

Front Matter and Table of Contents of Qualitative Research with Socio-Technical Grounded Theory

by Rashina Hoda
published by Springer in 2024

The following pages include the **front matter** and **Table of Contents**

To access the full book, consider the following options:

- **Order on [Amazon](#)**—both physical and e-book options are available and usually ships promptly.
- **Download** a free e-copy through your university or institution's subscription to [SpringerLink](#).
- **Buy the physical book** on [SpringerLink](#). You can avail a 40% discount if you have authored papers/chapters/books with Springer. You can also consider the “MyCopy Softcover” option as a more economical option.
- **Request your University Library** to procure a digital or physical copy of the book with Springer.

Rashina Hoda

Qualitative Research with Socio-Technical Grounded Theory

A Practical Guide to Qualitative
Data Analysis and Theory Development
in the Digital World



 Springer

Rashina Hoda

Qualitative Research with Socio-Technical Grounded Theory

A Practical Guide to Qualitative
Data Analysis and Theory Development
in the Digital World



Rashina Hoda 
Faculty of Information Technology
Monash University
Melbourne, VIC, Australia

ISBN 978-3-031-60532-1 ISBN 978-3-031-60533-8 (eBook)
<https://doi.org/10.1007/978-3-031-60533-8>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2024

This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Cover illustration: iStock.com/antoniookhr

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

If disposing of this product, please recycle the paper.

Dedicated to my parents, Mrs Sabiha Hoda, retired Professor of English Literature, and Dr Najmul Hoda, retired Professor of Pedodontics and WHO Fellow—the original socio-technical influences in my life.

Foreword

Software engineering (SE) has, during its more than half a century of research and practice, gradually been accepted as a socio-technical endeavour. Populated by software engineers and computer scientists, research and development projects have, to a large degree, been staffed mostly by people based on their skills in numbers, algorithms, and structured logic. Consequently, they observed and interpreted the world primarily in terms of numbers, algorithms, and formal structures.

With the emerging insight that not all SE issues can be deduced from mathematical foundations, empirical approaches started to emerge under the label of experimental software engineering during the 1970s and 1980s. Still, the pioneering work was dominantly quantitative, applying hypothesis testing to experimental setups, with humans conducting limited SE tasks in highly controlled environments. While these efforts were groundbreaking in adding rigour to the knowledge creation process, they mostly treated social factors equal to technical factors, trying to control and sample their variation—which due to the huge number and variation of factors is a Sisyphean task.

Caroline Seaman's landmark paper from 1999 on qualitative methods in empirical SE—a silver jubilee this year—broke the ice to acknowledge the social side of SE and consequently to methods emerging from Social Sciences. In the related research area of Information Systems, qualitative methods, including grounded theory (GT), were more commonly received, while the engineering community remained quite sceptical. However, SE researchers gradually adapted and adopted methods from the qualitative tool-box, including my own and colleagues' work on case studies. Still, grounded theory studies were considered somewhat strange birds by many, including myself. Maybe the cult-like character of language in professing oneself to the Glaserian, Strauss-Corbinian, or Constructivist faction was a deterrent? Most probable, ignorance played a bigger role in the scepticism, at least in my own case, where embracement has come with increasing knowledge and understanding of grounded theory principles and practices.

It is therefore highly appreciated that Prof. Rashina Hoda now presents a comprehensive book on Qualitative Research with Socio-Technical Grounded Theory, where she adapts general grounded theory methods to the specific context and audience of socio-technical SE, based on her own extensive research practice. The book has a potential to reduce the ignorance among SE researchers and set a standard for research practice—not the least in the hands of supervisors and peer reviewers. The

book extends and deepens her TSE paper on the same topic, framing it in the research philosophy context, adding detailed guidance and examples of data collection and analysis, as well as of theory development. My only concern is its sheer volume. Few senior researchers allow themselves to read a book from cover to cover. However, they do not have to since the book is well structured and written, allowing the reader to find guidance when needs appear.

In these days of “nulla dies sine AI”,¹ when ML and LLM models are thrown at various data sets for research purposes, what relevance do these technologies have for socio-technical grounded theory? In the concluding chapter, Hoda opens up for a balanced discussion through examples about both technical and social implications of using LLMs, like ChatGPT, in the research process. She concludes that the experienced human analyst still is at the core of grounded theory research, and my hypothesis and hope is that it will remain so even when more powerful tools assist the process.

