Research Methods for Construction

Fourth Edition

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# Contents

*About the Authors*  
*Preface*  

## PART I PRODUCING A PROPOSAL

### 1 Introduction  
1.1 The concept of research  
1.1.1 Research: a careful search/investigation  
1.1.2 Research: contribution to knowledge  
1.1.3 A learning process  
1.1.4 Contextual factors affecting research  
1.2 Classifications of research  
1.2.1 Pure and applied research  
1.2.2 Quantitative and qualitative research  
1.2.3 Other categories of research  
1.3 Theories and paradigms  
1.3.1 Development of knowledge  
1.3.2 Testing a theory  
1.3.3 A paradigm  
1.3.4 Positivism  
1.3.5 Interpretivism  
1.3.6 Models and hypotheses  
1.4 Research styles  
1.4.1 Action research  
1.4.2 Ethnographic research  
1.4.3 Surveys  
1.4.4 Case studies  
1.4.5 Experiments  
1.5 Quantitative and qualitative approaches  
1.5.1 Quantitative approaches  
1.5.2 Qualitative approaches  
1.5.3 Triangulated studies  
1.5.4 Data sources  
1.6 Where to begin  
1.7 Summary

### 2 Topic for Study  
2.1 Selection of a topic  
2.1.1 Resources  
2.1.2 Subject selection  
2.1.3 Choosing a topic
2.1.4 Evaluating alternatives 42
2.1.5 Refining a topic 43
2.2 Writing the proposal 43
  2.2.1 Aim 44
  2.2.2 Proposition 45
  2.2.3 Objectives 45
  2.2.4 Hypotheses 46
  2.2.5 Methodology and methods 48
  2.2.6 Programme 50
  2.2.7 Deliverables and industrial or practitioner support 50
2.3 Summary 51

PART II EXECUTING THE RESEARCH 53

3 Initial Research 55
  3.1 The research process 55
    3.1.1 Initial phase 58
    3.1.2 Data and information 58
    3.1.3 Dynamic process 60
  3.2 Initial search 61
    3.2.1 Definitions and assumptions 63
    3.2.2 Theory and literature review 63
    3.2.3 Analysing data from a search 64
  3.3 Literature-based discovery 67
  3.4 Assembling the theoretical framework 68
  3.5 Philosophy and methodology 69
    3.5.1 Ontology and epistemology 70
    3.5.2 Positivism and phenomenology 71
    3.5.3 Constructivism and reductionism 73
    3.5.4 Realism 74
    3.5.5 Fuzzy thinking 76
  3.6 Theoretical models and constructs 76
    3.6.1 What is modelling? 76
    3.6.2 Theoretical model 77
    3.6.3 Constructs 78
  3.7 Proper referencing 81
  3.8 Summary 82

4 Approaches to Empirical Work 86
  4.1 Role of experience 86
    4.1.1 When does research begin? 86
    4.1.2 What is experience? 87
4.2 Research design
  4.2.1 Context
  4.2.2 Empiricism and verification
  4.2.3 Deduction and induction
  4.2.4 Case study
  4.2.5 Ethnography
  4.2.6 Experiments and quasi-experiments
  4.2.7 Variance and errors
4.3 Qualitative approaches
  4.3.1 When are qualitative approaches employed?
  4.3.2 Development of theory from data
  4.3.3 Analysis of data
4.4 Quantitative approaches
  4.4.1 When are quantitative approaches employed?
  4.4.2 Sources of data
  4.4.3 Experimental control
4.5 Experimental design (including experiments and quasi-experiments)
  4.5.1 Experiments and quasi-experiments
  4.5.2 Variables
  4.5.3 Replication
  4.5.4 Between-subjects design (simple randomised experiments)
  4.5.5 Between-subjects design (matched randomised groups)
  4.5.6 Within-subject design (repeated measure design)
  4.5.7 Factorial experiments
4.6 Case study research
4.7 Modelling
  4.7.1 Classification of models
  4.7.2 Deterministic and stochastic models
  4.7.3 The modelling process
4.8 Simulation
  4.8.1 Dynamism
  4.8.2 Heuristics
  4.8.3 Approaches
4.9 Level of research
4.10 Summary

