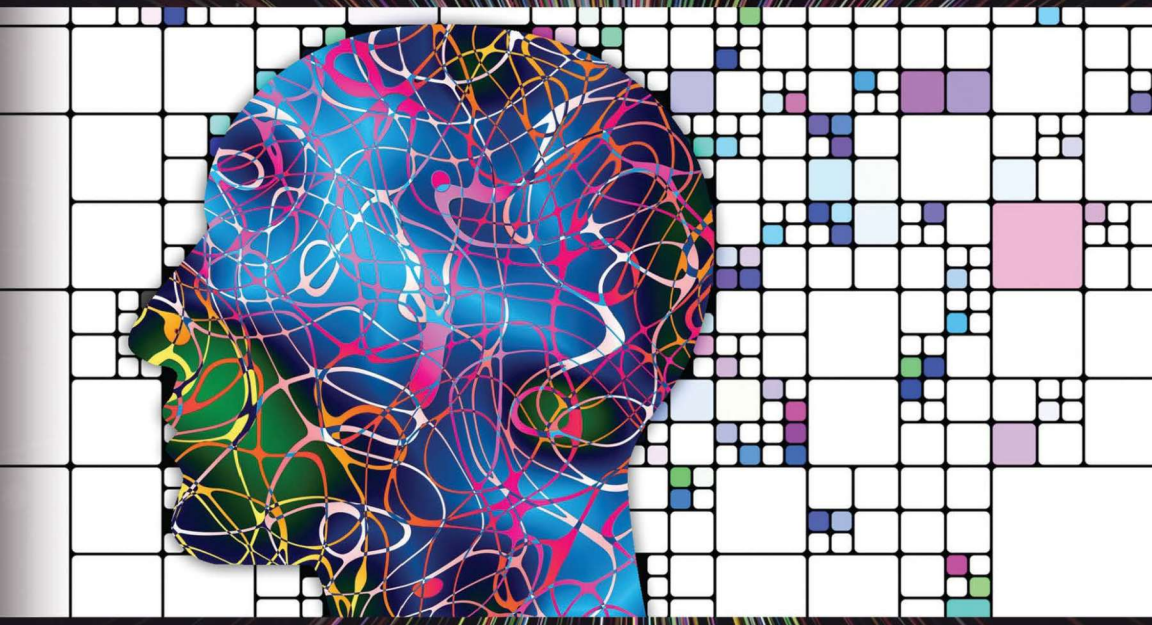
# HUMAN-MACHINE INTERFACE

## *Making Healthcare Digital*



*Edited By*
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# Human-Machine Interface

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## Making Healthcare Digital

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# Dedication

*This book is dedicated to all those wonderful readers who are working in healthcare and put their effort into improved patient care.*

# Contents

**Foreword** xxiii

**Preface** xxv

**Acknowledgement** xxvii

**Part I: Advanced Patient Care with HMI** 1

**1 Introduction to Human-Machine Interface** 3
*Shama Mujawar, Aarohi Deshpande, Aarohi Gherkar, Samson Eugin Simon and Bhupendra Prajapati*

1.1 Introduction 4
1.2 Types of HMI 6
1.2.1 The Pushbutton Replacer 6
1.2.2 The Data Handler 7
1.2.3 The Overseer 7
1.3 Transformation of HMI 7
1.4 Importance and COVID Relevance With HMI 9
1.5 Applications 11
1.5.1 Biological Applications 12
1.5.1.1 HMI Signal Detection and Procurement Method 12
1.5.1.2 Healthcare and Rehabilitation 12
1.5.1.3 Magnetoencephalography 13
1.5.1.4 Flexible Hybrid Electronics (FHE) 13
1.5.1.5 Robotic-Assisted Surgeries 13
1.5.1.6 Flexible Microstructural Pressure Sensors 14
1.5.1.7 Biomedical Applications 14
1.5.1.8 CB-HMI 15
1.5.1.9 HMI in Medical Devices 15
1.5.2 Industrial Applications 15
1.5.2.1 Metal Industries 16