This book is a valuable and timely contribution to the SE community. It is a gold mine for PhD students who may learn by examples and be empowered to teach their supervisors to adopt socio-technical grounded theory to further advance SE research. It is published at the right time, when the acceptance for qualitative research is growing, and before new attempts to quantify it—for example, by requesting inter-rater statistics in the coding process—have taken ground, and before ChatGPT’s successors have taken over.

Lund, Sweden
March, 2024

Per Runeson

¹ Paraphrase of the Latin phrase “Nulla dies sine linea” meaning “no day without a line”, often read as “no day without a line of writing”. The idea was originated by Pliny the Elder in the first century AD.

Preface

I first caught the qualitative research “bug” as I embarked on my PhD journey around the mid-2000s at Victoria University of Wellington, New Zealand. Agile software development had just started proliferating across the software industry. It placed people at the heart of software engineering (SE), validating my own experiences as a software developer. I became motivated to study agile software teams. Borrowing a qualitative research method from Sociology was a natural choice for this purpose. However, piecing together an understanding of the traditional grounded theory (GT) methods from the many different books written by and for sociologists did not come easy. Subsequently, I wrote several papers elucidating GT steps and procedures and sharing my experiences with the wider SE research community.

Through my own research experience and that of supervising and reviewing others over time, I was convinced of two things. First, it did not have to be that difficult for SE researchers to excel in qualitative research and theory development. Second, there was something unique about the SE research context that meant GT had to be adapted, but that had not been systematically addressed. Motivated by these concerns, I decided to write a book that would serve as a practical guide to ease GT adoption and practice in SE research. By the time I had expanded on how SE researchers could go about charting their paths to qualitative data analysis and theory development, I realised it was no longer Glaserian, Strauss-Corbinian, or Constructivist GT that I was writing about. What I had ended up formulating was a modern socio-technical version of traditional GT. I defined the socio-technical research framework that underpinned my version and called it socio-technical grounded theory (STGT). While traditional GT methods enable the study of social phenomena, STGT enables the study of socio-technical phenomena that abound in SE and related disciplines. Traditional GT methods subscribe to specific research paradigms. In contrast, STGT can be applied with different paradigms depending on physical, virtual, and extended realities and researcher worldviews. Traditional GT methods focus exclusively on enabling theory development. STGT, on the other hand, can be applied as a full method for theory development and in a limited capacity for data analysis within qualitative and mixed-methods research studies. STGT was formally introduced in my TSE article (early access 2021, published 2022) while I continued to write this book.

The book is structured into five parts. Part I—Introduction includes three chapters that serve to provide an overview of the book in Chap. 1 About This Book; a brief history of the origins and evolution of the grounded theory methods in Chap. 2

Traditional Grounded Theory Methods; and an introduction to STGT in Chap. 3 Socio-Technical Grounded Theory: An Overview. Part II—Foundations of Research includes three chapters that serve to cover the foundational building blocks of empirical research through a simple yet powerful approach to designing research methods in Chap. 4 Research Design Canvas; the fundamental concepts of philosophy in Chap. 5 Research Philosophy; and the myriad of literature review methods including those suited to STGT in Chap. 6 Literature Reviews

Part III—Qualitative Data Collection and Analysis includes four chapters that serve to explain the key concepts related to collecting qualitative data in Chap. 7 Basics of Qualitative Data Collection; a wide range of techniques used for collecting qualitative data in Chap. 8 Techniques of Qualitative Data Collection; how to go about preparing and filtering qualitative data in Chap. 9 Qualitative Data Preparation and Filtering; and the data analysis procedures of open coding, constant comparison, and memoing in Chap. 10 STGT for Qualitative Data Analysis.

Part IV—Theory Development includes two chapters that explain what is considered theory (or theoretical outcomes) in Chap. 11 What Is Theory?; and the advanced STGT steps of theory development in Chap. 12 Theory Development. Part V—Evaluation and Future Directions includes two chapters that present the evaluation guidelines for assessing STGT applications and outcomes in Chap. 13 Evaluation Guidelines; and explore new opportunities in qualitative research using large language models in Chap. 14 Future Directions in Qualitative Research.

If you are new to qualitative research or research in general, you will benefit from reading all the chapters, preferably in sequence. If you are considering a *full STGT study*, the book will take you through a full research journey, from an interest in a topic to developing mature theoretical outcomes. If you are considering a limited application of *STGT for data analysis* as part of a qualitative or mixed-methods research study, you will find the chapters in Parts II and III especially valuable.

