for her research is to describe, which puts it in the radical structuralist quadrant—one quadrant anti-clockwise from her aim.

Describe (Radical Structuralist)

Jill Fresen (2005) worked in the field of quality assurance for web-based learning. The research was a reflective study of her own work as an learning practitioner at the University of Pretoria, and she set out to develop a model for the quality assurance of online learning. Although she calls her thesis an exploratory study models typically occur in the radical structuralist quadrant. She wanted to find one best way of ensuring quality in such a way that it could be compared across different courses. Furthermore she was concerned with the abstract nature of quality and quality assurance as a discipline, rather than with the day-to-day operational running of quality assurance interventions.

Her research questions were (1) “What factors promote quality web-supported learning?” (Fresen, 2005:4). (What are the factors... = What is...?) (2) “What factors contribute to client satisfaction (or frustration) with web-supported learning?” (Fresen, 2005:4). (What are the factors... = What is) and (3) “What lessons were learnt in applying standard quality assurance theory to the instructional design process for web-supported learning?” (Fresen, 2005:4) (lessons learnt = How should...?) Fresen employed a number of strategies to tease out, firstly what the key indicators were for successful online learning, and secondly how those indicators should be achieved. The outcome of her research was a conceptual framework for quality assurance in higher education—in other words, a model—a description. Fresen’s obsession with rules and regulations also confirm the relationship between the radical structuralist paradigm and the conventionist design position. Contained in her model was a taxonomy of critical success factors for web-supported learning. In her own later work, as in the work of others, Fresen has continued to explore the possibilities and constraints of her quality assurance model—showing that the rationale (to explore) is removed by one quadrant anti-clockwise from the aim (to describe).

Table 2.1 provides a quick overview of the four studies presented above.

Conclusions and Recommendations

The four case studies show how doctoral research can be conducted in either of the four quadrants suggested by Burrell and Morgan (1979). Moreover it shows how the use of four questions, used in pairs, help with framing the research.

The Key Aims, Beliefs and Concerns of Researchers

The Burrell and Morgan (1979) model tells us that researchers believe either in a positivist (yes/no) reality, or in an anti-positivist (it depends) reality. Their concerns

Table 2.1 Four case studies

Author	Paradigm	Aim	Questions	Outcome	Rationale
Van Ryneveld	Humanist	The purpose of this study is to <i>explore</i> the role of the metaphor of a game in the interaction, dynamics and complexities of a web-based module that is presented to adult learners	What are the opportunities and challenges presented to adult learners when they play online learning games?	An indication that the introduction of a game metaphor can inspire high levels of motivation in adult learners and provide a stimulating, all be it challenging, online learning environment	Further research could indicate the conditions under which online games prove motivational or challenging.
	Formalist		How do these learners respond to the challenges and opportunities?		
Meyer	Interpretive	The purpose is to interpret the participants' affective experiences in an online learning environment and to <i>explain</i> why they remain studying	How do adult learners feel about their online learning experiences?	Three categories of affective factors that adult learners' experience of online learning.	The understanding achieved in this study could assist with the development of methods to improve the retention of online learners
	Populist		Why do some of them continue with their studies in spite of extreme negative experiences?		
Cloete	Functionalist	To <i>develop</i> an integrated training resource programme for the education and training of cataloguers	Why do cataloguers experience problems with the mastery of certain subject content, particularly in distance education?	A multimedia programme that was designed to meet the learning needs of cataloguers that was shown in a summative evaluation to have been successful in meeting its training objectives	The results of this research could provide a blueprint for the developing of further multimedia training programmes for cataloguers in similar positions
	Develop		How should a certain mix of media and technologies be applied to enable the successful training of cataloguers?		

(continued)

Table 2.1 (continued)

Author	Paradigm	Aim	Questions	Outcome	Rationale
Fresen	Radical Structuralist Conventionalist	To <i>describe</i> what happens at the intersection of quality assurance of web-based learning for higher education	What are the key indicators of quality in higher education? How should web-supported learning be designed to achieve quality?	A conceptual framework (model) of quality assurance in higher education, that includes a taxonomy of critical success factors for web-supported learning	To provide a precedent and contribute criteria that would be useful to other higher education institutions. (i.e. to contribute to the further exploration of the theme)

are either with radical change or with regulation. When these two dimensions are placed orthogonally, four quadrants emerge, with four different aims, which I define as to explore, explain, develop or describe. When these aims are achieved in the specific sequence shown above, a complete design research cycle is formed.

Alignment Between Aims and Research Questions

The two pairs of diametrically opposed question stems (How does...? – How should...? and What is...? Why does...?) assist with the alignment of the questions and aims, provided that their mutually exclusive character is respected. One cannot ask “How does...? *and* How should...?” The reason is clear, since one cannot be a little bit subjective and a little bit objective. Neither can one support a little bit of regulation and a little bit of radical change. Selecting one question from each pair, however, will triangulate with the aim of the research. One should however be cautious not to phrase questions incorrectly “What is the reason for...?” actually means “Why is...?”.

Recommendations for Policy and Practice

As a supervisor of many students I have found Burrell and Morgan’s framework very useful in categorising the work of all my students to ensure some common basis. Of course there are numerous other models too, and any could be used, but what makes this one particularly useful is that any other type of research could be classified in these two dimensions. All researchers have to position themselves as either subjective or objective, and all researchers have to work either with abstract or concrete realities. The most important recommendation in terms of policy and practice, though, is that nobody should try to work on both sides of the divide simultaneously. Nobody should try to be a little bit subjective, and also a little bit objective, or predominantly concrete with a slight hint of the abstract. Such research confuses readers and also prevents the researcher from demonstrating proficiency in either dimension.

Recommendations for Further Development

The ABC instant research question generator is still in its infancy, but it has shown itself to work well in helping novice researchers to find a point of departure. What is required now is to consider the extent to which the quadrant within which the research is conducted has any influence on the nature of the research. It is tempting to say that Radical Humanist research is predominantly qualitative while radical structuralism is mainly quantitative, but at this stage it is still speculation.

Furthermore the model is useful to classify ongoing research. I have on more than one occasion found it very useful to take a whole set of conference proceedings and to classify them into the four different quadrants, and in that way to obtain a philosophical footprint of the particular conference. In such a way a school, or a professional or research body could determine what their focus is, or maybe what it should be.

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