1.5.2.2 Video Game Industry 16
1.5.2.3 Aerospace and Defense 16
1.5.2.4 Water Purification Plant HMI Based on Multi-Agent Systems (MAS) 17
1.5.2.5 Virtual and Haptic Interfaces 17
1.5.2.6 Space Crafts 17
1.5.2.7 Car Wash System 18
1.5.2.8 Pharmaceutical Processing and Industries 18
1.6 Challenges 18
1.7 Conclusion and Future Prospects 19
References 20

**2 Improving Healthcare Practice by Using HMI Interface 25**
***Vaibhav Verma, Vivek Dave and Pranay Wal***
2.1 Background of Human-Machine Interaction 26
2.2 Introduction 26
2.2.1 Healthcare Practice 26
2.2.2 Human-Machine Interface System in Healthcare 26
2.3 Evolution of HMI Design 27
2.3.1 HMI Design 1.0 27
2.3.2 HMI Design 2.0 28
2.3.3 HMI Design 3.0 28
2.3.4 HMI Design 4.0 28
2.4 Anatomy of Human Brain 28
2.5 Signal Associated With Brain 31
2.5.1 Evoked Signals 31
2.5.2 Spontaneous Signals 32
2.5.3 Hybrid Signals 32
2.6 HMI Signal Processing and Acquisition Methods 32
2.7 Human-Machine Interface–Based Healthcare System 36
2.7.1 Healthcare Practice System 36
2.7.1.1 Healthcare Practice 36
2.7.1.2 Current State of Healthcare Provision 37
2.7.1.3 Concerns With Domestic Healthcare 38
2.7.2 Medical Education System 38
2.7.2.1 Traditional and Modern Way of Providing Medical Education 38
2.8 Working Model of HMI 38
2.9 Challenges and Limitations of HMI Design 40
2.10 Role of HMI in Healthcare Practice 40
2.10.1 Simple to Clean 41

2.10.2 High Chemical Tolerance 41
2.10.3 Transportable and Light 41
2.10.4 Enhancing Communication 41
2.11 Application of HMI Technology in Medical Fields 42
2.11.1 Medical and Rehabilitative Engineering Using HMI 42
2.11.2 Controls for Robotic Surgery and Human Prosthetics 45
2.11.3 Sensory Replacement Mechanism 47
2.11.4 Wheelchairs and Moving Robots Along With Neurological Interface 48
2.11.5 Cognitive Improvement 49
2.12 Conclusion and Future Perspective 51
References 52

**3 Human-Machine Interface and Patient Safety 59**
***Arun Kumar Singh and Rishabha Malviya***
3.1 Introduction 59
3.2 Detecting Anesthesia-Related Drug Administration Errors and Predicting Their Impact 60
3.2.1 Methodological Difficulties in Studying Rare, Dangerous Phenomena 61
3.2.2 Consequences of Errors 63
3.2.3 Lessons From Other Industries 65
3.2.4 The Double-Human Interface 66
3.2.5 The Culture of Denial and Effort 67
3.2.6 Poor Labeling 68
3.3 Systematic Approaches to Improve Patient Safety During Anesthesia 69
3.3.1 Design Principles 69
3.3.2 Evidence of Safety Gains 70
3.3.3 Consistent Color-Coding 71
3.3.4 The Codonics Label System 72
3.4 The Triumph of Software 73
3.4.1 Software in Hospitals 74
3.4.2 Software in Anesthesia 75
3.4.3 The Alarm Problem 76
3.5 Environments that Audit Themselves 77
3.6 New Risks and Dangers 77
3.7 Conclusion 78
References 79

**4 Human-Machine Interface Improving Quality of Patient Care 89**
***Rishav Sharma and Rishabha Malviya***
4.1 Introduction 90
4.2 An Advanced Framework for Human-Machine Interaction 92
4.2.1 A Simulated Workplace Safety and Health Program 92
4.3 Human–Computer Interaction (HCI) 93
4.4 Multimodal Processing 95
4.5 Integrated Multimodality at a Lower Order (Stimulus Orientation) 96
4.6 Higher-Order Multimodal Integration (Perceptual Binding) 96
4.7 Gains in Performance From Multisensory Stimulation 97
4.8 Amplitude Envelope and Alarm Design 98
4.9 Recent Trends in Alarm Tone Design for Medical Devices 99
4.10 Percussive Tone Integration in Multimodal User Interfaces 99
4.11 Software in Hospitals 100
4.12 Brain–Machine Interface (BCI) Outfit 101
4.13 BCI Sensors and Techniques 101
4.13.1 EEG 102
4.13.2 ECoG 102
4.13.3 ECG 102
4.13.4 EMG 103
4.13.5 MEG 103
4.13.6 FMRI 103
4.14 New Generation Advanced Human-Machine Interface 104
4.15 Conclusion 105
References 106

