Business Intelligence and Performance Management
Advanced Information and Knowledge Processing

Series Editors
Professor Lakhmi C. Jain
lakhmi.jain@unisa.edu.au

Professor Xindong Wu
xwu@cs.uvm.edu

For further volumes:
www.springer.com/series/4738
Editorial

Business Intelligence (BI) and Performance Management (PM) offer solutions to issues caused by the challenges of the 21st century, such as globalisation, volatile markets or technical progress. In all these challenges, handling growing volumes of data is a major issue that requires fast storage, reliable data access, intelligent retrieval of information and automated decision-making mechanisms, all provided at the highest level of service quality. BI and PM provide techniques to efficiently respond to the dynamic business. Selected aspects of both topics are discussed within this state-of-the-art volume. The contributing authors are leading academics and professionals representing various universities, research centres and companies worldwide. Their expertise covers multiple disciplines and industries that forms the pillars of BI and PM.

Figure 1 shows how this book is organised. The first part (“Introduction”) contains a chapter written by Hans-Georg Kemper, Peter Rausch, and Henning Baars about general Business Intelligence (BI) and Performance Management (PM) concepts in which related terms and definitions are introduced. In the following four parts BI and PM are analysed from different points of views. Part II discusses aspects concerning the strategic level. Afterwards, applications contributing to business development are outlined. Subsequently, ideas about methodologies are given. The fifth part focuses on important aspects of the related technologies. Finally, ideas about further developments conclude this book.

Part II (“BI/PM in Business Analytics, Strategy and Management”) begins with a chapter of Hans-Georg Kemper, Henning Baars, and Heiner Lasi. They present an integrated BI framework to close the gap between IT support for management and production. The next chapter, written by Peter Rausch and Michael Stumpf, gives insights into how to link the different management levels by means of BI and PM in the construction industry. Aspects of IT-based decision support on different management levels are discussed in the following chapter. Zafer-Korcan Görgülü and Stefan Pickl outline the integration of data mining and systems engineering as an integral part of the business strategy. Examples of clinical decision support and aviation management are outlined. To give the readers an idea how to introduce approaches supporting management instruments, Martin Kütz provides a guideline
for the introduction of key performance indicators and scorecards. To illustrate his explanations, he relates his chapter to the example of IT Management.

Part III ("BI/PM Applications to Business Development") includes selected examples of BI and PM applications, which were taken from various domains. They are transferrable to different industries. In the chapter of Dieter Landes, Florian Otto, Sven Schumann, and Frank Schlottke data mining approaches to detect incidents in networks are presented. The insights are based on experiences, which were made in the insurance business. Security issues are also the focus of Rick Adderley's chapter. He explores the differences between the cross industry process for data mining and the national intelligence model using a self-organising map. The presented case study is based on experiences in the field of public services. Klaus Freyburger's chapter about business planning and support by means of IT-Systems gives a very useful overview of applications and solutions in the field of business planning. The following chapter, written by Hans Georg Zimmermann, Ralph Grothmann, and Hans-Jörg von Mettenheim, puts the focus on planning purchase decisions. The presented solutions are based on advanced neural networks.

Since the benefit of all applications strongly depends on the adequacy of methodologies in terms of the problem domain, Part IV ("Methodologies") includes selected approaches. As the readers could learn from Part III, time series processing can be very useful for planning problems. Thus, Daniela Pohl and Abdelhamid Bouchachia present a roadmap of online and offline methods which are applied in financial services and other industries. A major issue, of course, is coping with uncertainty. Hence, the following chapters are addressed to this subject. For instance, Peter Rausch and Birgit Jehle explore regression analyses to solve the issue of data
supply for planning and budgeting processes under uncertainty. It also includes a fuzzy approach. The fuzzy set theory offers a rich approach that also can be used to solve other issues. Heinrich J. Rommelfanger presents a fuzzy approach to minimise the total cost in production and transportation planning. Alaa F. Sheta, Malik Braik, Ertan Öznergiz, Aladdin Ayesh, and Mehedi Masud combine fuzzy approaches with neural networks. Bringing these instruments together, they show how to improve steel making processes and how to model the dynamics of industrial processes. In addition to applying the methodologies, it is also very important to be able to measure efficiency of the deployed solutions. Martin Kütz presents useful approaches in his chapter and transfers them to IT organisations.

Part V (“Technologies”) looks at BI and PM from another point of view. It puts the focus on technologies. Werner Schmidt’s chapter explores business activity monitoring by means of a more or less loosely coupled combination of complex event processing functionality, process engines and dashboard applications. The idea is to introduce prerequisites for a continuous and simultaneous real-time monitoring. As another important issue, it is also necessary to process huge amounts of data. Therefore, Frederic Stahl, Mohamed Medhat Gaber, and Max Bramer analyse the aspect of scaling up data mining techniques to large datasets using parallel and distributed processing.

