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Maximilian Schosser

Big Data to Improve Strategic Network Planning in Airlines

With a foreword by Prof. Dr. Iris Hausladen

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For my wife Karin who filled the days of my PhD studies with pure joy.

For my mother Jutta who taught me the most important trait as a researcher – curiosity.

For my father Rudolf whose perfectionist mind helped with great suggestions for this thesis.

Foreword

Big data not just evolved as a popular buzzword over time but is meanwhile seen as a high potential field for improving business processes and decisions taken by responsible persons in different industry sectors, such as airlines.

Nevertheless, available advantages of big data have not yet been adequately measured from an economic perspective and have very often not yet been exploited at all or to a reasonable level. Additionally, corresponding theoretical concepts and scientific developments focusing on the area of network planning in airlines are currently more or less missing. Those challenging deficits make the topic considered by Mr. Schosser highly relevant both from a theoretical as well as a practical perspective.

Thus, the main objective of the thesis consists in closing both the scientific research gap and providing a solution to practitioners focusing on the assessment of big data opportunities in the network planning context of airlines.

The author provides with the step-by-step, theoretically and empirically based development of the framework, its elements and procedures in the present doctoral thesis an outstanding analytical as well as conceptual personal contribution. The framework is from a content-related point of view to be honored as a pioneering achievement and the dissertation contains a lot of new findings that represent a starting point for further work predominantly in the research and practice field of big data evaluation focused on airline network planning that can be transferred to further use cases respectively fields of applications.

The book, which is based on a dissertation at the HHL Leipzig Graduate School of Management, is aimed equally at readers from science and practice, dealing with (big) data collection, economic evaluation of big data as well as big data analytics.

Leipzig, May 2019 *Prof. Dr. Iris Hausladen*

Preface

The idea for this PhD thesis was born during a consulting project at a European airline, where different departments were at completely different maturity stages of using Big Data. While at some departments network planning was done the old-fashioned way, with legacy IT-systems, data and processes, other departments had already implemented a much more agile way of integrating Big Data.

The network planning department was frequently approached by data providers with concrete offers, but there was no method to evaluate the impact of the data for airline network planning, and most of the offers were turned down for this reason. At the same time, there was no research available to answer this question. The main objective of this PhD thesis is hence to alleviate the lack of evaluation methods and provide a concise answer/approach/framework of how Big Data can create value for individual network planning steps.

The target audience of this thesis comprises airline network planners of all seniority levels and fellow researchers working on Big Data applications for the transportation industry, on network optimization problems or on commercial topics in airlines. I tried to find a middle ground between content of pure scientific interest (e.g., chapters 2 and 3), and presenting relevant findings for practitioners (chapters 4, 5 and 6).

Finally, I want to thank everyone who contributed to this PhD thesis, in particular my thesis advisor Prof. Dr. Iris Hausladen, who provided guidance and challenge whenever necessary. Further, I want to thank all interview partners of our airline case study group, who need to stay anonymous due to non-disclosure agreements. Philipp Behrends, Karin Garcia and Rudolf Schosser made an invaluable contribution by reviewing and commenting on various drafts of this thesis. My thanks go also to all staff and students of HHL Leipzig Graduate School of Management who made my time there so enjoyable. Finally, I want to thank Maximilian Rothkopf for helping to shape the idea and David Speiser for his support of my PhD project. My PhD thesis would not have been possible without the financial support during my educational leave granted by the Zurich Office of McKinsey & Company.

Berlin, May 2019 *Maximilian Schosser*

Contents

List of Figures

List of Tables

List of Abbreviations

ACL	-	Airport Coordination Limited
ACMI	-	Aircraft, Crew, Maintenance and Insurance
ADS-B	-	Automatic Dependent Surveillance Broadcast
API	-	Application Programming Interface
ASK	-	Available Seat Kilometers
AWB	-	Air Waybill
BD	-	Big Data
BDA	-	Big Data Analytics
BDO	-	Big Data Opportunity
BI&A	-	Business Intelligence & Analytics
BT	-	Block Time
CAR	-	Cargo Airline
CASS	-	Cargo Accounts Settlement System
CCO	-	Chief Commercial Officer
CEO	-	Chief Executive Officer
COO	-	Chief Operations Officer
DOC	-	Direct Operating Cost
e.g.	-	For example (Latin: exempli gratia)
EASA	-	European Aviation Safety Agency
e-AWB	-	Electronic Air Waybill
EBIT	-	Earnings Before Interest and Tax
et al.	-	Et alii
etc.	-	Et cetera
EU	-	European Union
FDI	-	Foreign Direct Investment
FSC	-	Full-Service Carrier
FTE	-	Full-Time Equivalent
GB	-	Gigabyte
GDP	-	Gross Domestic Product
GDS	-	Global Distribution System
GPS	-	Global Positioning System
HS	-	Hub-And-Spoke
i.e.	-	That is (Latin: id est)

IAG	-	International Airlines Group
IATA	-	International Air Transport Association
ICAO	-	International Civil Aviation Organization
IMF	-	International Monetary Fund
IOC	-	Indirect Operating Cost
IP	-	Internet Protocol
IS	-	Information Systems
IT	-	Information Technology
KPI	-	Key Performance Indicator
LCC	-	Low-Cost Carrier
LoRaWAN	-	Low Range Wide Area Network
MCT	-	Minimum Connection Time
MIDT	-	Marketing Information Data Tape
MIT	-	Massachusetts Institute of Technology
NLP	-	Natural Language Processing
NP	-	Network Planning
NPV	-	Net Present Value
OAG	-	Official Airline Guide
O&D	-	Origin & Destination
OECD	-	Organisation for Economic Co-operation and Development
OR	-	Operations Research
p.	-	Page
P&RM	-	Pricing & Revenue Management
pp.	-	Pages
PP	-	Point-To-Point
QSI	-	Quality Of Service Index
RBV	-	Resource-Based View
RFID	-	Radio-Frequency Identification
RQ	-	Research Question
RR	-	Random Radial
RSK	-	Revenue Seat Kilometers
RTK	-	Revenue Ton Kilometers
SCA	-	Scheduled Charter Airline
SCM	-	Supply Chain Management

SRS	-	Schedule Reference Service
TAT	-	Turn-Around Time
TB	-	Terabyte
UK	-	United Kingdom
US	-	United States
USD	-	United States Dollar
VHB	-	German Academic Association for Business Research
VM	-	Virtual Machine
WTO	-	World Trade Organization