**5 Smart Patient Engagement through Robotics 115**
***Rakhi Mohan, A. Arun Prakash, Uma Devi N., Anjali Sharma S., Aiswarya Babu N. and Thennarasi P.***
5.1 Introduction 116
5.1.1 Robotics in Healthcare 116
5.1.2 Patient Engagement Tasks (Front End) 118
5.1.2.1 Robotics in Nursing, Patient Handling, and Support 118
5.1.2.2 Robotics in Patient Reception 119
5.1.2.3 Robotics in Ambulance Services 120
5.1.2.4 Robotics in Serving (Food and Medicine) 120
5.1.2.5 Robotics in Surgery and Surgical Assistance 121
5.1.2.6 Robotics in Cleaning, Moping, Spraying and Disinfecting 122

5.1.2.7 Robotics in Physiotherapy, Radiology, Lab Diagnostics and Rehabilitation (Exoskeletons) 122
5.1.2.8 Robotics in Tele-Presence 122
5.1.2.9 Robotics in Hospital Kitchen and Pantry Management 123
5.1.2.10 Robotics in Outdoor Medicine Delivery 123
5.1.2.11 Robotics in Home Healthcare 123
5.1.3 Documentation and Other Hospital Management Tasks (Back End) 124
5.1.3.1 Robotics in Patient Data Feeding and Storing 124
5.1.3.2 Robotics in Data Mining 124
5.1.3.3 Robotics in Job Allocation to Hospital Staffs 125
5.1.3.4 Robotics in Payroll Management 125
5.1.3.5 Robotics in Medicine and Medical Equipment Logistics 126
5.1.3.6 Robotics in Medical Waste Residual Management 126
5.2 Theoretical Framework 126
5.3 Objectives 127
5.4 Research Methodology 127
5.5 Primary and Secondary Data 127
5.6 Factors for Consideration 127
5.6.1 Patient Demographics 127
5.6.2 Hospital/Health Institutes Demographics 127
5.6.3 Patient Perception Factors 128
5.6.4 Hospital's Feasibility Factors and Hospital's Economic Factors for Implementation 128
5.7 Robotics Implementation 128
5.8 Tools for Analysis 129
5.9 Analysis of Patient's Perception 129
5.10 Review of Literature 129
5.11 Hospitals Considered for the Study (Through Indirect Sources) 131
5.12 Analysis and Interpretation 133
5.12.1 Crosstabulation 133
5.12.2 Regression and Model Fit 137
5.12.3 Factor Analysis 140
5.12.4 Regression Analysis 147

5.12.5 Descriptive Statistics 149
5.13 Conclusion 153
References 153
Annexure 154

**6 Accelerating Development of Medical Devices Using Human-Machine Interface 161**
***Dipanjan Karati, Swarupananda Mukherjee, Souvik Roy and Bhupendra G. Prajapati***
6.1 Introduction 162
6.2 HMI Machineries 164
6.3 Brain–Computer Interface and HMI 165
6.4 HMI for a Mobile Medical Exoskeleton 166
6.5 Human Artificial Limb and Robotic Surgical Treatment by HMI 167
6.6 Cognitive Enhancement by HMI 170
6.7 Soft Electronics for the Skin Using HMI 171
6.8 Safety Considerations 173
6.9 Conclusion 174
References 174

**7 The Role of a Human-Machine Interaction (HMI) System on the Medical Devices 183**
***Zahra Alidousti Shahraki and Mohsen Aghabozorgi Nafchi***
7.1 Introduction 184
7.2 Machine Learning for HCI Systems 185
7.3 Patient Experience 187
7.4 Cognitive Science 190
7.5 HCI System Based on Image Processing 192
7.5.1 Patient's Facial Expression 193
7.5.2 Gender and Age 194
7.5.3 Emotional Intelligence 199
7.6 Blockchain 201
7.7 Virtual Reality 203
7.8 The Challenges in Designing HCI Systems for Medical Devices 206
7.9 Conclusion 207
References 208

