

138 959 615X

DECISION SUPPORT FOR COLLABORATIVE AIRPORT STRATEGIC PLANNING

R.A.A. Wijnen

Contents

Preface	i
Contents	iii
List of Figures	xi
List of Tables	xiii
List of Acronyms	xv
1 Introduction	1
1.1 Airport strategic planning	2
1.2 The problems with airport strategic planning	5
1.2.1 Problem Area I: Lack of involvement of the stakeholders	5
1.2.2 Problem Area II: Inadequate approach for dealing with the future	6
1.2.3 Problem Area III: Inefficient problem solving process	7
1.3 Motivation for a decision support system	7
1.3.1 State of practice	8
1.3.2 State of the art	8
1.3.3 Gap between decisionmaking needs and decision sup- port	9
1.4 Research questions	9
1.5 Presentation of the research	10
1.6 Scope and limitations	11
1.7 Outline of the dissertation	12
References	15

I	Broad Perspective	19
2	Airport Strategic Planning	23
2.1	Strategic planning	23
2.1.1	Definition	24
2.1.2	History	24
2.1.3	Schools of strategic management	25
2.1.4	Strategic thinking	27
2.1.5	Social corporate responsibility	28
2.2	Approaches to airport strategic planning	30
2.3	Approaches to airport strategic planning versus the three problem areas	34
2.4	The resources involved in a strategic planning effort	36
2.4.1	People	36
2.4.2	Data and information	37
2.4.3	Tools	37
2.4.4	Underlying cause of the three problem areas	38
2.5	Summary and conclusion	39
	References	39
3	The Airport as a Socio-technical System	43
3.1	The technical perspective	44
3.1.1	The airspace	46
3.1.2	The airfield	47
3.1.3	The terminal system	51
3.1.4	The ground access system	53
3.1.5	Physical capacity	54
3.2	The social perspective	57
3.2.1	Noise	57
3.2.2	Emissions	59
3.2.3	Third-party risk	60
3.2.4	Environmental capacity	60
3.3	Bringing the perspectives together	64
3.3.1	The need for an integral view on airport performance	64
3.3.2	The airport as a socio-technical system: Conclusion	66
	References	67
4	Computer-based Systems for Airport Performance Analysis	75
4.1	Tools for airport performance analysis	76
4.1.1	Capacity and delay	77
4.1.2	Noise	78
4.1.3	Emissions	78

- 4.1.4 Third-party risk 79
- 4.1.5 Limitations of tools for use in strategic planning studies 79
- 4.2 Projects to develop computer-based systems 80
 - 4.2.1 TAPE 81
 - 4.2.2 OPTAS 82
 - 4.2.3 OPAL 83
 - 4.2.4 SPADE 84
 - 4.2.5 Airport Business Suite 85
- 4.3 Problems with existing computer-based systems 87
 - 4.3.1 Levels of decisionmaking and support 87
 - 4.3.2 Discussion of specific problems 89
- 4.4 Summary and conclusion 92
- References 93

II Decision Support Design 99

5 What is Needed? 103

- 5.1 Vision about decision support 104
 - 5.1.1 High-level goals 104
 - 5.1.2 Problem statement related to decision support for airport strategic planning 106
 - 5.1.3 HARMOS: A DSS for airport strategic planning 107
- 5.2 Key design principles 109
 - 5.2.1 Policy analysis approach 109
 - 5.2.2 Integrating resources 117
- 5.3 DSS development process 122
 - 5.3.1 Traditional approach 123
 - 5.3.2 Modern software engineering 125
- 5.4 Scope of the HARMOS development effort 129
- 5.5 Summary and conclusion 132
- References 132

6 Architecture of the HARMOS DSS 139

- 6.1 Software architecture 140
- 6.2 Logical view of the architecture 142
 - 6.2.1 Graphical User Interface Layer 145
 - 6.2.2 Domain Layer 146
 - 6.2.3 Technical Services Layer 147
- 6.3 Functional view of the architecture 148
 - 6.3.1 Define Decisionmaking Context 149
 - 6.3.2 Calibrate Study 151

6.3.3	Specify System Characteristics	152
6.3.4	Develop Scenarios	152
6.3.5	Define Strategy	153
6.3.6	Evaluate Strategy	154
6.3.7	Execute Performance Analysis	155
6.3.8	Compare Strategies	156
6.4	Summary	156
	References	157

