

Preface

The purpose of this book is to assemble many of the theories related to implementing an Enterprise Resource Planning (ERP) system, provide the history of implementation of SAP R/3 system in a multinational company during 1991-2004, and analyze the practice using the theories. We include a chapter that discusses the new products of SAP and shows how they might be used by the company in the future. We have also included another case study that discusses implementation of SAP R/3 in Sidler GmbH. This book provides the basics of ERP systems, so that a reader who is not familiar with the terminologies can understand them well enough to appreciate the importance of effective implementation of ERP systems.

This book can be used as a reference by a seasoned practitioner at any level of an organization or as an introduction to ERP by a person who is new to the concepts. It is particularly useful for project teams that are selecting or implementing ERP systems because it provides a detailed case study of implementation of a system at a company. The team can analyze the reported implementation, come up with alternate scenarios, learn from the exercise, and then proceed to work on effectively implementing the ERP system in their company. They can learn from the successful strategies and avoid the mistakes.

The book is particularly useful to students who are planning to graduate with an emphasis on business processes/ERP systems and practice as consultants or project managers in ERP implementation projects. It is especially helpful for students in graduate MBA and Executive MBA programs since it prepares them to be in charge of ERP implementation projects. This book provides them an insight into the implementation experiences of a large corporation that is expecting to spend about \$1 billion on an ERP project. This book is unique since it emphasizes and illustrates business processes, IT architectures, and IT structures.

Focus of This Book

The success of a company depends on people, products, and processes. Typically in the beginning there is an innovative idea to solve an existing problem or to create a new demand with a new product. Examples in history of people and processes coming together to develop innovations are numerous and in this book we will take a look at some of them.

In one example of an innovative idea being applied in a different field, Herman Hollerith decided to use the punch cards developed by the French silk weaver Joseph-Marie Jacquard to represent the data gathered for the American census of 1890, and to read and collate this data using an automatic machine (Maxfield & Montrose, 1998). This became the basis for the world's most famous information technology company, IBM.

In another example, two German engineers, Gottlieb Daimler and Karl Benz independently invented the engine and the automobile in the 1880s and laid the foundations for the motorization of road transport. With the help of financial backers and partners, they both turned their development projects into private businesses, Benz & Cie. in October 1883, and the Daimler-Motoren-Gesellschaft (DMG) in November 1890. In 1885, Benz designed and built the world's first practical automobile to be powered by an internal-combustion engine and received the first patent (DRP No. 37435) for a gas-fueled car on January 29, 1886. In June 1926, the two oldest motor manufacturers merged to form Daimler-Benz AG (DaimlerChrysler, 2005). DaimlerChrysler now has a global workforce and a global shareholder base. With 384,723 employees, DaimlerChrysler achieved revenues of EUR 142.1 billion (US\$192.3 billion) in 2004.

In 1886, Robert Bosch opened his "Workshop for precision and electric engineering." The next year he met Gottlieb Daimler, and Bosch developed a low-voltage magneto for the internal-combustion engine in stationary machines for him (Heuss, 1994). From that humble beginning, Robert Bosch GmbH has grown to be a 40 billion Euro company in 2004, with about 240,000 associates worldwide. By 2004, the Bosch Group had become the world's largest automotive supplier in terms of sales (Robert Bosch, 2005).

Finally, we want to mention SAP, a software company. In 1972, five former IBM employees launched a company called SAP (Systems Analysis and Program Development) in Mannheim, Germany, the same city where Karl Benz had started his company almost ninety years earlier. Their vision was to develop standard application software for real-time business processing. One year later, their first financial accounting product was ready for the market, forming the basis for the continuing development of other software components in what later came to be known as the "R/1 system," where "R" stands for real-time data processing. By the end of the decade, an intensive examination of SAP's IBM database and dialog control system led to the birth of SAP R/2. By 2005,

12 million workers around the world were using SAP solutions every day. There are now 91,500 installations worldwide, more than 1,500 partners, over 25 industry-specific business solutions, and more than 26,150 customers in 120 countries. SAP is the world's third-largest independent software vendor (SAP AG, 2005).

