# Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td>xiii</td>
</tr>
<tr>
<td>Acknowledgement</td>
<td>xv</td>
</tr>
<tr>
<td>Abstract</td>
<td>xvii</td>
</tr>
</tbody>
</table>

## 1 What Is Research?

1.1 Introduction ................................................. 1
1.2 Research and Development: What Is the Difference? ........ 3
1.3 Research, Development and PhD Students ....................... 4
Tasks .............................................................. 5

## 2 Why Are We Researchers?

2.1 Introduction .................................................. 7
2.2 What Is the Aim of PhD? ...................................... 9
2.3 University and Their PhD Students ............................ 10
2.4 Causes of Stress for the Candidates .......................... 10
2.5 Shortcomings of Output Focused PhD .......................... 12
2.6 Managing the Short-Term Demands ............................. 13
Tasks .............................................................. 14

## 3 Attributes of a Researcher

3.1 Introduction .................................................. 15
3.2 Knowledge and Creativity ..................................... 16
3.2.1 Researcher Attribute – Knowledge ........................ 17
3.2.1.1 Ideas vs. literature review ............................. 17
3.2.1.2 Literature review: Attention to detail ............... 18
3.2.2 Researcher Attributes: Creativity ........................ 19
3.2.2.1 Fostering creativity .................................... 19
3.3 Research Attributes: Resilient and Self-Confident .......... 20
3.3.1 Supporting to Develop Self-Confidence .................... 22
3.4 Research Attributes: Planning and Discipline .................................. 23
  3.4.1 Time Management ..................................................................... 24
3.5 Researcher Attribute: Flexibility .................................................. 25
3.6 Researcher Attributes: Communication ....................................... 25
  3.6.1 What Is Communication? .......................................................... 26
  3.6.2 Clarity of the Message ............................................................... 26
  3.6.3 Ability to Listen ........................................................................ 26
3.7 Research Attributes: Partnership and Networking ....................... 27
  3.7.1 Networking with Other Researchers ....................................... 28
  3.7.2 Partnership with Industry and External Agencies ...................... 28

Tasks ..................................................................................................... 29

4 The Supervisor and the Supervised .................................................... 31
  4.1 Introduction .................................................................................... 31
  4.2 Student and Supervisor ............................................................... 33
    4.2.1 Supervisor and the Student; Reality Check .............................. 33
    4.2.2 An Ideal Supervisor ............................................................... 33
    4.2.3 An Ideal Student .................................................................... 34
    4.2.4 The Real Situation .................................................................. 35
    4.2.5 The Real Supervisor ............................................................... 36
      4.2.5.1 The supervisor does not appear to have the time for
              the student or the project .................................................... 36
        4.2.5.1.1 Suggestions to the student ....................................... 37
      4.2.5.2 The supervisor appears to be unreasonable in the
              expectations of the student ............................................... 38
      4.2.5.3 Supervisor does not appear to have the knowledge of
              the topic ........................................................................... 39
      4.2.5.4 Supervisor does not appear to be interested in the
              student, the topic or the outcomes .................................... 40
      4.2.5.5 Supervisor makes personal remarks or invitations .............. 40
        4.2.5.5.6 Romantic liaison ....................................................... 41
      4.2.5.7 Supervisor personality type; Lacks emotions or is too emotional .................................................. 42
      4.2.5.8 Personality clash ............................................................ 43
    4.2.6 Real Research Student ............................................................ 44
      4.2.6.1 Transition from undergraduate to post-graduate ............... 44
        4.2.6.1.1 Change of expectations ........................................... 45
4.3 Selection of the Supervisor and Student .......................... 45
  4.3.1 Background of Student .................................... 46
4.4 Networking ......................................................... 47
  4.4.1 Networking with Other Professors .......................... 47
  4.4.2 Industry Partnership: Support for Students ............... 47
4.5 Dispute Management and Resolution ............................. 48
  4.5.1 Causes of Disputes .......................................... 48
    4.5.1.1 Expectations .................................. 49
    4.5.1.2 Challenge of research outcomes .................. 49
    4.5.1.3 Personal beliefs and desires ...................... 50
  4.5.2 Resolving and Managing Disputes .......................... 50
4.6 Communication – Supervisor and the Supervised ............... 51
4.7 Being Mindful with Supervisor ................................ 52
  Tasks .............................................................. 53

5 Responsibilities of a Researcher .................................. 55
  5.1 Introduction ................................................... 55
  5.2 Accountability ................................................ 56
    5.2.1 What Is the Need? .................................... 56
    5.2.2 Comparison between Researchers ...................... 57
    5.2.3 Challenges in Measuring Research Outcomes ............ 57
  5.3 Measuring Research Outcome .................................. 60
    5.3.1 Some Measures of Research Impact ..................... 61
  5.4 Need for Peer Review ......................................... 62
  5.5 Publications for Spread and Growth of Knowledge .......... 63
    5.5.1 Review Process: Spread of Knowledge ................. 64
  5.6 Review Process ................................................ 64
    5.6.1 Managing the Review Process .......................... 65
  5.7 Summary of Responsibilities of Researchers .................. 66
  Tasks .............................................................. 66