5 Hypotheses
  5.1 Essentials of a valid hypothesis
  5.2 Roles of hypotheses
  5.3 Objective testing of hypotheses
  5.4 Role of sampling
  5.5 Common statistical measures
    5.5.1 Normal distribution
  5.6 Null hypotheses
  5.7 Validities
  5.8 Summary
6 Data Collection 150
6.1 Data requirements 150
6.2 Collecting data from respondents 153
6.2.1 Surveys 154
6.2.2 Questionnaires 157
6.2.3 Interviews 158
6.2.4 Case studies 161
6.2.5 Triangulation 161
6.3 Sampling 162
6.4 Sample size 165
6.5 Scales of measurement 169
6.5.1 Scaling techniques (non-metric and metric) 171
6.5.2 Non-comparative (metric) scales 171
6.5.3 Comparative scales (non-metric) scales 172
6.5.4 Common scaling methods 172
6.5.5 Development of multi-item scales 174
6.6 Obtaining data 176
6.7 Response styles 184
6.8 Summary 185

7 Data Analysis 189
7.1 Analysing data 189
7.2 Plotting data 193
7.3 Statistical methods 196
7.4 Non-parametric tests 196
7.4.1 Sign test 196
7.4.2 Rank-sum tests 198
7.4.3 Chi-square ($\chi^2$) test 202
7.4.4 Goodness of fit 204
7.5 Parametric tests 204
7.5.1 $t$-Test 205
7.5.2 Analysis of variance (ANOVA) 205
7.5.3 Regression and correlation 208
7.5.4 Multiple regression 214
7.5.5 Time series 215
7.5.6 Index numbers 219
7.5.7 Simple average index 220
7.5.8 Chained index 226
7.6 Other analytical techniques 227
7.6.1 Cluster analysis 227
7.6.2 Factor analysis 228
7.6.3 Path analysis 230
7.6.4 Analytic hierarchy process 234
7.6.5 Analysing documents (from texts) 235
7.6.6 Conversation analysis 236
7.6.7 Discourse analyses 237
7.6.8 Social network analysis 238
7.6.9 Multi-level research 240
7.6.10 Meta-analysis 241
7.6.11 Longitudinal research 241

7.7 Summary 242

8 Ethics in Research 246
8.1 The concepts of morals and ethics 246
8.2 Research ethics 249
  8.2.1 Theory and literature 252
  8.2.2 Data collection, use and disposal 253
8.3 Data analysis, intellectual property and data protection 255
  8.3.1 Data analysis, results and reporting 255
  8.3.2 Intellectual property 257
  8.3.3 Data protection 257
8.4 Summary 258

PART III REPORTING THE RESULTS 261

9 Results, Inferences and Conclusions 263
9.1 Requirements for valid results 263
9.2 Potential sources of error 264
  9.2.1 Reliability 265
9.3 Results 266
  9.3.1 Producing the results 266
  9.3.2 Introductory results 267
  9.3.3 Substantive results 268
  9.3.4 Inferences 269
  9.3.5 Causal relationships 269
  9.3.6 Interpretation 270
9.4 Conclusions 274
  9.4.1 How to write conclusions 274
  9.4.2 Further research 276
9.5 Summary 277

10 Reports and Presentations 278
10.1 Report production 278
10.2 Communication 279
10.3 Contents of the report 281
  10.3.1 How to begin 281
  10.3.2 Text of the report 282
  10.3.3 Theory and literature 283
  10.3.4 Reporting on methodology and methods 284
  10.3.5 Reporting on data sourcing and data collection 285
x Contents

10.3.6 Presentation of results 285
10.3.7 Discussion of results 286
10.3.8 Conclusions 286
10.3.9 Limitations 287
10.3.10 Recommendations 287
10.3.11 Introduction 288
10.3.12 Remainder of the report 288

10.4 Oral presentation 289
10.5 Summary 290

Index 291
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Preface

We are very grateful to all our colleagues and researchers who have taken the trouble to provide us with feedback on previous volumes; that feedback has been extremely useful in helping us to amend and improve the content and presentation for this fourth edition of our book. Our own research has continued to inform us and so, the entire book has been scrutinised for scope, rigour and content as well as for ease of comprehension and use.

Research, itself, is a field which is developing and evolving constantly. Philosophical and methodological preferences and debates ebb and flow along the pattern of the dialectic triad. Mixed and multi-method approaches have become popular due to their more inclusive/comprehensive scope. Methods and techniques are developing and new ones are emerging. IT plays an ever greater role in research in a wide variety of ways.