If you are an experienced researcher who is time-poor, you can select specific chapters to browse (or download in the digital format) based on what piques your interest or addresses your doubts and challenges (see Chap. 1 About This Book for a detailed overview). If you are a reviewer, you will find the foundational research concepts in Part II and evaluation guidelines in Part V particularly illustrative and handy. If you are curious about how the future of qualitative research may be transformed with the advent of large language models powering Generative AI, you will enjoy my interactions with ChatGPT in the last chapter.

Writing this book has been a transformational journey across time, space, and disciplines. The manuscript travelled and transformed with me as I crossed the “ditch” from the University of Auckland, New Zealand, to Monash University, Australia. Even as the global pandemic took much away from us, I found refuge in writing, pouring my passion and experiences into words. It lured me down the rabbit holes of Philosophy and Ethics and into the AI wonderland.

Like most research method guide books, this is a labour of love—my love for qualitative research and confidence in STGT to enable rich studies on socio-technical topics. Simply put, this is the book I wish I had at the start of my research journey. I hope it makes yours easier, enriching, and enjoyable.

Melbourne, VIC, Australia
March, 2024

Rashina Hoda

Acknowledgements

Then which of the favours of your Lord will you deny?

– repeated 31 times, Chapter Ar-Rahmaan (The Compassionate), The Holy Qur'an

All praise be to Allah (Arabic for God), who blessed me with knowledge and patience and surrounded me with supportive and kind people who inspire me.

Narrated Abu Huraira: The Prophet (peace be upon him) said: *He who does not thank the people is not thankful to Allah* (Source: Sunan Abi Dawud 4811)

This book would not have been possible without the unwavering support of my loving family and friends. I am forever indebted to my late grandma—Mrs Qamrun Nisa Begum, a fearless champion of girls education, light-years ahead of her times—whom I will always aspire to emulate; my parents, retired Professors Najmul Hoda and Sabiha Hoda, who gifted me my wings; my husband, Mohammed Asif, who added the wind beneath those wings so I could fly; my elder son, Atif, who was my sounding board and creative guide for many design ideas; and my younger son, Imran, I love you. I am grateful to my brother and *guru*, Asif Hoda, for our numerous discussions on theories during the writing of this book and to my eldest brother, Shariq Hoda, for always expecting the very best from me. I thank my best friend, Amaara Rehmaan, for her faith in me. I lovingly thank my cat, Noorie, who made some serious attempts at contributing to the book by walking across the keyboard and whose antics provided much-needed comic relief.

There are a number of incredible people I need to thank on the professional front. I am sincerely grateful to Barney Glaser and Anselm Strauss for their invaluable contributions to the qualitative research community through the introduction of the original grounded theory research method, and to Juliet Corbin, Anselm Strauss, and Kathy Charmaz for the evolution of the method. My editor at Springer, Ralf Gerstner, for his encouragement, patience, and support through the writing of this book, including some challenging times during the global pandemic. I thank my long-term mentor, John Grundy. When I expressed concern about people being accustomed to reading research guide books authored by men with Anglo-Saxon names and questioned whether anyone would read one written by an usually named woman of colour, he simply replied “it's about time.” My Dean, Ann Nicholson, the mentor I didn't know I needed, for always encouraging me to keep going. My lovely colleagues and students at the HumanISE lab, Software Engineering group, and the wider Faculty of Information Technology.

I am especially grateful to Per Runeson for his wonderful foreword and support of the book. I am highly indebted to Christoph Treude, Philippe Kruchten, Mark Swillup, and John Grundy for their invaluable and in-depth feedback for improvements. I express my sincere gratitude to Margaret-Anne Storey, Klaas-Jan Stol, Zainab Masood, Johannes Berlind Soderqvist, Steve Adolph, Burak Turhan, Dulaji Hidellaarachchi, Bran Selic, Ingo Mueller, Kla Tantithamthavorn, and Arty Starr for providing their inputs and thoughtful feedback. I thank Associate Editor Ana Monero and the anonymous reviewers of my Socio-Technical Grounded Theory (STGT) article in the *IEEE Transactions on Software Engineering*.

