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PRODUCTION CONTROLLING IN THE DIGITAL AGE

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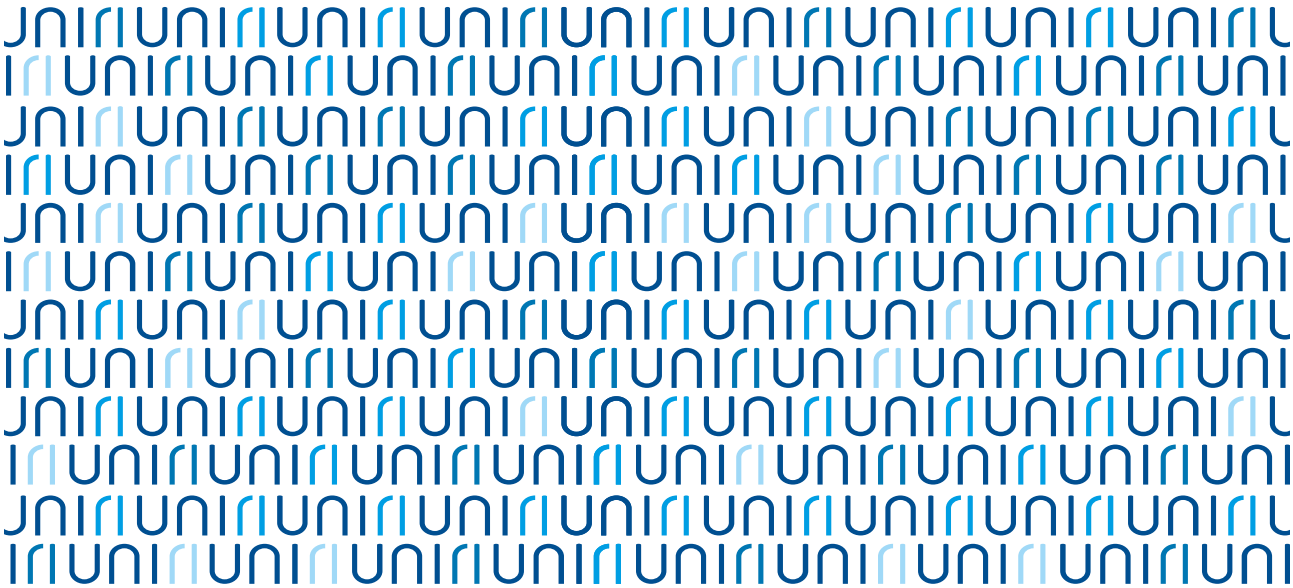

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PREFACE

The aim of this book is to present one of the most important parts of controlling – production – in its current 21st-century form – digitalization. Production is critical for the development of all societies and this is why measuring effects and overall company performance is of utmost importance. Digitalization is the current and future perspective embedded in almost every job and all segments of life. Controlling supports the management in the decision making process and is therefore not excluded from the impact of digitalized business processes.

This textbook is written for academic courses and practicing professionals. For the purpose of academic courses, the book is written as a core text for graduate and postgraduate students who want to acquire in-depth knowledge of the production controlling concept. For specialists like controllers, analysts, accountants, auditors, and other similar professions, the book provides an opportunity to apply their knowledge of the methodology that is to be used in strategic and operational process controlling. The five chapters of the textbook describe the essential approach to production controlling adapted to the needs of both students and professionals. Chapter 1 introduces the technological basis – Big Data. Cyber-physical systems are introduced for the purposes of business model creation and controlling. The introduction covers the impact of digitalization, and Chapter 2 describes the concrete concept of smart production, new forms and benefits of industrialization, business model in relation to smart production and economic dimension of Big Data, and the role of controllers. Chapter 3 discusses key performance indicators and a ratio system that can be used for controlling purposes. Chapter 4 deals with production process controlling starting with their components and determinants as success factors. Strategic and operational process controlling is described in detail by the methods and key performance indicators of value stream controlling. Production business model controlling is covered in the fifth chapter in which methodology is presented as a combination of process-oriented production controlling, supply chain controlling, and corporate controlling. Business model controlling methodology is based on innovation in production engineering and computer science, which calls for powerful IT business applications.