Given the extent and speed of developments, it is hardly surprising that debates and concerns also proliferate. Ethical issues concerning collection, processing, storage, use and disposal of data are addressed in Chapter 8 – which considers the various reports, legislation, codes of practice and requirements of ethical committees and reviews. Pressures of time and funding to ‘do the study’ (the empirical work) all too often lead to a lack of attention to how the study should be done and why. Attention should be given to the philosophical approach adopted (ontology, epistemology) and the consequent methodology – all require rationale/justification. Methods available should be scrutinised for appropriateness, both academically and practically, again, requiring justification for use in context. That is a fundamental theme of this book – to facilitate a researcher’s informed and justified selection of a philosophical paradigm and, thence, of appropriate methods to execute the research.

A particular, and vitally important, component is the critical study of theory and literature – usually, a major process to be undertaken early in the research to inform the researcher(s) and, hence, the study. Failure to undertake a thorough review of theory and literature will leave the research poorly informed and with important ‘holes’ and duplications; consequently, the essential discussion of the results and drawing of conclusions will be fundamentally flawed. (In grounded theory, the debate is not whether to study theory and literature but when to do so.)

In a fairly nascent field of research, such as construction, the need for demonstrated rigour is paramount. Methods and techniques from other disciplines and domains are adopted – that requires care and rigour in itself to ensure that suitable methods are selected and employed validly and correctly (e.g. avoiding the ecological fallacy in researching culture topics; appropriate uses of Likert response formats and of Likert scales, and statistical tests which are valid for them – see Chapter 6).

Thus, it could be tempting for us to be prescriptive over how to conduct studies, what methods to use, and so on. We have consciously and strongly resisted that temptation in order to preserve presentation and discussion of the rich array of methodologies and methods available – and appropriate in differing contexts and for different topics. Rather, we have incorporated the main threads of advice and debate, often drawn from the vast body of highly authoritative research papers and books, to succinctly inform researchers
of the issues and so, to enable them to make their own, informed selections for achievement of validity and reliability in their particular topics and contexts (which is, itself, a major intellectual component of research).

Finally, our thanks go to the many colleagues and friends who have helped and supported us. In particular, Madeleine Metcalfe and Harriet Konishi at Wiley-Blackwell, and all the production staff, who have been so kind, helpful and understanding in our endeavours to complete this fourth edition.

Anita Liu
Richard Fellows

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Part I

Producing a Proposal
Introduction

The objectives of this chapter are to:
- introduce the concept of research;
- provide awareness of different classifications of research;
- outline the essentials of theories and paradigms;
- discuss the various research styles;
- introduce quantitative and qualitative approaches;
- consider where, and how, to begin.

1.1 The concept of research

*Chambers English Dictionary* defines research as:

- a careful search
- investigation
- systematic investigation towards increasing the sum of knowledge.

For many people, the prospect of embarking on a research project is a daunting one. However, especially for people who are associated with a project-oriented industry, such as property development, building design, construction or facilities management, familiarity with the nature of projects and their management is a significant advantage. Dr Martin Barnes, an ex-chairperson of the Association of Project Managers (APM), has described a project as a task or an activity which has a beginning (start), a middle and an end that involves a process which leads to an output (product/solution). Despite the situation that much research is carried out as part of a long-term ‘rolling’ programme, each individual package of research is an entity which is complete in itself, while contributing to the overall programme.
Indeed, any work which assists in the advancement of knowledge, whether of society, a group or an individual, involves research; it will involve enquiry and learning also.

1.1.1 Research: a careful search/investigation

Research can be considered to be a ‘voyage of discovery’, whether anything is discovered or not. In fact, it is highly likely that some discovery will result because discovery can concern the process of investigation as well as the ‘technical subject’ (the topic of investigation). Even if no new knowledge is apparent, the investigation may lend further support for existing theory. What is discovered depends on the question(s) which the research addresses, the patterns and techniques of searching, the location and subject material investigated, the analyses carried out and, importantly, reflection by the researcher on the results of the analyses in the context of the theory and literature and methodology/methods employed. The knowledge and abilities of researchers and their associates are important in executing the investigative work and, perhaps more especially, in the production of results, discussion of them and the drawing of conclusions. Being open-minded and as objective as possible is vital for good research.