There are several acts of kindness I need to acknowledge that have become stepping stones in my book-writing journey. I thank Helen Sharp, Yvonne Dittrich, Alex Soley, and all the participants of the open space session I hosted at XP2018, who enthusiastically cheered me on as I nervously announced my book writing in a public setting for the first time. I am grateful to Xavier Franch for his excellent chairing of my first STGT technical briefing at ICSE 2021 and all the participants of the technical briefings at ICSE 2021, ICSE 2023, ICSE 2024, and various talks and seminars on STGT. I am grateful to Margaret-Anne Storey, Evan Leybourn, Alessandro Garcia and Wesley K. G. Assunção, and Zerina Tomkins for inviting me to present to the empirical research methods class, the Business Agility Institute's research group, the PUC-Rio graduate course, and the Digital Health Week 2023, respectively—all of these experiences helped me address a wide range of needs and audiences. I am grateful to Rachel Slattery for allowing me to use her talk and article as an example of visual notes-taking and open coding, and to Paul McIntosh whose pro tip for proof reading proved highly effective towards the end of my book-writing journey.

I am extremely grateful to those who guided me at the beginning of my research journey, my PhD supervisors, James Noble for believing in me when I doubted myself, and Stuart Marshall, for our numerous debates on qualitative research. I thank George Allan for planting the seed of adapting traditional GT in my mind many years ago. I thank Angela Martin and Michael Waterman with whom I exchanged tips and tricks of the trade as we navigated our PhD journeys. I am blessed to have been able to guide the PhD journeys of Zainab Masood, Yogeshwar Shastri, Yanti Andriyani, and Latha Murugesan at the University of Auckland, New Zealand, and Kashumi Madapme, Aastha Pant, Dulaji Hidellaarachchi, Hashini Gunatilake, Ulrike Maria Graetsch, and Harsha Perera at Monash University, Melbourne.

I express my sincere gratitude to all the industry practitioners worldwide who have participated in my research studies and those run by my students over the years—your generously shared experiences make our research grounded. I thank all those people who have ever asked me a question or two, and expressed their curiosity, interests, concerns, confusion, or frustration with qualitative data analysis and theory development—I have tried to address them in the book. I humbly acknowledge all those new and seasoned researchers who are using STGT in their research in expected and unexpected domains, including software engineering, requirements engineering,

artificial intelligence, human robot interaction, human computer interaction, digital health, blockchain, and other emerging and interdisciplinary areas.

Finally, I thank you, the reader, who has picked up this book, for being interested in learning about qualitative research, producing robust qualitative findings, and possibly even developing theories—this is for *you*, I hope it helps!

Contents

Dedication	v
Foreword	vii
Preface	ix
Acknowledgements	xiii
About the Author	xxv
Part I Introduction	1
1 About This Book	3
1.1 Why This Book? Why Now?	3
1.1.1 Qualitative Research in a Digital World	4
1.1.2 Rise of Human Aspects Research	5
1.1.3 Growing Interest in Theory Development	6
1.1.4 Challenges of Traditional Grounded Theory Methods	7
1.2 Who Is This Book For?	7
1.3 How to Use This Book?	9
1.4 Role of This Book	11
References	12
2 Traditional Grounded Theory Methods	15
2.1 Research Methods	16
2.2 Origin of Grounded Theory	18
2.3 The Traditional Grounded Theory Methods	19
2.4 Evolution of Traditional Grounded Theory	21
2.5 Traditional Grounded Theory in Software Engineering	22
2.6 When to Use Traditional Grounded Theory?	24

2.7	Traditional Grounded Theory Challenges	25
2.7.1	Eager But Not Equipped	26
2.7.2	No Version Control	26
2.7.3	Scope Confusion	27
2.7.4	DIY Gone Wrong	27
2.7.5	Evidence Gate Keeping	28
2.7.6	The Facade	29
2.7.7	Poor Presentation	29
2.7.8	Extreme Reviews	30
2.8	Addressing the Challenges	30
2.9	Summary	32
	References	33
3	Socio-Technical Grounded Theory: An Overview	37
3.1	What Is Socio-Technical Research?	39
3.1.1	Social Science Research Approach	39
3.1.2	Socio-Technical Research Framework	41
3.2	Socio-Technical Grounded Theory	44
3.2.1	Research Topics and Questions	45
3.2.2	Philosophical Foundations	45
3.2.3	Methodological Steps and Procedures	48
3.2.4	Two Application Levels	50
3.2.5	Application Selection Guide	51
3.2.6	Application Scope	53
3.2.7	Evaluation Guidelines	55
3.3	Summary	55
	References	56
	Part II Foundations of Research	59
4	Research Design Canvas	61
4.1	The Research Project	61
4.2	The Research Design Canvas	62
4.3	The Research Team	65
4.4	The Research Domain and Actors	69
4.5	The Research Topic	70
4.6	The Research Ethics	73
4.6.1	Ethics for Custom Collected Data	73
4.6.2	Ethics for Public Data	74
4.6.3	Ethics Approvals	74
4.7	The Research Values	75
4.8	The Research Questions	78
4.8.1	Types of Research Questions	78
4.8.2	Evolving Questions	80
4.8.3	Research Questions vs Hypotheses	80

