

Table of Contents

Acknowledgements.....i

Abstract......iii

Table of Contentsiv

List of Figuresviii

List of Tablesix

List of Abbreviationsx

A. Foundations 1

I. Introduction 2

 I.1 Motivation2

 I.2 Research Gap and Research Questions6

 I.3 Structure of this Thesis 11

 I.4 Research Positioning and Design 14

 I.4.1 Research Paradigms and Positioning 14

 I.4.2 Research Design16

 I.5 Anticipated Contributions and Implications 18

II. Research Background 24

 II.1 Artificial Intelligence and its Use-Cases for Medical Applications24

 II.1.1 What Artificial Intelligence is and its Potential24

 II.1.2 Medical Stakeholders and their Interaction with Artificial Intelligence27

 II.2 Explainable Artificial Intelligence.....29

 II.2.1 The Issue of Opaque Artificial Intelligence.....29

 II.2.2 The Rise of Explainable Artificial Intelligence as a Response.....31

 II.2.3 Current State of the Literature on the Effect of Explanations34

 II.3 AI-Advised Decision-Making and Decision Augmentation36

B. Studies on the Effect of Explanations on Medical Stakeholder 39

I. A Conceptual Framework for Understanding the Unique Informational Content of Explanations 41

1.	Study 1: Conceptualizing how Explanations are Perceived in the Context of AI-Advised Decision-Making	42
1.1	Introduction	43
1.2	Literature Review and Conceptual Foundations	45
1.2.1	AI-Advised Decision-Making and its Elements	45
1.2.2	Toulmin's Model of Argumentation	49
1.3	Conceptualizing AI Advice through the Lens of TMA	51
1.4	Implications of our Novel Toulmin-Based Conceptualization	54
1.5	Discussion	56
1.5.1	Contributions to Literature and Practice	57
1.5.2	Limitations and Future Research	58
1.6	Concluding Remarks	58
1.7	Appendix Study 1	60
II.	The Effect of Explanations on Medical Experts	62
1.	Study 2: Understanding the Effect of Explanations in the Context of Correct AI Advice	63
1.1	Motivation	64
1.2	Research Background	66
1.2.1	Explainability in IS Research	66
1.2.2	Research on AI Explanations	67
1.2.3	Linking AI Explanations and Causability	69
1.3	Understanding the Perception of Medical AI Explanations	70
1.3.1	Conceptualizing Explanations as Signals	70
1.3.2	Deriving a Research Model	71
1.4	Research Design and Experimental Setting	74
1.5	Data Analysis and Results	77
1.5.1	Measurement Model Results	77
1.5.2	Structural Model Results	80
1.5.3	Post-Hoc Analysis	80
1.6	Discussion	81
1.6.1	Contributions to Literature	81

1.6.2	Practical Implications	82
1.6.3	Limitations and Opportunities for Future Research.....	84
1.7	Conclusion	84
2.	Study 3: Understanding the Effect of Explanations in the Context of Incorrect AI Advice	86
2.1	Introduction	87
2.2	Background and Related Work	88
2.3	Theorizing the Effect of Explanations on Discontinuance	89
2.4	Research Design and Experimental Setting	91
2.4.1	Manipulations.....	91
2.4.2	Procedure	92
2.4.3	Operationalization	94
2.5	Data Analysis and Results	95
2.6	Discussion	97
2.6.1	Contributions to Literature and Practice	97
2.6.2	Limitations and Opportunities for Future Research.....	98
2.7	Conclusion	99
III.	The Effect of Explanations on Patients.....	100
1.	Study 4: Understanding the Effect of Explanations on Patients in the Context of Symptom Checker Apps	101
1.1	Introduction	102
1.2	Theoretical and Conceptual Background	104
1.2.1	How Users Perceive AI Advice	104
1.2.2	Decision-Making with Artificial Intelligence	106
1.3	Theorizing Interdependencies among AI Interaction Drivers based on General Systems Theory	107
1.4	Method.....	109
1.4.1	Data Collection and Demographics.....	109
1.4.2	Measures, Measurement Model, and Common Method Bias	110
1.4.3	Configurational Data Analysis	111
1.5	Results	111

1.5.1	Configurations that lead to Compliance with the Advice	112
1.5.2	Configurations that lead to Satisfaction with the Advice	113
1.6	Propositions	115
1.7	Discussion	117
1.7.1	Theoretical Contributions	117
1.7.2	Implications for Practice	118
1.8	Conclusion	119
C.	Contributions	121
I.	Findings and Synthesis	122
I.1	Findings on the Unique Characteristics of Explanations	122
I.2	Findings on Medical Experts' Interaction with Explanations	125
I.3	Findings on Patients' Interaction with Explanations	128
I.4	Summary of Key Findings	129
I.5	Synthesis of Key Findings	132
I.5.1	Deriving a Procedural Model	132
I.5.2	Applying the Model to the Implementation of an AI-Based Decision Support System in a Hospital	137
I.5.3	Applying the Model from the Perspective of a Product Manager at a Symptom Checker App Provider	139
II.	Contributions and Implications	141
II.1	Contributions to Research	141
II.2	Implications for Practice	143
II.3	Limitations and Future Research Directions	145
III.	Conclusion	147
	References	149
	Appendix	xi
Appendix A.	Overview of the Author's Individual Study Contribution	xii
Appendix B.	Overview of Further Studies	xiii
Appendix C.	Curriculum Vitae	xv