1.1.2 Research: contribution to knowledge

The Economic and Social Research Council (ESRC) defines research as ‘...any form of disciplined inquiry that aims to contribute to a body of knowledge or theory’ (ESRC, 2007). That definition demonstrates that the inquiry must be designed and structured appropriately and that it is the intent of the inquiry which is important (to distinguish from casual inquiries) rather than the outcome per se.

The Concise Oxford Dictionary (1995) provides a more extensive definition of research as ‘the systematic investigation into and study of materials, sources and so on in order to establish facts and reach new conclusions’. Here the emphasis lies on determining facts in order to reach new conclusions – hence, new knowledge. The issue of ‘facts’ is not as clear, philosophically speaking, as is commonly assumed, and will be considered later.

The dictionary continues: ‘an endeavour to discover new or collate old facts and so on by the scientific study of a subject or by a course of critical investigation’. Here there is added emphasis on the method(s) of study; the importance of being scientific and critical is reinforced.

Therefore, research comprises what (facts and conclusions) and how (scientific; critical) components. Being critical, even sceptical, rather than merely accepting, is vital; evidence to support assertions, use of methods, production of findings and so on is essential. ‘...critical analysis questions the authority and objective necessity of the normative framework that is taken for granted ...also challenges the adequacy of ...accounts ...’ (Willmott 1993: p. 522). Further, it is concerned to ‘...situate the development and popularity of ideas and practices ... in the material and historical contexts of their emergence and application ...’ (ibid: p. 521).

The history of the nature of investigations constituting research is paralleled by the continuum of activities undertaken in a modern research project – description, classification,
comparison, measurement, establishing (any) association, determining cause and effect (Bonoma 1985). ‘Studies toward the description end of the continuum might be associated more frequently with *theory building*, whereas those near the cause-and-effect end are more frequently used for theory disconfirmation [testing]’ ([..] added, *ibid*: p. 201).

Traditionally, the essential feature of research for a doctoral degree (PhD – Doctor of Philosophy) is that the work makes an original (incremental) contribution to knowledge. This is a requirement for a PhD, and many other research projects also make original contributions to knowledge. A vast number of research projects synthesise and analyse existing theory, ideas and findings of other research, in seeking to answer a particular question or to provide new insights. Such research is often referred to as scholarship; scholarship forms a vital underpinning for almost every type of research project (including PhD). However, the importance of scholarship is, all too often, not appreciated adequately – it informs and provides a major foundation upon which further knowledge is built, for both the topic of investigation and the methodology and methods by which investigations may be carried out.

Despite its image, research is not an activity which is limited to academics, scientists and so on; it is carried out by everyone many times each day. Some research projects are larger, need more resources and are more important than others.

**Example**

Consider what you would do in response to being asked, ‘What is the time, please?’ Having heard and understood the question, your response process might be:

- look at watch/clock
- read time
- formulate answer
- state answer (‘The time is…’).

In providing an answer to the original question, a certain amount of research has been done.

Clearly, it is the research question, or problem, that drives the research. Methodology, method(s), data and so on are determined to best suit answering the question validly, accurately and reliably. It is dangerous to adopt a method and then to hunt for questions and problems to which the method may be applied – it may not be (very) suitable and so, lead to difficulties and dubious results.

**1.1.3 A learning process**

Research is a learning process … perhaps the only learning process.

Commonly, teaching is believed to be the passing on of knowledge, via instructions given by the teacher, to the learner. Learning is the process of acquiring knowledge
and understanding. Thus, teaching exists only through the presence of learning and constitutes a communication process to stimulate learning; teaching is ‘facilitation of learning’. If someone is determined not to learn, they cannot be forced to do so, although they may be persuaded to learn through forceful means.

### 1.1.4 Contextual factors affecting research

Research does not occur in a vacuum. Research projects take place in contexts – of the researcher’s interests, expertise and experiences; of human contacts; of the physical environment and so on. Thus, despite the best intentions and rigorous precautions, it seems inevitable that circumstances, purpose and so on will impact on the work and its results (a ‘Hawthorne effect’ or a ‘halo effect’). The fact that research is being carried out will, itself, influence the results, as described in the Hawthorne investigations of Elton Mayo (1949) and noted in the writings of Karl Popper (1989) on the philosophy of research. Research is never a completely closed system. Indeed, much research is, of necessity, an open system which allows for, and accommodates, adaptability (e.g. exploratory studies, processual research).

