**Hand-out Smart manufacturing: A new perspective towards OM**

**WS 2019/2020**, last update: Oct 9th

Note: This document reflects our planning before the term starts and it will not be updated regularly. However, small changes regarding the content will be discussed in class, if appropriate, communicated via llias.

**Technicalities:**

One semester, taught every winter semester

Six credit points, four hours per week (Lectures: 2 hours/week and Tutorial: 2 hours/week), taught in English

Course Responsible: Prof. Dr. Andreas Größler

Lecturer and Tutor: Dr. Matin Mohaghegh

Part of the M.Sc. study program in (technically oriented) business administration

**Course Content:**

This course discusses theoretical foundations of Operations Management and examines the employment of these principles at operational domain. Topics include important theories, concepts, and strategies related to (a) quality management, (b) continuous improvement and sustainability, and (c) recent approaches and principles for smart manufacturing and modern operations management. This course is designed to teach how established improvement-based initiatives (e.g. Lean production, JIT, TQM, TPM, Six Sigma, etc.) and recently-emphasized techniques (e.g. Industry 4.0) for smart manufacturing lead to eliminate waste, create value, and contribute to sustainable development on the shop-floor. The strategic importance of operations techniques and decisions are also discussed in this course. We encourage active learning by getting students involved in case-discussions and case-studies.

**Learning Objectives:**

After successfully finishing this course, students can:

* Discuss core quality management concepts and get familiar with basic quality tools and techniques
* Understand how improvement-based practices facilitate organizational effectiveness
* Obtain an understanding of Industry 4.0 and a general overview of new technologies in smart manufacturing
* Discuss systematic problem-solving and understand how to define, analyze and manage complex operations problems
* Critically discuss the scientific papers
* Apply the theoretical concepts and approaches into real-life cases

**Course Content and Timetable**

Lectures will be held on Tuesdays, 11:30-13:00 in M 17.81 (K2), starting from 22/10/2019.

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| Date | Topic | | Literature & Reading Assignments |
| 22/10/2019 | Course Introduction, Overview, and Logistics | | - |
| 29/10/2019 | Quality Definitions, Perspectives, Important Philosophies, and Cost of Poor Quality | | Goetsch & Davis (2014), Ch. 1 |
| 05/11/2019 | Voice of Customers (VoC), Critical to Quality (CtQ), House of Quality (HoQ), and Quality Function Deployment (QFD) | | Goetsch & Davis (2014), Ch. 17 |
| 12/11/2019 | Statistical Thinking and Overview of Quality Tools | | Goetsch & Davis (2014), Ch. 15, and Ch. 18 |
| 19/11/2019 | Introduction to Continuous Improvement-Kaizen: From Quality to Strategic Management Perspectives | | Goetsch & Davis (2014), Ch. 19, P. 357-371 |
| 26/11/2019 | Toyota Production System (TPS): Problem-Solving Perspective | | Goetsch, & Davis (2014), Ch. 16 |
| 03/12/2019 | A Holistic View of Lean, and Lean Principles | | Emiliani, M. L. (1998) |
| 10/12/2019 | Lean: Practice Bundles (JIT, TQM, TPM, HRM) | | Shah & Ward (2003) |
| 17/12/2019 | Six Sigma (DMAIC & DFSS) | | Goetsch & Davis (2014), Ch. 19, P 374-384 |
| 07/01/2020 | Smart Manufacturing: Introduction to Industry 4.0 | | Ustundag & Cevikcan (2017), Ch.1 |
| 14/01/2020 | New Technologies (IoT, 3DP) and applications in Modern OM | | Ustundag & Cevikcan (2017), Ch. 10 and Ch. 13 |
| 21/01/2020 | Sustainable OM | Resource-Based View (RBV) | Hitt et al, (2016) |
| Dynamic Capability | Eisenhardt & Martin (2000) |
| 28/01/2020 | Hybrid Improvement-Based Techniques  Sustainable OM | Lean Six Sigma | Drohomeretski et al., (2014) |
| Lean 4.0 | Tortorella & Fettermann (2018) |
| 04/02/2020 | Paper Presentation and Discussion | | - |

**Case-Studies, Case Discussions, and Exercises**

Tutorials will take place on Thursdays, 9:45-11:15, in M 17.14 (K2), starting from 07/11/2019.