These examples show that people and products are essential for the success of companies. In particular, familiar products and the people who are the driving force of a company are visible to outsiders. However, less obvious factors actually determine a company's success or failure, such as the operating structure and processes they use. This is the focus of our book.

We will examine the internal and external processes used in a company and the information systems that enable and support these processes. We will not necessarily present new models and theories; our contribution to the academic and professional community is to present and analyze three case studies on the implementation of Enterprise Resource Planning (ERP) Systems in multinational organizations.

Robert Bosch Case Study

The major case study discussed in the book is the implementation of the SAP R/3 system by Robert Bosch GmbH, the world leader in the automotive parts supply industry. If you visit the homepage of the Bosch Group, you will find the term "diversity" mentioned several times. In the Bosch environment, this means diversity in products and technology (automotive technology, consumer goods and building technology, and industrial technology), and diversity in locations (more than 260 production locations in more than 50 countries). It also means diversity and complexity in the structure and processes used in the different plants and divisions of this well-established company. SAP's software system, R/3, basically structures business functions such as accounting, sales, purchasing, and so forth. It has changed its concept in the last few years to focus on business processes. However, it will take more time to master this transition, as is demonstrated in the book. The company is still developing new technologies to build process-oriented software solutions. Leading IT providers are still undergoing a transition process as they begin to provide new solutions that support a business process-oriented strategy.

The Robert Bosch GmbH case study in this book covers a period of more than 10 years. It starts in 1994, when the company's board of management established an IT division with a corporate-wide responsibility for IT. Traditionally, the IT functions in companies have a strong technology orientation. In the past few years, however, many companies have realized that IT solutions are closely

connected with business processes. The design of business processes is essential for business success. The quality of business processes measured in cycle-time, reliability, flexibility, reactivity, and costs is highly dependent on the information systems that support them. The issues involved in bringing together information systems, business processes, and the people who will have to work with them is the main subject of this case. Theoretically, the solution should be relatively easy: Optimal processes are designed using the best information systems and then implemented. The problems arise when this is done in a real company with real people. To teach this to students in the classroom is very challenging. Students typically have no idea about the complexity of real companies. To describe this in an abstract way is either trivial or impossible, so we decided to use the case study approach. We did not try to simplify and structure reality, since it is neither simple nor well structured. These are the types of challenges our graduates will face once they leave the classroom and enter the workforce.

When we talked to the IT executives at Robert Bosch in 1999, they were in the middle of the transition process as they reevaluated the way they were doing business. We learned that SAP was being implemented in Robert Bosch worldwide, but that the top management of Bosch was not satisfied with the implementation of more than 50 SAP R/3 systems. The case study shows that it took some time to convince the top management, as well as the people in the plants and departments, what needed to be done. The challenges were first to get the support of the company's top management for the necessary changes in the business processes. On the operational level, it was necessary to convince the workforce that an optimal solution in a certain plant may not be the optimal solution from a corporate point of view. It was necessary to make clear that standardization and harmonization of business processes would provide benefits for the individual plants and business units, as well as for the corporation as a whole. We also had the chance to document Bosch's existing, and very innovative, concepts for providing optimal integration of IT systems in 1999, which turned out to be very similar to the new concepts that are now included in the NetWeaver-based integration of SAP. The first two case studies developed during this period showed the managerial and technical issues that had to be solved for effective implementation of the SAP R/3 system. Further discussions during 2004 led to the development of an extra chapter on how Robert Bosch implemented the SAP R/3 system, along with documentation of the change in management processes that were put into practice.

To round out the book and provide another perspective, we also developed another case study by working with the management of Sidler GmbH in Germany on the implementation of SAP R/3 in their company.