As research is always executed in context, it is important to consider the contextual factors, the environmental variables, which may influence the results through their impacting on the data recorded. (Environmental variables and constructs are fundamental, express concerns of institutional theory; Scott 1995; Oliver 1997.) Such environmental variables merit consideration in tandem with the subject variables – dependent, independent and intervening (see Fig. 1.1) – of the topic of study. The choice of methodology/methodologies is important in assisting identification of all relevant variables, their mechanisms and amounts of impact.

**Figure 1.1** ‘Causality chain’ between variables (see also Fig. 4.1, p. 105).
Example

Consider Boyle’s Law. Boyle’s Law states that, at a constant temperature, the volume of a given quantity of a gas is inversely proportional to the pressure upon the gas, that is,

\[ V \propto \frac{1}{P} \]

\[ PV = \text{constant} \]

Laboratory experiments to examine Boyle’s Law attempt to measure the volumes of a particular quantity of gas at different pressures of that gas. The temperature is the environmental variable, to be held constant, the pressure is the independent variable and the volume is the dependent variable (following the statement of Boyle’s Law). The researcher’s breathing on the equipment which contains the gas may alter the temperature (otherwise constant) slightly and it will influence the results, though possibly not enough to be recorded. In such cases, the uncontrolled effects of environmental variables which impact on the results so that the relationship found is not in strict compliance with the statement of Boyle’s Law are denoted as ‘experimental error’.

Boyle’s Law, like the other gas laws, strictly applies only to a perfect gas but, for many ‘practical’ purposes, all gases conform to Boyle’s Law. For this reason, the purpose of the research is likely to be an important determinant of how the experiment is performed and to what level of accuracy. Considerations, such as those noted in respect of Boyle’s Law experiments, lead to research being classified as pure research and applied research. Slightly different views classify studies as either research or development whilst the purpose of a study often leads to academics’ work being classified as research or consultancy. Ultimately, such categorisations may prove insignificant – knowledge should be improved continuously in quantity and quality and applied for advancing society, including the advancement of knowledge.

1.2 Classifications of research

1.2.1 Pure and applied research

Frequently, classification of research is difficult, not only due to the use of “fuzzy” definitions but, more importantly, because the research occurs along a continuum. At one end, there is ‘pure’ or ‘blue sky’ research such as the discovery of theories, laws of nature and so on, whilst at the other, applied research is directed to end uses and practical applications. Most academics are encouraged to undertake research towards the ‘pure’ end of the spectrum whilst practitioners/industrialists tend to pursue development work and
applications. Of course, particularly in contexts like construction, the vast majority of research is a combination of ‘pure’ and ‘applied’ research – of theory and applications. Both are vitally important.

Essentially, development and applications (innovations) cannot exist without the basic, pure research while pure research is unlikely to be of great benefit to society without development and applications. Unfortunately, much snobbery exists within the research and development sectors – those who work in one sector all too often decry (or fail to value) the contributions of others who work in different sectors. Fortunately, the advances of Japanese industry and many individual organisations which recognise and value the synergetic contributions of the various sectors of the research spectrum are fostering a change in attitude (synergistic continuous improvement) such that research and development activities are recognised as being different and complementary – each with particular strengths, approaches and contributions to make.

Often, the difference concerns the questions to be addressed rather than the approaches adopted. Pure research is undertaken to develop knowledge, to contribute to the body of theory which exists – to aid the search for ‘truth’. Applied research seeks to address issues of applications: to help solve a practical problem (the addition to knowledge is more ‘incidental’ than being the main purpose). The (not always material) distinction may be articulated as being that pure research develops scientific knowledge and so asks ‘is it true?’ whilst applied research uses scientific knowledge and so asks ‘does it work?’

Commonly, research, especially applied research (located towards the developmental end of the research spectrum), involves solving problems. A simple dichotomous classification of types of problem is:

1. Closed (ended) problems – simple problems each with a correct solution. The existence of the problem, its nature and the variables involved can be identified easily. Such problems are common, even routine, and so, can be dealt with easily (often via heuristics/routines) to give the single correct solution. The problems are ‘tame’.
2. Open (ended) problems – tend to be complex; the existence of the problem may be difficult to identify, the situation is likely to be dynamic and so, the variables are difficult to isolate. Finding a solution is hard and may require novel ideas (e.g. through ‘brainstorming’). It may not be (very) evident when a solution has been reached and many alternative solutions are likely to be possible. Such problems are ‘wicked’, ‘vicious’ or ‘fuzzy’ and may well concern/involve insight.

