## **Contents**

Preface —— IX
Introduction — 1 Unprecedented Opportunity — 1 Scientific Background — 1 Humanism — 3 Book Objectives — 4 Chapter Overview — 4
Chapter 1 A Brief History of Modern Science —— 8
Chapter 2 The Four Sciences Shaping the 21st Century —— 11 Complexity Science —— 11 Network —— 13 Systems Thinking —— 16 Information Theory —— 18
Chapter 3  Modern Economics — 20  Information Economics — 20  Asymmetry of Information — 21  Techno-economic Paradigms — 22
Chapter 4 Artificial Intelligence (AI) — 26 Background — 26 A Short History of AI — 27 The Market Forecast for AI — 33
Chapter 5 5 Pillars to Reimagine 4IR Strategy — 34 Design — 36 Adaptability — 37 Uncertainty — 38 Collective Intelligence — 40 Platforms — 42

Chapter 6
The Dawn of a New Era: The Second Renaissance —— 44
Paradigm 1: Advanced Computing —— 45
Paradigm 2: Augmented Collective Intelligence (ACI) —— 47
Chapter 7
Real World Examples of Advanced Computing and Augmented Collective
Intelligence (ACI) —— 53
Biology —— <b>54</b>
Materials Science —— <b>55</b>
Environmental Science —— <b>58</b>
Urban Studies —— <b>60</b>
Other Examples —— <b>61</b>
Chapter 8
The Burden of a Second Renaissance —— 63
Research Focus — 64
Cybersecurity —— 65
Sustainability — <b>67</b>
Concentration of Advanced Computing Resources —— <b>70</b>
concentration of Advanced compating Resources
Chapter 9
The Problems to be Solved —— 72
Messy Problems —— 72
UN Problems —— <b>74</b>
Deep Tech —— <b>75</b>
Chapter 10
The 21 <sup>st</sup> Century Business Model —— 78
The History of Business Model — 78
A New Approach to Business Model —— <b>80</b>
Technical Infrastructure — 82
recinical fill astructure 32
Chapter 11
Further Considerations for Business Model —— 87
Customer Value Proposition —— 87
Customer Experience —— 93
Sustainable Competitive Advantage —— <b>94</b>
Timing —— <b>96</b>

## Chapter 12 Go-To-Market Tips — 98 Minimum Viable Product (MVP) — 98 Product Market Fit — 99 Funding — 99 Team — 100 Chapter 13 A Conlusion — 102 Federal Government Policy — 103 Education — 107 Environment — 108 Chapter 14 A Closing Thought — 110 References — 111

List of Figures —— 117