Part VI (“From Past to Present to Future”) gives the readers an idea about further developments. Many trends are already included in the other parts. However, we have decided to highlight one important subject. The Editors are honoured to finish the book with William H. Inmon’s chapter “Evolution of Business Intelligence”. He spans the arch from the first simple reporting systems to today’s evolved state of business intelligence and to the analysis of textual data.

The book describes selected theoretical aspects and presents practical solutions of the BI and PM area. The readers will get an excellent overview of how BI and PM are applied successfully to the challenges of the 21st century.

We hope that the readers will enjoy the book.

Nuremberg, Germany
Taif, Saudi Arabia
Leicester, UK

Peter Rausch
Alaa F. Sheta
Aladdin Ayesh
Acknowledgements

We are indebted to many people for their support and encouragement which was invaluable for the successful production of this book project. Firstly, we like to thank all authors for their excellent contributions and the wonderful cooperation during the review and publishing process. Also, we are deeply grateful to all referees for their valuable suggestions and their effort. Words can’t express how grateful we are to Michael Stumpf for contributing his great ideas and countless hours of his spare time to make this book a success. We appreciate his valuable feedback and the fruitful scientific discussions very much. Without Michael’s support we certainly wouldn’t have achieved this quality.

Last but not least thanks a lot to the Springer and the VTeX team, especially Helen Desmond, Ben Bishop and Edita Baronaitė for their great support.

Besides, Peter likes to thank his co-editors Alaa and Aladdin for their inspiring ideas. His sincerest thanks go to the lady of his heart, Birgit Jehle, for her encouragement, the feedbacks, her great ideas & suggestions, the scientific discussions, the valuable advices, the continuous support or just listening. It cannot be put into words how much she supported Peter and sacrificed her valuable time. Peter is also very grateful to Heinrich Rommelfanger and Patricia Brockmann who provided him with valuable feedback which helped so much to improve the quality of the chapters he was involved in. Additionally, Peter likes to express further greatest thanks for help and feedback to Carolin Theelke and to Caroline & Hans Benker. He dedicates this book to: Hannelore Wendt, Christian Amann, Thomas Hillerbrandt, Linda Kröber, Mr. Kuthning and an unknown lady from Italy. Without you this book wouldn’t exist!

Alaa would like to thank his co-editor Peter for his sincere and continue effort to make this book possible. He also wants to thank Aladdin for his great suggestion. Alaa would like to acknowledge his wife Rania for her support throughout his career and especially for the development of this book. She has been the source of motivation and the stimulus for me to improve my profession and move forward towards great achievements. Rania: I dedicate this book to you. I also thank my lovely children’s: Ahmed and Ayaa for their smart questions and wonderful smile. I hope one day they will read this book and know how much I love them. I cannot forget
to thank my parents for their continuous praying. I want to dedicate this book to the
sole of my best friend Ahmed Effat whom used to believe on me and tells that I can
make great works.

Aladdin likes to thank his co-editors Peter and Alaa for their great efforts in real-
ising this book, for their great friendship, and for their great display of profession-
alism. It has been a pleasure to work with them. He also likes to acknowledge his
late parents for all they have done. They may have passed away but they are here in
spirit through their great guidance, encouragement, and believing in him that made
his career. In memory of Sabah and Saad.

Peter Rausch
Alaa F. Sheta
Aladdin Ayesh
Contents

Part I  Introduction
1 Business Intelligence and Performance Management: Introduction  . 3
Hans-Georg Kemper, Peter Rausch, and Henning Baars

Part II  BI/PM in Business Analytics, Strategy and Management
2 An Integrated Business Intelligence Framework  . . . . . . . . . . . . . . . 13
Hans-Georg Kemper, Henning Baars, and Heiner Lasi
3 Linking the Operational, Tactical and Strategic Levels by Means
   of CPM: An Example in the Construction Industry  . . . . . . . . . . . 27
Peter Rausch and Michael Stumpf
4 Adaptive Business Intelligence: The Integration of Data Mining
   and Systems Engineering into an Advanced Decision Support
   as an Integral Part of the Business Strategy  . . . . . . . . . . . . . . . 43
Zafer-Korcan Görgülü and Stefan Pickl
5 How to Introduce KPIs and Scorecards in IT Management  . . . . . 59
Martin Kütz

Part III  BI/PM Applications to Business Development
6 Identifying Suspicious Activities in Company Networks Through
   Data Mining and Visualization  . . . . . . . . . . . . . . . . . . . . . . . 75
Dieter Landes, Florian Otto, Sven Schumann, and Frank Schlottke
7 Exploring the Differences Between the Cross Industry Process
   for Data Mining and the National Intelligence Model Using a Self
   Organising Map Case study  . . . . . . . . . . . . . . . . . . . . . . . . . . . 91
Richard Adderley
8 Business Planning and Support by IT-Systems  . . . . . . . . . . . . . . 107
Klaus Freyburger
9 Planning Purchase Decisions with Advanced Neural Networks . . . 125
Hans Georg Zimmermann, Ralph Grothmann, and
Hans-Jörg von Mettenheim