Clearly, most problems requiring research for their solution are likely to be open ended. However, in solving problems, there are many sources of influence (bias) which may impact on the people involved – not least, the approaches adopted for solving and the solutions determined for closed-ended problems.

1.2.2 Quantitative and qualitative research

The other primary classification system concerns the research methods adopted (for collection and analysis of data) – broadly, quantitative and qualitative research. Quantitative
approaches adopt ‘scientific method’ in which initial study of theory and literature yields precise aims and objectives with proposition(s) and hypotheses to be tested – conjecture and refutation may be adopted, as discussed by philosophers such as Popper (1989) and so, tend to be explanatory. In qualitative research, an exploration of the subject is undertaken, sometimes without prior formulations – the object may be to gain understanding and collect information and data such that theories will emerge and so, tends to be exploratory (as exemplified in grounded theory; Glaser and Strauss 1967). Thus, qualitative research is a precursor to quantitative research. In an ‘advanced’ body of knowledge, where many theories have been developed and laws have been established, quantitative studies of their applicabilities can be undertaken without the need to determine theories and such afresh, thereby avoiding, ‘reinventing the wheel’ for each new study. Thus, Harrison et al. (2007: p. 1234) suggest that ‘… qualitative research methods work best for developing new theoretical ideas and making interpretations of a theory or a phenomenon’s significance; quantitative research is directed toward identifying general patterns and making predictions’.

The typology of Edmondson and McManus (2007) indicates appropriate methodologies according to the extent of development of research in a discipline. Research in construction is relatively ‘nascent’ or ‘intermediate’ in maturity and in matching to the fieldwork context. Hence, accentuation of exploratory studies using qualitative methods (rather than hypothesis testing and quantitative methods which are appropriate for mature disciplines/domains) is appropriate to foster development of construction knowledge.

Generally, quantitative approaches provide ‘snapshots’ and so, are used to address questions such as what, how much, how many? Thus, the data, and results, are instantaneous or cross-sectional (e.g. compressive strength of a concrete cube; number of firms in an industry; market price of an item; content of an Architect’s Instruction). Qualitative approaches seek to find out why things happen as they do; to determine the meanings which people attribute to events, processes and structures and so on. Many qualitative studies use data regarding people’s perceptions to investigate aspects of their social world; others seek to ‘go deeper’ to address people’s assumptions, prejudices and so on to determine their impacts on behaviour and, thence, (organisational/project) performance.

The fundamental issues in designing any research, and so, underpinning the selection of quantitative, qualitative or combination approaches, concern the research question and constraints and, perhaps most particularly, what is to be measured and the requirements of validity and reliability.

Sometimes, qualitative research is assumed to be an easy option, perhaps in an attempt to avoid statistical analyses by persons who do not excel in mathematical techniques. Such an assumption is seriously flawed – to execute a worthwhile research project using qualitative methods can be more intellectually demanding than if quantitative methods had been employed. The use of qualitative methodologies should not be assumed to be a ‘soft option’.

Irrespective of the nature of the study, rigour and objectivity are paramount throughout. Drenth (1998, p. 13) defines objectivity as ‘… the degree to which different observers or judges are able to record the data in the same manner. Judgement or classification of data in scientific research should not be substantially influenced
Research requires a systematic approach by the researcher, irrespective of what is investigated and the methods adopted. Careful and thorough planning is essential and, especially where large amounts of data are collected, rigorous record keeping is vital – in the study of theory and previous work (literature) as well as in the field work.

The impact of the researcher must be considered, both as an observer, experimenter and so on, whose presence will impact on the data collected and the results derived, and through bias which may be introduced in data collection, analyses and inferences. Such biases may be introduced knowingly – to investigate the subject from a particular viewpoint – or unknowingly, perhaps by asking ‘leading questions’. Normally, the impact of the researcher and the execution of the research should be minimised through careful research design and execution; rigorous documentation and ‘writing up’ are vital and must specify the perspective/paradigm adopted (and rationale for its adoption).