III Implementation of the HARMOS Architecture 161

7	The HARMOS Domain Model	165
7.1	The HARMOS software development process	166
7.1.1	Activities carried out within the disciplines	166
7.1.2	Iterations	167
7.1.3	Visualizing the design	168
7.2	High-level overview of the Domain Model	169
7.2.1	Core classes	169
7.2.2	Workflow	170
7.3	Study Module	172
7.3.1	Study Service	173
7.3.2	Study	173
7.3.3	Context	174
7.3.4	Case	175
7.4	System Module	177
7.4.1	Modeling the system	177
7.4.2	Exploiting object orientation	178
7.5	External Factor Module	182
7.5.1	Scenario Service	183
7.5.2	Scenario	183
7.5.3	Traffic Demand	183
7.6	Strategy Module	186
7.6.1	Strategy Service	187
7.6.2	Strategy	188
7.6.3	Operational Plan	188
7.6.4	Scorecard Service	190
7.7	Outcome of Interest Module	191
7.8	Performance Analysis Module	192
7.8.1	Analysis Service	194
7.8.2	Tool Adapters	195

7.9	Summary and conclusion	195
	References	199
8	Proof of Concept for the HARMOS DSS	201
8.1	The HARMOS concept: Closing the gap between decisionmaking needs and decision support	202
8.2	Specific problems related to airport strategic planning	203
8.2.1	Schiphol Group	203
8.2.2	Air France-KLM	204
8.2.3	Air Traffic Control the Netherlands	205
8.2.4	The Government and Ministries	205
8.2.5	The Community	206
8.2.6	Summary of the specific problems in each of the problem areas	207
8.3	Problem Area I: Lack of involvement of the stakeholders	207
8.3.1	Define Decisionmaking Context	208
8.3.2	Compare Strategies	208
8.4	Problem Area II: Inadequate approach for dealing with the future	209
8.4.1	Develop Scenarios	209
8.4.2	Define Strategy	210
8.5	Problem Area III: Inefficient problem solving process	211
8.5.1	Calibrate Study	211
8.5.2	Evaluate Strategy	211
8.6	Compatibility with Master Planning	212
8.7	Summary	214
	References	216
9	Proof of Usefulness of the HARMOS DSS	217
9.1	Approach for testing DSS usefulness	217
9.1.1	Methodology and technology	218
9.1.2	Design of the workshop	218
9.1.3	Potential users	218
9.2	Workshop results	219
9.2.1	Part I: Open question about key challenges in airport strategic planning	219
9.2.2	Part II: Specific problems in each of the problem areas.	220
9.2.3	Part III: Feedback on specific functionality of the HARMOS DSS	223
9.3	Response to the workshop results	228
9.3.1	Part I: Open question about key challenges in airport strategic planning	228

- 9.3.2 Part II: Specific problems in each of the problem areas . . . 230
- 9.3.3 Part III: Feedback on specific functionality of the HARMOS DSS 232
- 9.3.4 Discussion of the workshop results 234
- 9.4 Implications of the workshop results for using HARMOS 235
- 9.5 Conclusions about the usefulness of the HARMOS DSS 236
- References 237

IV Epilogue 241

10 Answering the Research Questions 245

- 10.1 Research Question 1 246
- 10.2 Research Question 2 247
- 10.3 Research Question 3 247
- 10.4 Research Question 4 248
- 10.5 Research Question 5 248
- References 249

11 Next Steps and Reflection 251

- 11.1 Next Steps 251
 - 11.1.1 Growing the HARMOS DSS 252
 - 11.1.2 Adopting agile development 254
- 11.2 Reflection 255
 - 11.2.1 Involvement in other DSS projects 255
 - 11.2.2 Other applications for the HARMOS DSS 256
 - 11.2.3 Learning approach to software engineering 256
 - 11.2.4 Changes to our mental model 256
- References 259

V Appendix on the HARMOS Graphical User Interface 263

A Graphical User Interface 265

- A.1 Overview of the Graphical User Interface 265
 - A.1.1 Components 265
 - A.1.2 Menu structure 266
- A.2 Study Manager 268
- A.3 Calibrator 270
- A.4 Scenario Builder 271
- A.5 Strategy Builder 273
- A.6 Strategy Evaluator 274

A.7 Strategy Comparator	277
A.8 Summary and Conclusion	277
References	278
Summary	281
Samenvatting	297
About the author	315
TRAIL Thesis Series	319