**8 Human-Machine Interaction in Leveraging the Concept of Telemedicine 211**
***Dipa K. Israni and Nandita S. Chawla***
8.1 Introduction 212
8.2 Innovative Development in HMI Technologies and Its Use in Telemedicine 213
8.2.1 Nanotechnology 214
8.2.2 The Internet of Things (IoT) 215
8.2.3 Internet of Medical Things (IoMT) 216
8.2.3.1 Motion Detection Sensors 217
8.2.3.2 Pressure Sensors 217
8.2.3.3 Temperature Sensors 217
8.2.3.4 Monitoring Cardiovascular Disease 217
8.2.3.5 Glucose Level Monitoring 217
8.2.3.6 Asthma Monitoring 217
8.2.3.7 GPS Smart Soles and Motion Detection Sensors 218
8.2.3.8 Wireless Fetal Monitoring 218
8.2.3.9 Smart Clothing 218
8.2.4 AI 219
8.2.5 Machine Learning Techniques 220
8.2.6 Deep Learning 221
8.2.7 Home Monitoring Devices, Augmented and Virtual 222
8.2.8 Drone Technology 223
8.2.9 Robotics 223
8.2.9.1 Robotics in Healthcare 224
8.2.9.2 History of Robotics 224
8.2.9.3 Tele-Surgery/Remote Surgery 224
8.2.10 5G Technology 225
8.2.11 6G 225
8.2.12 Big Data 226
8.2.13 Cloud Computing 226
8.2.14 Blockchain 227
8.2.14.1 Clinical Trials 228
8.2.14.2 Patient Records 228
8.2.14.3 Drug Tracking 228
8.2.14.4 Device Tracking 229
8.3 Advantages of Utilizing HMI in Healthcare for Telemedicine 230
8.3.1 Emotive Telemedicine 230

8.3.2 Ambient Assisted Living 232
8.3.2.1 Wearable Sensors for AAL 232
8.3.3 Monitoring and Controlling Intelligent Self-Management and Wellbeing 233
8.3.4 Intelligent Reminders for Treatment, Compliance, and Adherence 233
8.3.5 Personalized and Connected Healthcare 233
8.4 Obstacles to the Utilize, Accept, and Implement HMI in Telemedicine 234
8.4.1 Data Inconsistency and Disintegration 234
8.4.2 Standards and Interoperability are Lacking 234
8.4.3 Intermittent or Non-Existent Network Connectivity 234
8.4.4 Sensor Data Unreliability and Invalidity 235
8.4.5 Privacy, Confidentiality, and Data Consistency 235
8.4.6 Scalability Issues 235
8.4.7 Health Consequences 235
8.4.8 Clinical Challenges 236
8.4.9 Nanosensors and Biosensors Offer Health Risks 236
8.4.10 Limited Computing Capability and Inefficient Energy Use 236
8.4.11 Memory Space is Limited 237
8.4.12 Models of Digital Technology are Rigid and Sophisticated 237
8.4.13 Regulatory Frameworks 237
8.4.14 Incorporated IT Infrastructure 237
8.4.15 Misalignment with Nations' e-Health Policies 238
8.4.16 Implementing Costs 238
8.4.17 Operational and Systems Challenges 238
8.4.18 Logistical Challenges 239
8.4.19 Communication Barriers 239
8.4.20 Unique Challenges 239
8.5 Conclusions 239
References 240

**9 Making Hospital Environment Friendly for People: A Concept of HMI 247**
***Rihana Begum P., Badrud Duza Mohammad, Saravana Kumar A. and Muhasina K.M.***
9.1 Introduction 248
9.2 A Scenario for Ubiquitous Computing and Ambient Intelligence 249