**Figure 1.2** Triangulation of quantitative and qualitative data.

by the subjectivity of the observer’. Thus, it is helpful if all the researchers agree the definitions of terms, metrics for collecting the data and the related protocols. Commonly, qualitative data, which are subjective (such as obtained in opinion surveys), can and should be analysed objectively, often using quantitative techniques. However, one should not lose sight of the richness which qualitative data can provide and, often, quantitative data cannot (see Van Maanen, 1988). Triangulation – the use of qualitative and quantitative techniques together to study the topic – can be very powerful to gain insights and results, to assist in making inferences and in drawing conclusions, as illustrated in Fig. 1.2.
Example

Consider the question, ‘Do you not agree that universities are under-funded?’ The phrasing, ‘Do you not agree that…’, suggests that the respondent ought to agree that universities are under-funded and so, asking such a ‘leading’ question is likely to yield more responses of agreement than if the question were phrased more objectively/neutrally.

The question could be phrased much more objectively, ‘Do you believe that universities are:

(1) funded generously, or
(2) funded adequately, or
(3) funded inadequately?’

Even phrasing the question in that way, although removing the ‘agreement bias’ is incomplete as it assumes that all the respondents have a belief about the topic – some may not and so, a fourth possibility of ‘no opinion’ should be included. Unfortunately, that additional possibility also allows respondents to opt out of expressing their opinion!

Tsoukas (1989: p. 551) cautions that ‘… qualitative is a type of evidence rather than a research design’ which, by analogy, applies to quantitative studies too.

1.2.3 Other categories of research

Further categorisation of types of research accords with the purpose of the research (question) as set out as follows.

- **Instrumental** – to construct/calibrate research instruments, whether physical measuring equipment or as tests/data collection (e.g. questionnaires; rating scales). In such situations, the construction and so on of the instrument is a technological exercise; it is the evaluation of the instrument and data measurement in terms of meaning which renders the activity scientific research. The evaluation will be based on theory.
- **Descriptive** – to systematically identify and record (all the elements of) a phenomenon, process or system. Such identification and recording will be done from a particular perspective and, often, for a specified purpose; however, it should always be done as objectively (accurately) and as comprehensively as possible (this is important for later analysis). The research may be undertaken as a survey (possibly of the population identified) or as case study work. Commonly, such research is carried out to enable the subject matter to be categorised.
- **Exploratory** – to test, or explore, aspects of theory (if any is applicable). A central feature is discovery of processes and so on, sometimes through the use of
propositions/hypotheses. A proposition or a hypothesis may be set up and then tested via research (data collection, analyses and interpretation of results). More usually, a complex array of constructs or/and variables is identified by the research and propositions/hypotheses are produced to be tested by further research.

- **Explanatory** – to answer a particular question or explain a specific issue/phenomenon. As in exploratory studies, propositions/hypotheses are used but here, as the situation is known better (or is defined more clearly), theory and so on can be used to develop the hypotheses which the research will test. Also, this could be a follow-on from exploratory research which has produced hypotheses for testing.

- **Interpretive** – to fit findings/experience to a theoretical framework or model; such research is necessary when empirical testing cannot be done (perhaps due to some unique aspects – as in a particular event of recent history, for example ‘the Asian financial crisis of 1997’). Interpretivism is founded on the ‘… assumption that human understanding and action are based on the interpretation of information and events by the people experiencing them…’ (Gioia and Chittipeddi, 1991: p. 435). The models used may be heuristic (using ‘rules of thumb’) – in which variables are grouped to (assumed) relationships – or ontological, which endeavour to replicate/simulate the ‘reality’ as closely as possible.

A further categorisation of research concerns what is being investigated – product, process or both. Research in construction includes all three categories; research into structural integrity is product oriented (e.g. strength properties of materials etc.), construction management research tends to be process oriented (e.g. organisational culture of construction firms) or both process and product (e.g. the impact of different procurement approaches on project and project management performance). Van de Ven (1992: p. 169) identifies a process as ‘… a sequence of events that describes how things change over time’.

### 1.3 Theories and paradigms

Usually, research is distinguished from other investigations, searches, enquiries and so on by being ‘scientific’; traditionally regarded as adoption of the ‘scientific method’. Scientific method is ‘a method of procedure that has characterized natural science since the seventeenth century, consisting in systematic observation, measurement, and experiment, and the formulation, testing, and modification of hypotheses: criticism is the backbone of the scientific method [in plural]:the process is based on presently valid scientific methods’ (Oxford English Dictionary, 2013). Today, the concept of scientific method embraces quite diverse approaches and interpretations – to the extent that different sciences (natural, social etc.) tend to use different methods, leads to the conclusion that there is no single “scientific method”. However, traditionalism remains strong in that some empiricists and positivists refute any approach which does not conform to the traditional concept as being ‘unscientific’!