We have used all these case studies in graduate and undergraduate business classes at Pforzheim University in Germany and Auburn University in the United

States, where they were very well received by the students. Even those students who had taken a few courses on SAP R/3 told us that they understood for the first time the business implications of implementing SAP R/3 in a multinational corporation when they analyzed the Robert Bosch case study.

Organization of This Book

As we developed the case studies, we worked with Idea Group Publishers to produce the case studies in the form of a textbook. They provided us with feedback that convinced us that it was essential to include chapters that provide general information about multinational companies, ERP systems, change management topics, and the technical issues involved. We therefore added several introductory chapters to make it easier for students to understand and benefit from analyzing the case studies. The book is presented using twelve chapters, and we will summarize the contents of each chapter briefly below.

Chapter I introduces the book and explains the pedagogical approach we follow, particularly how the case study approach can be used to bring real-world issues into the classroom. We make especially clear how the learning process works. This should help the instructor using this book, as well as help the students learn how to use the case studies and derive the most value through analyzing them.

Chapter II defines and describes how multinational companies function. We explain the basic features of organizational structures and how large companies structure their divisions. In addition, we explain the strategies followed by multinational companies to manage their divisions and plants.

Chapter III provides a general overview about Enterprise Resource Planning systems, starting with historical approaches such as MRP and MRP II. A brief description of the functions or modules of an ERP system helps students to understand the strength and complexity of such a software solution. Due to the fact that an ERP system is not a simple software solution, such as a spreadsheet system used on a single computer by one user, we provide a short description of the technical architecture of an ERP system. An overview of the ERP market is also provided and the major companies that sell ERP systems are briefly described. Due to the fact that the Robert Bosch case uses the SAP R/3 system, we go on to describe SAP and their ERP system in detail. Using this chapter, a reader with only a limited background in ERP can gain a general idea about this subject. An experienced reader could read this chapter quickly or even skip it.

Chapter IV introduces the concept of change management. To implement an ERP system company wide means that it will be necessary to manage the change

process. Basically, this is not a technical issue but a psychological challenge, and the reader is given a well-founded overview of the change management life cycle in this chapter. Learning about the life cycle is essential for future executives who will have to manage changes in organizations. Based on this understanding of an ERP system, we can then explain the issues involved in implementation, concentrating on structural, technical, and managerial issues and presenting a range of possible implementation strategies and approaches.

Chapter V describes the basic concepts of database management systems and defines terms such as “normalization” and “single instance,” with examples. The chapter describes the issues that must be considered when implementing ERP systems and the phases that could be used to implement an ERP system. It concludes by describing enterprise modeling methodology and how a company could be structured.

Chapter VI is the first case study, covering the period 1992-1999. It also provides an overview of the Bosch company to give the reader a picture of the different business sectors of Bosch and how Bosch is structured. The reasons for implementing a corporation-wide IT division are also discussed. The rest of the chapter focuses on understanding the business, the structure, and the IT issues within Robert Bosch in the United States (RBUS). In this chapter, the reader will also meet the people who were the main players in implementing the SAP R/3 system at Robert Bosch.

Chapter VII is the second case study on Robert Bosch, and shows how a solution for the IT issues in Robert Bosch US could not be approved without finding a solution for the whole company, due to the fact that Bosch does its business on a global scale. We present the process followed by the CIO at RBUS as he worked on a proposal to solve the problems in Robert Bosch U.S., while at the same time the central IT division in Germany was working on concepts to standardize and harmonize the company’s business processes, as well as defining a standardized systems solution. The top management of Robert Bosch US initially rejected the project proposal presented by the CIO at RBUS, since he proposed using a specialized solution in the US, which would not be suitable for the whole company. These two case studies provide students with an opportunity to propose future strategies for implementing SAP R/3 throughout the corporation.

