

Contents

| | | |
|----------|--|----------|
| 1 | Production Development over Time..... | 1 |
| 1.1 | Production Development in Focus..... | 1 |
| 1.1.1 | Time to Emphasise the Importance of Production | 1 |
| 1.1.2 | Part of the Product Realisation Process..... | 5 |
| 1.1.3 | Structured Way of Working | 6 |
| 1.1.4 | Road Map of the Book | 7 |
| 1.2 | Industrial Revolutions | 9 |
| 1.2.1 | The Historical Perspective | 9 |
| 1.2.2 | The First Industrial Revolution | 10 |
| 1.2.3 | The Second Industrial Revolution..... | 11 |
| 1.2.4 | Black Ford Model T and Fordism | 12 |
| 1.2.5 | Annual Model Change and Sloanism..... | 17 |
| 1.3 | Organisational Fundamentals | 18 |
| 1.3.1 | Scientific Management | 19 |
| 1.3.2 | Organisational Theory of Importance for Industrial Production | 22 |
| 1.3.3 | Socio-Technical Organisational Theory..... | 25 |
| 1.4 | Toyota Production System..... | 26 |
| 1.4.1 | The Founder of Toyota | 26 |
| 1.4.2 | Inspiration from USA..... | 27 |
| 1.4.3 | Towards Lean Production | 29 |
| 1.4.4 | The Toyota Way | 30 |
| 1.5 | Industrialisation in Sweden | 31 |
| 1.5.1 | Development Towards Mass Production | 31 |
| 1.5.2 | Alternative Production Concept..... | 32 |
| 1.6 | Production Development: A Summary..... | 34 |
| 1.6.1 | External Influences | 34 |
| 1.6.2 | Actual Options | 35 |
| 1.6.3 | Strategies and Fundamental Attitudes..... | 36 |

| | | |
|----------|--|-----|
| 2 | Production System | 37 |
| 2.1 | A Systems Perspective | 37 |
| 2.1.1 | Characteristics of a System | 38 |
| 2.1.2 | Production: A Transformation System | 39 |
| 2.1.3 | Classification of Systems | 40 |
| 2.1.4 | Open System | 42 |
| 2.2 | What Is a Production System? | 43 |
| 2.2.1 | Terminology | 43 |
| 2.2.2 | The Structure of the Production System | 45 |
| 2.2.3 | Life-Cycle Perspective | 46 |
| 3 | From Business Plans to Production | 49 |
| 3.1 | Strategies to Reach Targets | 49 |
| 3.1.1 | Manufacturing Strategy | 53 |
| 3.1.2 | Competitive Factors | 54 |
| 3.1.3 | Decision Categories | 55 |
| 3.1.4 | Formulating and Implementing Manufacturing Strategies | 63 |
| 3.2 | The Production System's Contribution to Competitiveness | 65 |
| 3.3 | Production System and Manufacturing Strategy in Balance | 67 |
| 3.3.1 | Product Profiling | 68 |
| 3.4 | New Production System at Lesjöfors AB | 71 |
| 4 | Production System Development | 77 |
| 4.1 | New or Changed Production Systems | 77 |
| 4.2 | Industrial Development of Production Systems | 82 |
| 4.2.1 | Typical Development Situations | 82 |
| 4.2.2 | Industrial Practice | 83 |
| 4.2.3 | Structured Ways of Working | 86 |
| 4.3 | Evaluation: Part of Development | 88 |
| 4.3.1 | Evaluation of Existing Production Systems | 89 |
| 4.3.2 | Evaluation of System Alternatives | 91 |
| 4.3.3 | Evaluation of Equipment- or System Suppliers | 95 |
| 4.3.4 | Evaluation After Change | 96 |
| 4.3.5 | Factors Affecting Evaluation of Production Systems | 98 |
| 4.4 | "It Is in the Walls" | 100 |
| 4.5 | Production System Designers | 102 |
| 4.6 | New Assembly Plant in Uddevalla | 105 |
| 5 | Production System Development in Theory | 109 |
| 5.1 | Fundamental Concepts and the Knowledge Area | 109 |
| 5.1.1 | Design and Development | 111 |
| 5.1.2 | Evaluation and Follow-Up | 112 |
| 5.1.3 | Process | 114 |