Essentially, research, as a cognitive process, comprises a logic of discovery and the (subsequent) validation of discoveries – to promote refinement and further discovery. Unfortunately, some researchers may be unaware of their underlying ontological and
epistemological beliefs and assumptions (which are founded in culture and early upbringing – see, n.b., Hofstede 2001) or, otherwise do not express those underpinnings in research reports and so on. The ontological and epistemological bases of research are fundamental as they inform all research activities – notably, using and developing theory, which denotes what elements in the world are relevant to the topic of investigation and how those elements are related to each other and to context (Van Maanen et al. 2007).

Losee (1993: p. 6) depicts Aristotle’s inductive–deductive method for the development of knowledge as shown in Fig. 1.3. He notes that, ‘scientific explanation thus is a transition from knowledge of a fact [point (1) in the diagram] to knowledge of the reasons for the fact [point (3)]’.

**1.3.1 Development of knowledge**

Popper (1972, 1989) argues that scientific knowledge is different from other types of knowledge because it is falsifiable rather than verifiable; tests can only corroborate or falsify a theory, the theory can never be proved to be true. No matter how many tests have yielded results which support or corroborate a theory, results of a single test are sufficient (provided the test is valid) to falsify the theory – to demonstrate that it is not always true. The more general application for acceptability in scientific investigation is shown in Fig. 1.4.

Different philosophies consider that scientific theories arise in diverse ways. Cartesians, who hold a ‘rationalist’ or ‘intellectual’ view, believe that people can develop explanatory theories of science purely through reasoning, without reference or recourse to the observations yielded by experience or experimentation. Empiricists maintain that such pure reasoning is inadequate so, it is essential to use results and knowledge (experience) from observation and experimentation to determine the validity or falsity of a scientific theory. Kant (1934) noted that the scope of peoples’ knowledge is limited to the area of their possible experience; speculative reason beyond that, such as attempts to construct a metaphysical system through reasoning alone, has no justification.

Nagel (1986) suggests that the scientist adopts a ‘view from nowhere’ which implies the possibility of total objectivity and that phenomena exist totally independently of any
observer. Conversely, Kuhn (1996: p. 113) notes that ‘what a man sees depends both upon what he looks at and also upon what his previous visual-conceptual experience has taught him to see’ (as employed in sensemaking, Weick, 1995 – how people determine meaning).

Tauber (1997) observes that, as science has evolved, so the notion of what constitutes objectivity has changed such that different branches of science require/employ different standards of ‘proof’.

Dialectic, a development of ‘trial and error’, can be traced back to Plato, who employed the method of developing theories to explain natural phenomena and followed this by a critical discussion and questioning of those theories; notably whether the theories could account for the empirical observations adequately. Thus, commonly, scientists offer theories as tentative solutions to problems; the theory is criticised from a variety of perspectives; testing the theory occurs by subjecting vulnerable or criticised aspects of the theory to the most severe tests possible. The dialectic approach, following Hegel and discussed by authors such as Rosen (1982), is that a theory develops through the dialectic triad – thesis, antithesis and synthesis. The theory advanced initially is the thesis; often, it will provoke opposition and will contain weak points which will become the focus of opposition to it. Next, the opponents will produce their own counter-theory, the antithesis. Debate and testing will continue until recognition of the strengths and weaknesses of the thesis and antithesis are acknowledged and the strengths of each are conjoined into a new theory, the synthesis. This is likely to regenerate the cycle of dialectic triad.

Stinchcombe (2002) postulates an alternative framework for the development of theory. The framework comprises three mechanisms that, usually, occur in the sequence of ‘(i) Commensuration, or the standardisation of theoretical constructs, definitions or processes that enable comparison across theorisations; (ii) evangelism, or the zealous conversion of adherents to a particular theoretical or methodological stance and (iii) truth-telling, or critical tests that can detect the most veridical theories in a particular field’ (Glynn and Raffaelli 2010: p. 362).

Figure 1.4 Depiction of the approach to the advancement of knowledge, as advocated by Galileo (Source: Losee 1993).