Chapter VIII provides an analysis of the case studies performed by the authors on the case studies presented in Chapters 6 and 7. Analytical methods are applied to produce answers to the questions raised in the case studies. This chapter can be used in different ways: The first approach would be for the instructor to use these analysis to prepare student assignments, and the second approach would be for the reader to compare his or her own analysis to those provided by the authors.

Chapter IX continues the case study provided in Chapters VI and VII, covering the period from the beginning of 2000 to the summer of 2004, including the company's projections out to 2008. It shows the reader what Robert Bosch did in this period to implement an ERP solution for a company of this size. This SAP R/3 project is one of the largest undertaken anywhere in the world, and is expected to cost more than one billion dollars. Therefore, the reader has the unprecedented benefit of learning from an exceptional case study. This chapter presents changes that are not limited to technical aspects, but affect the way Robert Bosch is managing its business globally. But it also shows that in a company of this size, a step-by-step implementation approach is the only way to execute such a major change successfully. Nevertheless, this approach does not lead to an optimal solution in an ideal sense.

Chapter X provides the reader with some idea of the future of ERP solutions, which are expected to provide businesses with a high degree of integration and flexibility. The authors of this chapter are working at the forefront of the future software solution architectures, and collaborate closely with SAP. The material describes the basics of the Service Oriented Architecture (SOA), which was mentioned as the future direction in Chapter 3. Based on this general understanding, the Enterprise Service Architecture (ESA) is presented. The description is not limited to concepts, but shows also how this ESA concept is supported by NetWeaver, which is the product portfolio of SAP that enables flexible integrated solutions. This chapter shows that many of the problems described in the case studies will be solved more elegantly in the future, and it shows also how these technologies will provide countless new possibilities to support business processes in more optimal ways. Many of the described concepts and products are still under development, but they are already in place and used by some companies.

Chapter XI delivers an additional example of ERP implementations in another company. The Sidler company is also active in the automotive supplier industry. It is a fairly small company, but also works in different parts of the world and supplies car manufacturers all over the world. They had to implement a new ERP infrastructure because their existing IT solutions were outdated and were not able to comply with the Y2K issue or to cope with the introduction of the new European currency, the Euro. They had a low level of expertise in managing IT projects of this size, so they had to rely on external consultants. This led to many problems, but finally they implemented the system successfully. This was basically possible because the size of the company was limited and they were able to improvise.

Chapter XII concludes the book and summarizes the benefits the reader will have gained. It reviews the inventory of skills that a student should have improved by analyzing the case studies and lists lessons in implementing ERP systems that could be applicable to the student's future career. This chapter analyzes the change management processes adopted by Robert Bosch using

the change management life cycle theory. In particular, it provides students with an in-depth understanding of ERP implementation by analyzing the implementation of SAP R/3 systems at Robert Bosch RB GmbH during 1991-2004. Overall, the book identifies key management issues in designing and implementing ERP systems and illustrates them with real-world examples.

Strength of This Book

The strength of this book lies in the combination of the theories that are provided in Chapters I through V and the case studies that illustrate the theories in Chapters VI through X. Other chapters analyze the case studies and connect the theories with the practical examples. This process gives students an opportunity to understand how to apply the theories they learn in class to a practical problem. The students will inevitably face unsolved and difficult problems in the future, and we expect the approach used in this book will provide them with the valuable analytical skills they will need to address these problems.

Reference List

- DaimlerChrysler. (2005). The Brand Mercedes-Benz. Retrieved August 15, 2005, from https://www.cms.daimlerchrysler.com/emb_classic/0,,0-195-78709-1-84456-1-0-0-0-0-434-78641-0-0-0-0-0-0-0,00.html
- Heuss, T., Gillespie, S., Kapczynski, J. (1994). *Robert Bosch: His life and achievements*. New York: Henry Holt & Co.
- Maxfield & Montrose Interactive, Inc. (1998). A history of computers: 1890 AD Herman Hollerith's tabulating machines. Retrieved August 15, 2005, from <http://www.maxmon.com/punch1.htm>
- Robert Bosch GmbH. (2005). Structure and business sectors. Retrieved August 15, 2005, from <http://www.bosch.com/content/language2/html/2143.htm>
- SAP AG. (2005). SAP history: From start-up software vendor to global market leader. Retrieved August 15, 2005, from <http://www.sap.com/company/history.epx>