4.9	The Research Philosophy	82
4.10	The Research Protocols	83
4.10.1	Research Data	83
4.10.2	Research Analysis Techniques	85
4.10.3	Research Tools	86
4.11	The Research Impact	88
4.12	The Pilot Study	89
4.13	Summary	90
	References	91
5	Research Philosophy	93
5.1	Why Research Philosophy	94
5.2	Reasoning	95
5.2.1	Inductive Reasoning	96
5.2.2	Deductive Reasoning	97
5.2.3	Abductive Reasoning	99
5.3	Ontology	101
5.3.1	STGT Expands Ontology	102
5.4	Epistemology	104
5.4.1	STGT Expands Epistemological Choices	105
5.5	Research Paradigms	105
5.5.1	Constructivism	106
5.5.2	Positivism and Postpositivism	108
5.5.3	Other Approaches and Perspectives	109
5.6	Summary	110
	References	110
6	Literature Reviews	113
6.1	Why Literature Review?	114
6.2	Literature Reviews in Socio-Technical Grounded Theory	117
6.2.1	Lean Literature Review	119
6.2.2	Targeted Literature Review	125
6.2.3	Grounded Theory Literature Review	129
6.3	Other Literature Reviews	132
6.3.1	Informal Review	132
6.3.2	Systematic Reviews	133
6.4	Literature Review Selection Guide	134
6.5	Summary	136
	References	136
Part III	Qualitative Data Collection and Analysis	139
7	Basics of Qualitative Data Collection	141
7.1	Iterative Data Collection and Analysis	142
7.1.1	Working in Batches	143
7.1.2	Estimating Batch Sizes	145

7.2	Sampling Techniques	145
7.2.1	Convenience Sampling	146
7.2.2	Snowball Sampling	146
7.2.3	Random Sampling	147
7.2.4	Representative Sampling	147
7.2.5	Theoretical Sampling	148
7.3	Tips for Data Collection	149
7.3.1	Tips for Effective Sampling	149
7.3.2	Tips for Effective Recruitment	151
7.3.3	Tips for Effective Engagement	154
7.4	Dealing with Data	156
7.4.1	Data Ethics	156
7.4.2	Data Sharing	157
7.4.3	Data Quality	158
7.4.4	Data Usage	161
7.4.5	Data Quantity and Theoretical Saturation	162
7.5	Summary	165
	References	165
8	Techniques of Qualitative Data Collection	167
8.1	Data Collection Techniques	167
8.1.1	Custom-Data Collection	169
8.1.2	Existing-Data Collection	170
8.2	Pre-interview Questionnaires	171
8.2.1	Advantages of Pre-interview Questionnaires	172
8.2.2	Sample Pre-interview Questionnaire	173
8.2.3	Tips for Designing Pre-interview Questionnaires	173
8.2.4	Usage and Tools for Administering the Pre-interview Questionnaire	176
8.2.5	Threats and Limitations of Pre-interview Questionnaires	176
8.3	Semi-structured Interviews	177
8.3.1	Advantages of Interviews	177
8.3.2	Sample Interview	178
8.3.3	Tips for Designing and Conducting Interviews	181
8.3.4	Usage and Tools for Interviewing	187
8.3.5	Threats and Limitations of Interviews	188
8.4	Observations	189
8.4.1	Advantages of Observations	189
8.4.2	Sample Observations	190
8.4.3	Tips for Conducting Observations	191
8.4.4	Usage and Tools for Observations	192
8.4.5	Threats and Limitations	192
8.5	Other Data Sources and Collection Techniques	193