9.3 Emergence of Ambient Intelligence 250
9.4 Framework for Advanced Human-Machine Interfaces 251
9.5 Brain Computer Interface (BCI) 252
9.5.1 The BCI System: An Introduction 252
9.5.2 The Characteristics of a BCI 253
9.5.2.1 Dependent and Independent BCIs 253
9.5.2.2 Motor Disabilities: Options for Restoring Function 253
9.5.3 Components of BCI 254
9.5.4 Structure of the Human Brain and Its Signals 254
9.5.4.1 A Signal That is Evoked 256
9.5.4.2 Spontaneous Signals 256
9.5.4.3 Hybrid Signals 257
9.6 Development in MHI Technologies and Their Applications 257
9.7 Techniques of Signal Acquisition and Processing Applied to HMI 258
9.8 Hospital-Friendly Environment for Patients 260
9.8.1 Physiological Study State 260
9.8.1.1 Nature 260
9.8.1.2 Music 260
9.8.2 Pain State 260
9.8.2.1 Nature 260
9.8.2.2 Natural Light 261
9.8.3 Sleep 261
9.8.3.1 Nature Images 261
9.8.4 Patient Experience 261
9.8.4.1 Patient's Satisfaction 261
9.8.4.2 Interaction 262
9.9 Applications of HMI for Patient-Friendly Hospital Environment 263
9.9.1 Healthcare and Engineering 263
9.9.2 Controls for Robotic Surgery and Human Prosthetics 265
9.9.3 Sensory Substitution System 266
9.9.4 Mobile Robots and Wheelchairs With Neural Interfaces 267
9.9.5 Technology on Biometric System 268
9.9.6 Enhancement of Cognition Level 269
9.9.7 fNIRS-EEG Multimodal BCI as a Future Perspective 270

9.10 Conclusion 270
References 271

**Part II : Emerging Application and Regulatory Prospects of HMI in Healthcare 279**

**10 HMI: Disruption in the Neural Healthcare Industry 281**
***Preetam L. Nikam, Amol U. Gayke, Pavan S. Avhad, Rahul B. Bhabad and Rishabha Malviya***
10.1 Introduction 282
10.2 Stimulation of Muscles 283
10.3 Cochlear Implants 283
10.3.1 Implants for Cochlear 283
10.3.2 Prosthetics for Ears 284
10.4 Peripheral Nervous System Interaction 284
10.5 Sleeve Electrodes 285
10.6 Flat-Interfaced Nerve Electrodes 287
10.7 Transverse and Longitudinal Intrafascicular Electrode (LIFE and TIME) 287
10.8 Multi-Channel Arrays That Penetrate 288
10.8.1 Numerous-Channel Arrays That Penetrate 288
10.9 Spinal Cord Stimulation and Central Nervous System Interaction 289
10.9.1 Cortical Connections 289
10.9.2 Stimulation of the Auditory Nucleus and Ganglions 290
10.9.3 Stimulation of the Deep Brain 290
10.10 Computer–Brain Interfaces 290
10.11 Conclusion 291
References 291

**11 Dynamics of EHR in M-Healthcare Application 295**
***Eva Kaushik and Rohit Kaushik***
11.1 Introduction 296
11.1.1 Why EHR is Needed in the Nation? 296
11.1.2 Empowering Patients in Healthcare Management 297
11.1.3 Data Management in EHR 298
11.1.4 Long-Term Architectural Approach 298
11.2 Background Related Work 299
11.3 Methodology 300
11.3.1 Use-Cases on Ground Base Reality 300

11.3.2 Integration of Technology to Solve Healthcare Issues 301
11.3.3 Workflow 302
11.4 Tools and Technologies 303
11.5 Limitations 304
11.6 Future Scope 305
11.6.1 Personalized EHR Cards 305
11.7 Discussion 306
11.7.1 Electronic Health Records and Personal Health Records 306
11.7.2 Physicians' Review Toward EHR 307
11.7.3 Interoperability 307
11.8 Conclusion 308
References 308

**12 Role of Human-Machine Interface in the Biomedical Device Development to Handle COVID-19 Pandemic Situation in an Efficient Way 311**
***Soma Datta and Nabendu Chaki***
12.1 Introduction: Background and Driving Forces 312
12.1.1 Observed Scenario During May 2021 314
12.1.1.1 Transmission Medium 314
12.1.2 Limitation of Vaccine Technology 314
12.1.3 Adverse Effect of Protective Measure 314
12.1.4 Revoking of Restrictions Causes Surges in Pandemic 315
12.2 Methods 315
12.2.1 Determine Major Influencing Factors 316
12.2.2 Analyzed the Selected Influencing Factor 317
12.2.2.1 Evidence 1 318
12.2.2.2 Evidence 2 318
12.2.2.3 Evidence 3 320
12.2.3 Managing Mechanism to Reduce the Spreading Rate of COVID-19 320
12.2.4 The Households Health Safety Systems to Disinfect Outdoor Cloths 321
12.2.4.1 Present Households Disinfect Systems for Cloth and Personal Belonging 321
12.2.4.2 The Outline of Households Health Safety Systems to Disinfect Outdoor Clothes 322
12.2.5 Upgradation of Individual Room Air Conditioning System 324