| | | |
|----------|--|------------|
| 5.2 | The Development Process | 115 |
| 5.2.1 | Design: Problem-Solving and Decision | 116 |
| 5.2.2 | Activities in the Development Process..... | 118 |
| 5.2.3 | Industrial versus Academic Perspectives | 121 |
| 5.2.4 | Different Approaches to the Design Process..... | 123 |
| 5.3 | The Evaluation Process | 126 |
| 5.4 | Production Development: Part of Product Realisation | 130 |
| 5.4.1 | Parallel Development Processes | 130 |
| 5.4.2 | Design Activity Dependency | 134 |
| 5.5 | Learning and Production System Development | 135 |
| 5.5.1 | Comprehensive View and Process Perspective..... | 136 |
| 5.5.2 | Development of Production Systems as Process and Project..... | 137 |
| 5.5.3 | Learning During System Development..... | 140 |
| 6 | Planning and Preparation for Efficient Development | 145 |
| 6.1 | A Framework Supporting Development of the Production System..... | 145 |
| 6.2 | Contextual Aspects | 148 |
| 6.2.1 | Perspectives and Attitudes | 149 |
| 6.2.2 | Company Preconditions | 152 |
| 6.2.3 | Investment Considerations | 153 |
| 6.3 | Management and Control | 156 |
| 6.3.1 | Resource Allocation to Production Engineering and Production Development..... | 157 |
| 6.3.2 | Time Perspective..... | 159 |
| 6.3.3 | Work Team Composition..... | 160 |
| 6.3.4 | Creativity and Analytical Ability | 163 |
| 6.4 | A Structured Way of Working..... | 165 |
| 7 | Preparatory Design of Production Systems | 171 |
| 7.1 | Background Study | 171 |
| 7.1.1 | The Importance of Solid Preparatory Work | 172 |
| 7.1.2 | Starting Point for System Design | 173 |
| 7.1.3 | Evaluation of Existing Production Systems | 174 |
| 7.2 | Pre-Study | 179 |
| 7.2.1 | Pre-Study Content: Strategic and Pushing | 179 |
| 7.2.2 | To Handle Uncertainties | 181 |
| 7.2.3 | Strategy for Future Production Systems..... | 182 |
| 7.3 | Resulting Requirement Specification | 185 |
| 8 | Design and Evaluation of Production Systems | 191 |
| 8.1 | Design Specification..... | 191 |
| 8.1.1 | Handling Complexity | 192 |
| 8.1.2 | Modelling..... | 194 |

