Contents

Foreword Satya Nadella vii

Preface Klaus Schwab ix

Introduction 1

Section 1 The Fourth Industrial Revolution 5

Framing the Fourth Industrial Revolution 7
Connecting the Dots 18
Embedding Values in Technologies 29
A Human Rights–Based Framework 47
Empowering All Stakcholdcrs 49

Section 2 Technologies, Opportunities and Disruption 67

2.1 Extending Digital Technologies 75
New Computing Technologies 77
Blockchain and Distributed Ledger Technologies 87
The Internet of Things 98
Highlight on Data Ethics 110
Cyber Risks 114

2.2 Reforming the Physical World 121
Artificial Intelligence and Robotics 123
Advanced Materials 134
Additive Manufacturing and Multidimensional Printing 142
The Upside and Downside of Drones 150

2.3 Altering the Human Being 155
Biotechnologies 157
Neurotechnologies 167
Virtual and Augmented Realities 177
A Perspective on Arts, Culture, and the Fourth Industrial Revolution 188

2.4 Integrating the Environment 193
Energy Capture, Storage and Transmission 195
Geoengineering 203
Space Technologies 211

Conclusion: What You Can Do to Shape the Fourth Industrial Revolution 220

Acknowledgments 241
Contributors 248
References 251
Notes 267