12.2.5.1 The Outline of the AI-Based Room Ventilator System 324
12.2.6 Design of Next-Generation Mask 324
12.3 Results 325
12.4 Conclusion 325
Acknowledgment 325
References 326

**13 Role of HMI in the Drug Manufacturing Process 329**
***Biswajit Basu, Kevinkumar Garala and Bhupendra G. Prajapati***
13.1 Introduction 330
13.1.1 Dialogue Systems 331
13.2 Types of HMI 333
13.3 Advantages and Disadvantages of HMI 334
13.4 Roles of HMI in the Pharmaceutical Manufacturing Process 339
13.5 Common Applications for Human-Machine Interfaces 343
13.5.1 Automotive Dashboards 343
13.5.2 Monitoring of Machinery and Equipment 344
13.5.3 Digital Displays 344
13.5.4 Building Automation 344
13.5.5 Video and Audio Production 344
13.6 Healthcare System-Based Human–Computer Interaction 345
13.6.1 Healthcare System 345
13.6.2 Teaching of Medicine and Physiology 346
13.7 Performance Test of Healthcare System Based on HCI 349
13.7.1 HCI-Based Medical Teaching System 349
13.8 Human-Machine Interface for Healthcare and Rehabilitation 349
13.8.1 Ambient Intelligence and Ubiquitous Computing Scenario 349
13.8.2 The Advanced Human-Machine Interface Framework 350
13.9 Human-Machine Interface for Research Reactor: Instrumentation and Control System 351
13.10 Future Scope of Human-Machine Interface (HMI) 352
13.11 Conclusion 353
References 353

**14 Breaking the Silence: Brain–Computer Interface for Communication** **357**
***Preetam L. Nikam, Sheetal Wagh, Sarika Shinde, Abhishek Mokal, Smita Andhale, Prathmesh Wagh, Vivek Bhosale and Rishabha Malviya***
14.1 Introduction 358
14.2 Survey of BCI 359
14.3 Techniques of BCI 361
14.3.1 Potentials Associated With an Event 361
14.3.2 Cortical Gradual Potentials 361
14.3.3 Evoked Visual Possibilities 361
14.3.4 Sensorimotor Rhythms 362
14.3.5 Motor Imagery 362
14.4 BCI Components 362
14.4.1 Signal Acquisition 363
14.4.2 Signal Processing 363
14.4.3 Extraction of Features 363
14.4.4 Signal Categorization 363
14.5 BCI Signal Acquisition Methods 364
14.6 BCI Invasion 364
14.7 BCI With Limited Invasion 364
14.8 BCI Not Invasive 364
14.9 BCI Applications 365
14.9.1 Movement 365
14.9.2 Recreation 365
14.9.3 Reconstruction 366
14.9.4 Interaction 366
14.9.5 Interaction With Others 366
14.9.6 Diagnosis and Treatment of Depression 366
14.9.7 Reduces Healthcare Costs 367
14.10 BCI Healthcare Challenges 367
14.10.1 Ethical Difficulties 367
14.10.2 Goodwill 367
14.10.3 Legality 368
14.10.4 Freedom of Privacy 368
14.10.5 Issues With Standardization 368
14.10.6 Problems With Reliability 368
14.10.7 Prolonged Training Process 369
14.10.8 Expensive Acquisition and Control 369