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| Date | Topic | Case/Article/Exercise & Game |
| 07/11/2019 | Exercise on House of Quality | - |
| 14/11/2019 | Exercise on Control Charts | - |
| 21/11/2019 | Continuous improvement | Tennis Ball Game |
| 28/11/2019 | Systematic Problem-Solving | A3 Paper |
| 05/12/2019 | How Lean Bundles contribute to Manufacturing Performance | Cua et al. (2001) |
| 12/12/2019 | TPS Case-Study | Toyota Motor Manufacturing |
| 19/12/2019 | A Successful Lean Implementation (Case-Study) | Thrustmaster |
| 09/01/2020 | How Smart Manufacturing Changes Traditional Thinking | Porter & Heppelmann (2014) |
| 23/01/2020 | Critical Discussions on RBV for OM | Bromiley & Rau (2016) |
| 30/01/2020 | Dynamic Capabilities and Learning Mechanism | Zollo & Winter (2002) |
| 06/02/2020 | Learning Organization & Survey | Garvin et al. (2008) |
| 13/02/2020 | Paper Presentation and Discussion | - |

**Examination:**

Course assessment will be based on a written final exam. The content of the final exam includes all the topics discussed in either the lectures or the tutorials. Reading assignments are also part of the final exam. Students can voluntarily present and discuss one assigned paper. Otherwise, they are required to answer to 1-2 extra questions in the final exam with no additional time. In total 50 % of all points are necessary to pass the course with 6 credit points.

**Literature:**

* Bromiley, P., & Rau, D. (2016). “Operations management and the resource-based view: Another view”. *Journal of Operations Management*, 41, 95-106.
* Cua, K. O., McKone, K. E., & Schroeder, R. G. (2001). “Relationships between implementation of TQM, JIT, and TPM and manufacturing performance”. *Journal of Operations Management*, *19*(6), 675-694.
* Drohomeretski, E., Gouvea da Costa, S. E., Pinheiro de Lima, E., & Garbuio, P. A. D. R. (2014). “Lean, Six Sigma and Lean Six Sigma: An analysis based on operations strategy”. *International Journal of Production Research*, 52(3), 804-824.
* Eisenhardt, K., M., Martin, J, A (2000). “Dynamic Capabilities: What are they?”. *Strategic Management Journal*, 21, 1105-1121.
* Emiliani, M. L. (1998). “Lean behaviors”. *Management Decision*, 36(9), 615-631.
* Garvin, D. A., Edmondson, A. C., & Gino, F. (2008). “Is yours a learning organization?”. *Harvard Business Review*, *86*(3), 109.
* Goetsch, D. L., & Davis, S. (2014). “Quality management for organizational excellence: Introduction to total quality”.
* Hitt, M. A., Xu, K., & Carnes, C. M. (2016). “Resource based theory in operations management research”. *Journal of Operations Management*, 41, 77-94.
* Porter, M. E., & Heppelmann, J. E. (2014). “How smart, connected products are transforming competition”. *Harvard Business Review*, 92(11), 64-88.
* Shah, R., & Ward, P. T. (2003). “Lean manufacturing: Context, practice bundles, and performance”. *Journal of Operations Management*, 21(2), 129-149.
* Tortorella, G. L., & Fettermann, D. (2018). “Implementation of Industry 4.0 and lean production in Brazilian manufacturing companies”.*International Journal of Production Research*, 56(8), 2975-2987.
* Ustundag, A., & Cevikcan, E. (2017). “Industry 4.0: Managing the digital transformation". Springer.
* Zollo, M., & Winter, S. G. (2002). “Deliberate learning and the evolution of dynamic capabilities”. *Organization science*, 13(3), 339-351.

**Additional Literature:**

* Santos, J., Wysk, R. A., & Torres, J. M. (2006). *Improving production with lean thinking*. John Wiley.