Part IV Methodologies

10 Financial Time Series Processing: A Roadmap of Online and
Offline Methods .......................................................... 145
Daniela Pohl and Abdelhamid Bouchachia

11 Data Supply for Planning and Budgeting Processes under
Uncertainty by Means of Regression Analyses ............... 163
Peter Rausch and Birgit Jehle

12 Minimizing the Total Cost in Production and Transportation
Planning—A Fuzzy Approach .............................................. 179
Heinrich J. Rommelfanger

13 Design and Automation for Manufacturing Processes:
An Intelligent Business Modeling Using Adaptive Neuro-Fuzzy
Inference Systems .......................................................... 191
Alaa F. Sheta, Malik Braik, Ertan Öznergiz, Aladdin Ayesh, and
Mehedi Masud

14 How to Measure Efficiency in IT Organizations ............ 209
Martin Kütz

Part V Technologies

15 Business Activity Monitoring (BAM) .......................... 229
Werner Schmidt

16 Scaling up Data Mining Techniques to Large Datasets Using
Parallel and Distributed Processing .............................. 243
Frederic Stahl, Mohamed Medhat Gaber, and Max Bramer

Part VI From Past to Present to Future

17 Evolution of Business Intelligence ............................... 263
W.H. Inmon
Contributors

Richard Adderley  A E Solutions (BI) Ltd, Evesham, Worcestershire, UK
Aladdin Ayesh  Faculty of Technology, De Montfort University, Leicester, UK
Henning Baars  Chair of Information Systems I, University of Stuttgart, Stuttgart, Germany
Abdelhamid Bouchachia  Bournemouth University, Bournemouth, UK
Malik Braik  Electronic, Electrical and Computer Engineering Department, University of Birmingham, Birmingham, Edgbaston, UK
Max Bramer  School of Computing, University of Portsmouth, Portsmouth, Hants, UK
Klaus Freyburger  Hochschule Ludwigshafen am Rhein, Ludwigshafen, Germany
Mohamed Medhat Gaber  School of Computing, University of Portsmouth, Portsmouth, Hants, UK
Zafer-Korcan Görgülü  Institute for Theoretical Computer Science, Mathematics and Operations Research, Universität der Bundeswehr München, Neubiberg-München, Germany
Ralph Grothmann  Siemens AG Munich, Corporate Technology, Munich, Germany
W.H. Inmon  Inmon Consulting Services, Castle Rock, CO, USA
Birgit Jehle  Noris Treuhand Unternehmensberatung GmbH, Nuremberg, Germany
Hans-Georg Kemper  Chair of Information Systems I, University of Stuttgart, Stuttgart, Germany
Martin Kütz  Fachbereich Informatik und Sprachen, Hochschule Anhalt, Köthen, Germany
Dieter Landes  Coburg University of Applied Sciences and Arts, Coburg, Germany
Heiner Lasi  Chair of Information Systems I, University of Stuttgart, Stuttgart, Germany

Mehedi Masud  Department of Computer Science, College of Computers and Information Technology, Taif University, Taif, Saudi Arabia

Florian Otto  Coburg University of Applied Sciences and Arts, Coburg, Germany

Ertan Öznergiz  Marine Engineering Operations Department, Faculty of Naval Architecture and Maritime, Yildiz Technical University, Istanbul, Turkey

Stefan Pickl  Institute for Theoretical Computer Science, Mathematics and Operations Research, Universität der Bundeswehr München, Neubiberg-München, Germany

Daniela Pohl  Alpen-Adria-Universität Klagenfurt, Klagenfurt, Austria

Peter Rausch  Department of Computer Science, Georg Simon Ohm University of Applied Sciences, Nuremberg, Germany

Heinrich J. Rommelfanger  Faculty of Economics and Business Administration, Goethe University Frankfurt am Main, Schwalbach am Taunus, Germany

Frank Schlottke  Applied Security, Stockstadt, Germany

Werner Schmidt  University of Applied Sciences Ingolstadt, Ingolstadt, Germany

Sven Schumann  HUK COBURG, Coburg, Germany

Alaa F. Sheta  Department of Computer Science, College of Computers and Information Technology, Taif University, Taif, Saudi Arabia

Frederic Stahl  The School of Design, Engineering & Computing, Poole House, Bournemouth University, Poole, Dorset, UK

Michael Stumpf  Department of Computer Science, Georg Simon Ohm University of Applied Sciences, Nuremberg, Germany

Hans-Jörg von Mettenheim  Institut für Wirtschaftsinformatik, Leibniz Universität Hannover, Hannover, Germany

Hans Georg Zimmermann  Siemens AG Munich, Corporate Technology, Munich, Germany