14.11 Conclusion 370
References 370

**15 Regulatory Perspective: Human-Machine Interfaces 375**
***Artiben Patel, Ravi Patel, Rakesh Patel, Bhupendra Prajapati and Shivani Jani***
Abbreviations 376
15.1 Introduction 376
15.2 Why are Regulations Needed? 377
15.2.1 Safety 378
15.2.2 Uniform Requirements 378
15.2.3 Promote Innovation 378
15.2.4 Free Movement of Goods 378
15.2.5 Compensation 379
15.2.6 Fostering Innovation 379
15.3 US Regulatory Perspective 379
15.3.1 History of Medical Device Regulation and Its Supervision in the United States 380
15.3.2 Classification of Medical Devices 384
15.3.3 Reclassification 385
15.3.4 How to Determine if the Product is a Medical Device or How to Classify the Medical Device 385
15.3.5 Device Development Process 387
15.3.6 Overview of Device Regulations 391
15.3.7 Quality and Compliance of Medical Devices 393
15.3.8 Human Factors and Medical Devices 395
15.3.9 Continuous Improvement of Regulations 402
15.4 Conclusion 407
References 407

**16 Towards the Digitization of Healthcare Record Management 411**
***Shivani Patel, Bhavinkumar Gayakvad, Ravisinh Solanki, Ravi Patel and Dignesh Khunt***
16.1 Introduction 412
16.2 Digital Health Records: Concept and Organization 416
16.3 Mechanism and Operation of Digital Health Record 419
16.3.1 Physician-Hosted EHR 420
16.3.2 Remotely-Hosted EHR 420
16.3.2.1 Subsidized System 420
16.3.2.2 Dedicated Hosted System 421

16.3.2.3 Cloud-Based or Internet-Based Computing 421
16.4 Benefits of Digital Health Records 426
16.4.1 Security 426
16.4.2 Costs 427
16.4.3 Access 427
16.4.4 Storage 427
16.4.5 Accuracy and Readability 427
16.4.6 Practice Management 428
16.4.7 Quality of Care 428
16.5 Limitations of Digital Health Records 428
16.5.1 Completeness 428
16.5.2 Correctness 429
16.5.3 Complexity 429
16.5.4 Acceptability 430
16.5.4.1 People 430
16.5.4.2 Hardware, Software and Network 430
16.5.4.3 Procedure 430
16.6 Risk & Problems Associated With the System 431
16.6.1 Lack of Concord 431
16.6.2 Privacy and Data Security Issues 431
16.6.3 Problems in Patient Matching 432
16.6.4 Alteration of Algorithms in Decision-Support Models 432
16.6.5 Increased Workload of Clinicians 432
16.7 Future Benefits 432
16.8 Miscellaneous 434
16.8.1 Policies Regarding Data Exchange 434
16.8.1.1 Directed Exchange 435
16.8.1.2 Query-Based Exchange 435
16.8.1.3 Consumer-Mediated Exchange 435
16.8.2 Current Practices of Digital Health Records 438
16.8.2.1 India 438
16.8.2.2 Australia 439
16.8.2.3 Canada 439
16.8.2.4 USA 440
16.8.2.5 China 440
16.8.3 Data Analysis 442
16.8.4 Role and Benefits to the Stakeholders 443
16.8.4.1 Advantages to the Patient 443
16.8.4.2 Advantages to the Healthcare Providers 444

16.8.4.3 Advantages to the Society 444
16.9 Conclusion 445
References 446

**17 Intelligent Healthcare Supply Chain 449**
***Chirag Kalaria, Shambhavi Singh and Bhupendra G. Prajapati***
17.1 Introduction 450
17.2 Supply Chain – Method Networking? 451
17.3 Healthcare Supply Chain and Steps Involved 451
17.4 Importance of HSC 452
17.5 Risks and Complexities Affecting the Globally Distributed HSC 453
17.5.1 Legacy HSC 453
17.5.1.1 SWOT Analysis of Legacy HSC 454
17.5.2 What is an Intelligent Supply Chain? 454
17.5.3 Difference Between Legacy HSC and Intelligent HSC 456
17.6 Technologies Come to Aid to Build an Intelligent HSC 457
17.6.1 HMI 457
17.6.2 AI 458
17.6.3 ML/DL 459
17.7 Blockchain 460
17.8 Robotics 461
17.9 Cloud Computing 463
17.10 Big Data Analytics (BDA) 465
17.11 Industry 4.0 465
17.12 Internet of Things (IoT) 467
17.13 Digital Twins 469
17.14 Supply Chain Control Tower 470
17.15 Predictive Maintenance 472
17.16 A Digital Transformation Roadmap 473
17.17 Prerequisite for Designing Intelligent HSC 475
17.18 HMI—Usage in HSC Management 476
17.19 HMI—A Face of the Supply Chain Control Tower 477
17.20 The Intelligent Future of the Healthcare Industry 478
17.21 Conclusion 480
References 481

**Index 483**

# Foreword

It gives me immense pleasure to write the foreword for this book edited by Dr. Rishabha Malviya. Dr. Malviya is a highly dedicated and enthusiastic individual who works tirelessly to achieve his goals. His commitment to his work is unparalleled, and he is truly one of the most exceptional people I have had the pleasure of meeting.

