Contents

Foreword ix
Morgan JAFFRELOT

Acknowledgments xiii

Introduction xv

Part 1. Cognitive Aid as a Gateway 1

Introduction to Part 1 3

Chapter 1. Defining a Cognitive Aid 5

1.1. Cognitive aid as a support device for mental activity 5
1.1.1. The birth of cognitive aids: from aeronautics to the hospital sector 8
1.1.2. Contributions of cognitive aids in the medical field 12
1.1.3. Limitations in the use of medical cognitive aids 17
1.2. Cognitive aid defined as an instrument 20
1.2.1. Utility of the cognitive aid 22
1.2.2. Ease of use of the cognitive aid 23
1.3. Gateway function 24

Chapter 2. Cognitive Aid: A Gateway Between the Individual and their Environment 27

2.1. The cognitive system: knowledge in the head and in the environment 29
2.2. Cognitive aid as a psychological instrument 33
2.2.1. The vortex in emergency medicine 36
2.2.2. The structuring effect of psychological instruments 38

2.2.3. A gateway between internal and external cognition: "DansMaBlouse" app . . . 43
2.3. Conclusion . . . 45

Chapter 3. Routing Analytical Thinking to Support Intuition . . . 47

3.1. Intuitive thinking: vulnerable thinking . . . 49
3.1.1. Activation of the knowledge network: priming . . . 50
3.1.2. Reinforcement of certain connections . . . 50
3.1.3. Heuristics . . . 51
3.1.4. Cognitive biases . . . 53
3.1.5. Affordance-based behavior . . . 55
3.2. The power of analytical thinking . . . 56
3.2.1. Natural language and analytical thinking . . . 57
3.3. Formal logic to elucidate reasoning . . . 58
3.3.1. Navigating towards analytical thinking without assistance . . . 59
3.3.2. Routing analytical resources through cognitive aid . . . 64
3.4. Conclusion . . . 71

Chapter 4. Routing Intuitive Thinking to Support Analysis . . . 73

4.1. The vulnerability of analytical thinking . . . 74
4.1.1. The impact of uncertainty on analytical thinking . . . 74
4.1.2. The impact of short-term memory on analytical thinking . . . 75
4.1.3. The effects of the physiological state on short-term memory . . . 76
4.2. The power of intuitive thinking . . . 77
4.2.1. Gut feeling . . . 78
4.2.2. Expertise: knowledge schemas for addressing ill-defined problems . . . 79
4.2.3. Heuristics to adapt to the environment . . . 81
4.2.4. Chunks to surpass the capacity of short-term memory . . . 84
4.3. Slowness and risks in accessing intuitive resources unaided . . . 85
4.4. Access to intuition thanks to cognitive aids . . . 86
4.5. Conclusion . . . 91

Chapter 5. Routing Prescribed Tasks to Support the Actual Activity . . . 93

5.1. Guidelines from domain experts . . . 95
5.1.1. Standardizing healthcare practices . . . 95
5.1.2. Transitioning from guidelines to cognitive aids . . . 97
5.2. Instructions from hospital managers . . . 100
5.2.1. Cognitive aids for organizational functioning . . . 102
5.2.2. An example of cognitive aid to care for and manage: the PsyStart system . . . 104

5.3. Care: a system with tight coupling 105
5.3.1. A coupling to be developed 106
5.3.2. A nonlinear and uncertain causal relationship 107
5.3.3. A workspace characterized by high variability 107
5.3.4. Resilience provided by loose coupling 109
5.3.5. Risks of considering care as tight coupling: the case of alarms 113
5.3.6. An example of aid for loose coupling: the welcome sheet in emergency rooms 115
5.3.7. Coupling nuances in the health field 118
5.4. Conclusion 119

Part 2. Cognitive Aid as a Turing Machine 123

Introduction to Part 2 125

Chapter 6. Analyzing the Work Domain to Design a Tape 133

6.1. An ecological interface for supervising an emergency service department 134
6.2. The techniques of work domain analysis 136
6.2.1. Delineating the work domain 137
6.2.2. Abstraction hierarchy 138
6.2.3. The Delphi technique: consulting domain experts 141
6.2.4. Constraints on the content of a cognitive aid 143
6.2.5. Constraints on the material form of a cognitive aid 145
6.2.6. Part of the environment as a cognitive aid: a triage station in the emergency department 149
6.2.7. Ergonomic evaluation tools for content and format 153
6.3. Conclusion 154

Chapter 7. Task Analysis for Designing a Network of States 157

7.1. Task analysis techniques 159
7.2. Designing a fast and frugal tree. 160
7.2.1. Designing an ad hoc decision tree 161
7.2.2. A decision tree for medical-psychological reception of refugees 161
7.3. Designing a communication protocol 164
7.3.1. Inter-individual communication protocol 165
7.3.2. Protocol in teamwork 167
7.4. Designing the operation procedure for using a cognitive aid 169
7.4.1. Typical operating modes 170
7.4.2. Distribution of operating procedures within the team 171
7.4.3. Degree of coupling in the use of cognitive aids 172
7.4.4. Attentional constraints in the use of cognitive aids 173

7.4.5. Recommendations for designing a network of states 174
7.4.6. Operating modes observed in real-world activity 175
7.4.7. Evaluation of cognitive aid usage 177
7.5. Conclusion 180

Conclusion 183

References 189

Index 203