Acknowledgments

The work on this book goes back to fall 1999, when we first contacted Dr. Eggensperger, the CIO of Robert Bosch GmbH in Stuttgart, Germany, and the idea to write a case study about the ERP implementation process in the Bosch corporation was born. The authors decided to focus the case study on two aspects: the corporate view and the view of the Bosch subsidiary in the United States of America. In this first phase, we interviewed different IT executives in the U.S. as well as in Germany. We would like to express our gratitude to Mrs. Margit Bauer, CIO Robert Bosch GmbH, and Mr. Don Chauncey, vice president of Information Systems Robert Bosch US, for providing us with invaluable information. Based on this field research, we were able to prepare two case studies. For contributing to the process of improving the cases studies, we also thank the reviewers of the Ninth Annual International Casewriters' Workshop held during the meetings of the World Association for Case Method Research & Application (WACRA) held in Budapest, Hungary, July 2000. In the semesters following, we used the case studies in different undergraduate and graduate classes, and we appreciate the advice and feedback given by our students at Auburn University and Pforzheim University.

In 2004, we decided to publish the case studies, supplemented by additional material, as a book. In this context we contacted the Bosch company again. In the summer of 2004, we conducted a series of interviews with Mike Bieganski, vice president of Information Technology for Robert Bosch North America in Chicago, and Gerd Friedrich, CIO of Robert Bosch GmbH in Stuttgart. We appreciate the information that they shared with us, which enabled us to conduct a longitudinal study covering a timeline of about 10 years. We are also grateful to Mr. Friedrich for writing a foreword for this book expressing the importance of publishing books that combine theory and practice.

In February 2001 and March 2005, we had the chance to discuss our results with MIS faculty at the SAP Research and Application Congress 2001 in San Diego, California, and the SAP Curriculum Congress 2005 in Atlanta, Georgia. We again received valuable feedback that we were able to use to improve our cases. In this context, we are much obliged to Dan Pantaleo, vice president of SAP, who also wrote a foreword for this book expressing how the lessons learnt from the case studies presented are so helpful for professionals in the business arena.

In preparing a book, the professionalism of the experienced staff at the publisher is indispensable. We acknowledge the help of all involved in the collation and review process for this book. Kristin Roth, development editor, Jan Travers, senior managing editor, and Dorsey Howard, marketing assistant at Idea Group Publishing helped us tremendously in revising and finalizing the manuscript. Last but not least, our deep gratitude is due to the reviewers who gave us valuable advice to strengthen the value of the book.

We also thank our graduate students, Keegan B. Corcoran, Manuel Offermanns, Ramin Chandhok, and Nazmi Doganc who helped develop some of the materials used in the chapters. Van Norris helped by providing valuable comments on an earlier draft. Jan Szechi edited the material to make it more presentable. We are grateful to our colleague William R. Boulton for providing permission to use the Sidler GmbH case study. We also acknowledge the managers from this company, who provided permission to publish this case study. We are also thankful to our graduate students who provided feedback on earlier versions of the case study.

In closing, we wish to thank the authors of Chapter 10, Valentin Nicolescu, Holger Wittges, and Helmut Krcmar, from the Technische Universitaet Muenchen, for writing this chapter. Finally, we want to thank our respective spouses, Lakshmi and Jutta, for their love and support throughout this project.

Dr. Chetan S. Sankar
Auburn University, USA
sankacs@auburn.edu

Dr. Karl-Heinz Rau
Pforzheim University, Germany
karl-heinz.rau@hs-pforzheim.de