As for the book's topic, Human-Machine Interface (HMI) is a hot trend in the medical field. Developers are always exploring ways to enhance the technologies that play a crucial role in daily life. In the context of a hospital, HMI holds immense significance as it enables devices to function better and enhance the experience of both healthcare professionals and patients. The implementation of HMI in a clinical setup offers a range of advantages. The development of dynamic human-machine interfaces and user interfaces has significantly benefited the healthcare sector. As new and innovative techniques for patient care emerge, HMI will continue to evolve, offering even more benefits for healthcare professionals and patients alike.

As a comprehensive resource, this book empowers readers to utilize their skills and expertise to advance healthcare through HMI. The book delves into a variety of HMI tools and related strategies that can be used to evaluate, design, regulate, and upgrade healthcare delivery systems and processes. Finally, it offers a comprehensive overview of the state-of-the-art applications of computational intelligence in the healthcare sector, providing insights into how these technologies can be utilized to improve patient care and outcomes. I fully believe that this book will be a helpful reference for healthcare professionals, academicians, students, and computer engineers who work on, or want to learn about, medical systems.

**Mr. Dhruv Galgotia**
*CEO, Galgotias University, Greater Noida, India*

# Preface

With increasing healthcare expenditures and greater demand for affordable, user-friendly medical devices, Human-Machine Interface (HMI) has emerged as an essential trend in product development. HMI systems offer the controls necessary for a user to operate a device or instrument. When done correctly, they facilitate simple, dependable accessibility and streamline technological operations. HMI systems are vital in the medical sector and can accelerate recovery, improve clinical monitoring, and even save lives.

Most medical procedures are improved by HMI systems, from calling an ambulance to ensuring that a patient receives adequate treatment. This book describes biomedical technologies in the context of advanced HMI, with a focus on direct brain-computer connection. This book describes several HMI tools and related techniques for analyzing, creating, controlling, and upgrading healthcare delivery systems, and provides details regarding how advancements in technology, particularly HMI, ensure ethical and fair use in patient care.

Written by renowned authors from various regions, this book starts an introduction to basics of the human-machine interface and moves on to a second chapter that deals with how HMI can improve healthcare practices. A third chapter explains the connection between patient safety and security using HMI, and a fourth discusses how HMI improves the quality of patient care. Chapter 5 explores the most advanced application of the technology in the form of robotics for healthcare, while the sixth and seventh chapters investigate the latest research in the development of medical devices that use HMI. Chapter 8 provides current information about the robust technology framework that enables telemedicine. Chapter 9 discusses the hot topic, the "environment-friendly hospital." This chapter gives a better understanding of how to improve the environment of hospitals and therefore make future healthcare places and spaces more responsive to patient needs.

The second half of the book explores and investigates how the most recent advancement of this technology can improve patient care. Chapter 10 explains HMI's emergence as a highly successful means of treating mental health issues, depression, Alzheimer's disease, dementia, and paralysis by repairing human cognitive or sensory-motor functions. The next chapter deals with the privacy of patients and the security of their information, specifically with the adoption of electronic records in the healthcare industry, while Chapter 12 explores the latest progress made in combating COVID-19 with advanced medical devices. Chapter 13 outlines how pharmaceutical manufacturing has entered a new level of productivity and quality assurance thanks to HMI. The next chapter discusses how the brain-computer interface is used for communication, while Chapter 15 focuses on important regulatory perspectives about the implementation of HMI. The book concludes with two chapters that address record and supply chain management.

Potential readers of the book include practitioners and researchers interested in applying the ideas of human-computer interaction. Our thanks go to all the authors for their great contributions to this book's success. We also want to express our regards to the prestigious Wiley and Scrivener Publishing for their continuous kind support and guidance.

**Editors**
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