8.5.1	Focus Groups	193
8.5.2	Surveys	194
8.5.3	Recordings	195
8.5.4	Texts	195
8.5.5	Social Media.....	196
8.5.6	Artefacts	196
8.5.7	Data Mining	197
8.5.8	Immersive Experiences in Extended Realities	198
8.6	Summary	199
	References	199
9	Qualitative Data Preparation and Filtering	201
9.1	Data Preparation	202
9.1.1	Preparing Interview Data	203
9.1.2	Preparing Observational Data.....	203
9.1.3	Preparing Recordings Data	204
9.1.4	Preparing Survey Data.....	204
9.1.5	Preparing Text-Based Data	205
9.1.6	Data Storage and Organisation	205
9.2	Data Filtering	206
9.2.1	Key Information	208
9.2.2	Contextual Information	209
9.2.3	Noise	214
9.3	Tips on Data Filtering	218
9.3.1	Discard Invalid Data	218
9.3.2	Go Gentle on Noise Cancellation	218
9.3.3	Treat Sensitive Demographic Information Carefully	219
9.3.4	Distinguish Between Key and Contextual Information	219
9.3.5	Distinguish Between Process of Abstraction and Noise.....	220
9.3.6	Leverage Fringe Benefits of “Interesting Noise”	220
9.4	Summary	221
	References	222
10	Socio-technical Grounded Theory for Qualitative Data Analysis	223
10.1	Basics of Qualitative Data Analysis	224
10.2	Preparing for Qualitative Data Analysis	225
10.2.1	The Mindset	225
10.2.2	The Approach	226
10.2.3	The Assumptions List	227
10.2.4	The Worldview	228
10.2.5	A Visual Notes-Taking Analogy	229
10.3	Open Coding	232
10.3.1	Open Coding with Hashtags	233
10.3.2	Open Coding: An Example	234
10.3.3	The Zoom Out-Zoom In Technique	236

10.3.4	Drawing Out Analytical Codes	237
10.3.5	Drawing Out Socio-technical Codes	241
10.3.6	Considering Options and Revising Codes	246
10.4	Constant Comparison	248
10.4.1	Increasing Levels of Abstraction	248
10.4.2	Constant Comparison: An Example	250
10.5	Memoing	252
10.5.1	Types and Forms of Memos	253
10.5.2	Quality and Quantity of Memos	254
10.5.3	Using Memos	255
10.6	Tips for Data Analysis	255
10.6.1	Create Clear and Strong Codes	255
10.6.2	Code for Richness	256
10.6.3	Fill in the Context	257
10.6.4	Apply a Research Paradigm	258
10.6.5	Improve Theoretical Sensitivity	259
10.7	Team-Based Coding	260
10.7.1	Why Inconsistencies Arise Across Multiple Coders	260
10.7.2	A Word About Inter-coder Reliability	261
10.7.3	Guidelines for Achieving Alignment in a Coding Team	262
10.8	Expected Outcomes	265
10.9	Summary	265
	References	266
Part IV Theory Development		269
11	What Is Theory?	271
11.1	What Is Theory?	271
11.1.1	Random and Educated Guesses	273
11.1.2	Research-Based Predictions	274
11.1.3	Scientific Laws	274
11.1.4	Scientific Theories	276
11.2	Socio-technical Grounded Theories	279
11.3	Expected Outcomes	281
11.3.1	Broad and High-Level Theoretical Outcomes	282
11.3.2	Focused and High-Level Theoretical Outcomes	282
11.3.3	Focused and In-Depth Theoretical Outcomes	283
11.3.4	Broad and In-Depth Theoretical Outcomes	284
11.4	Summary	284
	References	285
12	Theory Development	287
12.1	Attitude to Theory Development	288
12.2	Approach to Theory Development	290