6 Continuing to Be a Researcher: Motivation Issues for Researchers .................................. 67
  6.1 Introduction ................................................... 67
  6.2 Mid-Candidature Blues ......................................... 69
  6.3 Why Do We Get the Blues? ................................... 70
  6.4 Motivating a Researcher – Suggestions for the Supervisor 72
    6.4.1 Corporate Style Carrot and Stick Approach ............ 72
    6.4.2 Accolades and Shaming ............................... 73
    6.4.3 Finding Motivation is Personal ...................... 73
6.5 How to Motivate Yourself? .......................... 74
  6.5.1 Identifying the Different States .................. 76
  6.5.2 Lazy and Confused State: What Happens? ..... 77
  6.5.2.1 Lazy and confused state: What to do? ...... 78
  6.5.3 In the Active State ............................. 79
  6.5.4 The Creative State .............................. 81
    6.5.4.1 Stating the vision ......................... 82
    6.5.4.2 Planning for the vision .................... 82
    6.5.4.3 Short term goals .......................... 83
6.6 How to Become Productive? ........................ 84
  Tasks ............................................. 84

7 Research Proposal 85
  Task Before You Start This Chapter .................... 85
  7.1 Introduction ................................... 86
    7.1.1 Dynamic Idleness ............................ 86
    7.1.2 Mid-Candidature Blues ....................... 87
  7.2 Purpose of Research Proposals ..................... 88
  7.3 What Is a Research Proposal? ....................... 88
  7.4 Developing the Research Proposal ................. 89
    7.4.1 Title ..................................... 90
    7.4.2 Aim ...................................... 90
    7.4.3 Objective ................................. 91
    7.4.4 Scope ..................................... 91
      7.4.4.1 Example to explain scope ............... 92
    7.4.5 Research Questions ........................... 92
      7.4.5.1 Example of research proposal .......... 93
    7.4.6 Developing the Hypothesis ..................... 95
      7.4.6.1 Example for developing the hypothesis .. 95
    7.4.7 Developing the Methodology ................... 96
    7.4.8 Time Frame ................................ 97
      7.4.8.1 Project timeline ........................ 97
      7.4.8.2 Regularity in timeline .................... 98
      7.4.8.3 Changes to the timeline ................... 98
    7.4.9 Milestones ................................. 99
  Tasks ............................................. 99

8 Planning the Experiments 101
  8.1 Introduction ................................... 101
  8.2 Focus and Scope ................................. 102
| 9.7 | Listening and Observing | 123 |
| 9.8 | Planning the Presentation | 124 |
| 9.8.1 | How to Start: A Brief to Put in Context | 124 |
| 9.8.1.1 | Example | 125 |
| 9.8.1.2 | Example | 125 |
| 9.8.2 | Content | 126 |
| 9.8.3 | Conclusion | 126 |
| 9.8.3.1 | Facts and opinion | 127 |
| 9.9 | Style of Communication | 127 |
| 9.9.1 | Aggressive Communication | 128 |
| 9.9.2 | Passive Communication | 128 |
| 9.9.3 | Assertive Communication | 128 |
| 9.9.4 | Examples: Aggressive and Assertive Communication | 129 |
| 9.10 | Written Communication | 130 |
| 9.10.1 | Informal Written Communication | 131 |
| 9.10.1.1 | Writing emails | 132 |
| 9.11 | Formal Written Communication | 134 |
| 9.11.1 | Structure | 134 |
| 9.11.2 | Style | 135 |
| 9.11.2.1 | Compact | 135 |
| 9.11.2.2 | Formal | 135 |
| 9.11.2.3 | Simple statements | 136 |
| 9.11.3 | Content | 136 |
| 9.12 | Some Points for Effective Written Communication | 137 |
| Tasks | 138 |

### 10 Why Publish? 139

| 10.1 | Introduction | 139 |
| 10.2 | Peer Review of Research | 140 |
| 10.3 | Publications for Accountability | 141 |
| 10.4 | Manuscript Submissions as Milestones | 142 |
| 10.5 | Publications for Employability | 143 |
| 10.6 | How to Stand Out of the Crowd? | 144 |
| 10.7 | Benefit to the Society | 145 |
| 10.8 | Measure of Outcomes | 146 |
| 10.9 | Getting the Balance | 147 |
| Tasks | 148 |
11 How to Publish: Writing Manuscripts

11.1 Introduction ................................................. 149
11.2 Target Audience ............................................ 150
11.3 When to Start the Manuscript? ......................... 151
11.4 Develop a Plan .............................................. 152
11.5 Typical Subheadings of a Paper in Science, Engineering and Health ............................................ 152
11.6 Starting the Manuscript ........................................ 153
11.7 The Title .................................................. 154
11.8 Abstract ................................................... 154
11.9 Writing the Introduction ...................................... 155
11.9.1 Introduction – Some Common Mistakes ............... 156
11.10 Theory ................................................... 157
11.11 Methodology ............................................... 158
11.12 Data Analysis .............................................. 159
11.13 Discussion ............................................... 159
11.14 Conclusion ............................................... 160
11.15 Paper Iterations ........................................... 160
11.16 List of Authors ............................................. 161
11.17 What Gets Published? ...................................... 161
11.18 What Gets Rejected? ....................................... 163
11.19 Post-Submission of Manuscript ......................... 163
11.20 Difference between Thesis and Manuscript ............ 164
11.21 Review Process ........................................... 165
11.22 Managing the Review Process ............................ 167
11.22 Tasks .................................................. 168

Appendix ................................. 169
Index ........................................ 171
About the Author ......................... 173