| | | |
|-----------|---|------------|
| 8.2 | Developing Conceptual Production Systems..... | 195 |
| 8.2.1 | Flows and Flow Principles..... | 195 |
| 8.2.2 | Flowcharts..... | 197 |
| 8.2.3 | Production Planning..... | 200 |
| 8.2.4 | Choice of Process and Layout..... | 202 |
| 8.2.5 | Level of Technology and Automation | 209 |
| 8.2.6 | Work Organisation and Work Environment | 211 |
| 8.3 | Evaluation of Solution Alternatives..... | 214 |
| 8.3.1 | Conditions for Evaluation During the Development Process | 217 |
| 8.3.2 | Methods for Evaluation..... | 218 |
| 8.4 | Detailed Design of the Chosen Alternative | 220 |
| 8.4.1 | Detailed Layout..... | 222 |
| 8.4.2 | Planning the Layout | 225 |
| 8.4.3 | Work Studies..... | 227 |
| 8.4.4 | Detailed Design of Work and Work Place..... | 227 |
| 8.5 | Systems Solution | 230 |
| 9 | From System Solution to Production System in Operation | 231 |
| 9.1 | Implement Production Systems | 231 |
| 9.1.1 | Terminology..... | 233 |
| 9.1.2 | Different Start-Up Situations | 235 |
| 9.2 | Building Production Systems | 237 |
| 9.3 | Planning and Preparing Production Start-Up..... | 239 |
| 9.3.1 | Start-Up Model | 239 |
| 9.3.2 | Organisation and Management | 242 |
| 9.4 | Carry-Out Production Start-Up | 244 |
| 9.4.1 | Efficient Start-Up of Production Systems | 244 |
| 9.4.2 | Problems During Production Start-Up | 246 |
| 9.5 | Evaluate the Result | 248 |
| 9.5.1 | Evaluation of Production System After Start-Up..... | 248 |
| 9.5.2 | Prerequisites for Evaluation After Start-Up | 249 |
| 9.5.3 | Analysis of the Development Process..... | 250 |
| 10 | Production System Performance | 255 |
| 10.1 | World-Class Manufacturing | 255 |
| 10.1.1 | Successful Production Systems..... | 258 |
| 10.2 | What Should Be Measured? | 259 |
| 10.2.1 | Productivity and Efficiency..... | 260 |
| 10.2.2 | Overall Equipment Effectiveness..... | 263 |
| 10.2.3 | Manual Assembly Efficiency | 265 |
| 10.2.4 | Measures Associated with Competitive Factors | 266 |
| 10.3 | Measures and Methods for Follow-Up in Practice | 268 |

| | | |
|-----------|---|------------|
| 10.4 | Continuous Follow-Up of Performance..... | 271 |
| 10.4.1 | Different Measurement Systems | 271 |
| 10.4.2 | Use of Measurement Systems | 274 |
| 11 | The Art of Avoiding Production Disturbances..... | 277 |
| 11.1 | Related Concepts | 277 |
| 11.1.1 | Dependability | 277 |
| 11.1.2 | Production Disturbances | 280 |
| 11.2 | Production Efficiency | 282 |
| 11.2.1 | Reduced Disturbances Increases Production Efficiency | 283 |
| 11.3 | Comparison Between Improvement Models | 285 |
| 11.4 | To Handle Uncertainty | 287 |
| 11.5 | Eliminating Disturbances During Development..... | 288 |
| 11.5.1 | Approach..... | 289 |
| 11.5.2 | Competence Development and Knowledge Transfer..... | 290 |
| 11.5.3 | Strategic Concerns | 292 |
| 11.5.4 | Development Process | 295 |
| 11.5.5 | Participants..... | 298 |
| 11.5.6 | Means of Assistance..... | 299 |
| 11.5.7 | Cooperation with Suppliers..... | 300 |
| 11.5.8 | Systematic Way of Working: Basis for Robust Production Systems | 301 |
| 12 | Production Development in the Future..... | 303 |
| 12.1 | Trends and Visions | 303 |
| 12.1.1 | Assembly: The Mirror of Change | 303 |
| 12.1.2 | Trends Within Two Sectors | 305 |
| 12.2 | What is Required from Future Production Systems?..... | 307 |
| 12.2.1 | Key Areas and Success Factors..... | 307 |
| 12.2.2 | Lean Production as an Objective..... | 308 |
| 12.2.3 | Right Automation..... | 310 |
| 12.3 | Future Production from an International Perspective | 311 |
| 12.3.1 | Production in Europe | 311 |
| 12.3.2 | Production in USA | 313 |
| 12.3.3 | China: The Factory of the World?..... | 314 |
| 12.4 | Make or Buy? | 315 |
| 12.4.1 | Basis of Decisions and Carrying Through | 317 |
| 12.4.2 | Consequences of Outsourcing and Relocation..... | 319 |
| 12.5 | Production in Focus | 320 |
| 12.5.1 | Snap Shots..... | 320 |
| 12.6 | Go for Survival: Create Competitive Advantages | 321 |
| | References..... | 325 |
| | Index | 335 |



<http://www.springer.com/978-1-84882-494-2>

Production Development
Design and Operation of Production Systems
Bellgran, M.; Säfsten, E.K.
2010, XIII, 340 p., Hardcover
ISBN: 978-1-84882-494-2