12.3	Theory Development: Selecting a Mode	290
12.4	Theory Development: Common Procedures	294
12.4.1	Theoretical Sampling	295
12.4.2	Advanced Memoing	295
12.4.3	Targeted Literature Review	297
12.4.4	Theoretical Saturation	298
12.5	Emergent Mode	298
12.5.1	Targeted Data Collection	299
12.5.2	Targeted Data Analysis	299
12.5.3	Theoretical Structuring	300
12.5.4	Applying the Emergent Mode: A Practical Example	302
12.6	Structured Mode	306
12.6.1	Structured Data Collection	306
12.6.2	Structured Data Analysis	307
12.6.3	Theoretical Integration	308
12.6.4	Applying the Structured Mode: A Practical Example	309
12.7	Reporting Outcomes	312
12.7.1	As Traditional Outputs	312
12.7.2	As Other Outputs	314
12.8	Presenting Outcomes	314
12.8.1	As Theory Statement	314
12.8.2	As Theory Diagram	316
12.8.3	With Examples of Raw Data	319
12.9	Nuances of Theory Development	319
12.9.1	Role of Theoretical Sensitivity	319
12.9.2	Role of Deduction	320
12.9.3	Role of Abduction	321
12.9.4	Importance of Visualisation	322
12.9.5	Structuring and Integration	323
12.9.6	Narrowing Down Versus Validation	323
12.10	Is Theory Development for Me? Quiz	324
12.11	Summary	328
	References	328
	Part V Evaluation and Future Directions	331
13	Evaluation Guidelines	333
13.1	Evaluation Approach	334
13.1.1	Assessing Review Suitability	334
13.1.2	Acknowledging Default Position	335
13.1.3	Establishing an Acceptance Threshold	335
13.1.4	Cultivating a Constructive Feedback Style	336
13.2	Evaluation Criteria	336

13.3	Evaluating STGT Application	337
13.3.1	Credibility	338
13.3.2	Rigour	339
13.4	Evaluating STGT Outcomes	340
13.4.1	Evaluating Outcomes from STGT for Data Analysis	340
13.4.2	Evaluating Outcomes from Full STGT Studies	343
13.5	Summary	346
	References	347
14	Future Directions in Qualitative Research	349
14.1	Qualitative Research with LLMs	349
14.2	Exploring ChatGPT for Qualitative Data Analysis	350
14.2.1	Can ChatGPT Perform Qualitative Data Analysis?	351
14.2.2	Can ChatGPT Review Qualitative Data Analysis?	353
14.2.3	Can ChatGPT Generate Theories?	356
14.2.4	LLM-Assisted Qualitative Research	360
14.3	Further Applications	362
14.3.1	Beyond Grounded Theory	362
14.3.2	Beyond Software Engineering	362
14.4	Summary	363
	References	363
	Index	365

About the Author

Rashina Hoda is a Professor of Software Engineering in the Faculty of Information Technology at Monash University, Australia, where she researches the human and socio-technical aspects of software engineering (SE) and artificial intelligence. She is passionate about helping people improve processes and outcomes—reflected in her empirical research on agile methods, mentoring of early career researchers on the use of research methods, and her educating of the next generation of software engineers. She is a passionate champion of marginalised girls and women in STEM and serves as the Associate Dean (Equity Diversity and Inclusion).

Rashina has been immersed in empirical research for two decades, practising, supervising, reviewing, and editing qualitative and mixed methods SE research. She has published over 130 peer-reviewed papers in premier SE venues, many being outcomes of Grounded Theory (GT) research. Two of her GT papers appear in the five “most comprehensive and detailed” of the nearly hundred papers reviewed in a critical review of GT in SE research by Stol et al. (2016). She received a distinguished paper award at the International Conference on Software Engineering (ICSE 2017).

Based on years of learning and reflections, she adapted the traditional GT methods to suit the unique socio-technical context of SE research projects and developed socio-technical grounded theory (STGT). She first introduced STGT in a TSE paper (early access 2021, published 2022) and has since presented it as a journal first talk at ICSE 2022 and as technical briefings at ICSE 2021, ICSE 2023, and ICSE 2024.

She is an active member of the international SE research community, serving as an Associate Editor of IEEE Transactions on Software Engineering and on the organising and programme committees for ICSE, International Conference on the Cooperative and Human Aspects of Software Engineering (CHASE), Foundations of Software Engineering (FSE), International Conference on Information Systems (ICIS), and International Conference on Agile Software Development (XP). She is a public speaker, presenting her research at TEDxAuckland, Agile conferences, industry and public events, and in news, print, and media.

Previously, she was a Senior Lecturer at the University of Auckland, New Zealand. She holds a PhD in Computer Science from Victoria University of Wellington, New Zealand, and a Bachelors (Honours) degree in Computer Science from Louisiana State University, USA. She has also had a short experience in the industry as a software developer. Rashina is often described as having a knack for presenting complex ideas in simple, clear, and engaging ways, a skill liberally applied in this book. In her free time, she enjoys sketching, reading, writing poems and short stories, walking in nature, and spending time with family and friends.