The beginning of this century was very dynamic. Rapid technological inventions, especially in IT, have been growing tremendously. What are the challenges of production controlling and what does it take to make it successful? The answers can be found in this textbook!

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Authors

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1. The Impact of Digitalization

Technological innovations bring possibilities and create a digital world. The impact of digitalization on the organizations' performance and business model creation is evident. "Digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business."[1]

The fourth industrial revolution will lead to modular networking of processes in industrial companies or factories. An intelligent factory consists of Internet-based production in which manufacturing facilities, products, materials, and tools communicate. Make to order (MTO) means production based on customer requirements. This generates costs for configuration of a wide range of product variants. On the other hand, globalization leads to high competition and pressure caused by rising costs which can only be solved by using high end technology. The vision of individualized products and services with manufacturing costs from batch production has become reality by pioneering development in manufacturing and information technology.

The search for and analysis of avoidable costs has lately focused on both technological competence and process competence. Process competence defines the ability to perceive complexity and guarantees that the process will result in suitable solutions and value added for the customer.

Digitalization is an ongoing process that will continue in the 21st century. However, it is also a tool for obtaining and handling information within the organization and its environment. The effects of digitalization are continuous and entail both opportunities and challenges for the controlling profession.

Controlling is a function that helps companies perform more efficiently and effectively in order to achieve the set goals and objectives. By using different analytical tools, controllers analyze various aspects of performance, coordinate plans between departments and make integrative conclusions suitable for decision making.

The role of controlling in the digital enviroment has been facing a challenge. Self-service business intelligence (SSBI) enables the employees in various departments to select data themselves. The controller's role of a gatekeeper in the controlling enviroment has become obsolete in the digital age, because in the past controlling was predominantly focused on data collection and processing, while nowadays employees can do it themselves. However, if anyone could select the data by self-service, every employee would select the data supporting their own argumentation. Data selection is in that case not objective, but subjective, and controllers' meetings will be postponed to set enterprise-related global data models and governance for data harmonization.

1 Gartner IT Glossary, http://www-it-glossary/Digitalization

The analysis of digitalization controlling has an additional role – to harmonize data in coordination with the IT department. Generally, data are signs adhering to a specific syntax. Data become information if they have a meaning for the recipient. Models make sections of reality less complex in order to make understanding of the context easier for model users. The data model definition is used to find out which data are needed and how they relate to each other. The data model must be specified by controlling in coordination with the IT department. Only strict governance can ensure harmonized data and enable the management to access decision-relevant data.

The future role of controlling is to derive meaningful conclusions from the selected data, which are now Big Data. Quantitative methods, i.e. mathematical-statistical methods, can be used to measure the correlation of the factors influencing the behavior of customers, to understand the development of market data and to predict the development of customer behavior and market data, provided that test results are successful.

The central task of data scientists is application of statistical methods using information technology. On the other hand, business interpretation and development of concepts in response to forecasting is a task of controlling.

Classic instruments of product cost controlling are based on classic costing and the focus is on production time cost as a part of the entire production process. Using sensors, data are made available every second through running production processes. Monitoring of the production processes takes place in real time. Thus, production controlling is always informed about the current state of production processes and can make timely decisions accordingly. Besides, the search for alternatives can be automated by self-learning systems when there is a problem in production. Therefore, the established production controlling needs to respond to this progress with new approaches.

1.1. The Technological Basis of Semi-Autonomous Organizational Units

Building a modular, flexible production structure is inconceivable without developments in the field of the information and communication technology, such as:

- Real-time data collection
- Short-term response to events
- Calculation and visualization of production process indicators
- Support of continuous improvement
- Steering, control and monitoring of the production in real time.