



MS5987 Digital Operations and Technology

Instructor: R K Amit*

TA: Balaganesh C.†

Lectures: Wed (08:00—9:50) & Fri (13:00—14:50)

Venue: DoMS 401

Machines with interchangeable parts can now be constructed with great economy of effort. Witness the humble typewriter, or the movie camera, or the automobile. . . . The world has arrived at an age of cheap complex devices of great reliability; and something is bound to come of it.

Vannevar Bush, *As We May Think*, 1945

About the Course

Business enterprises strive to match supply with demand in uncertain environments using innovative products, processes, and business models. In operations management, we study such processes and business models. Recent advances in digital technologies like additive manufacturing, platforms, blockchains, machine intelligence, and Internet-of-things have significantly impacted products, processes, and business models. This program provides an overview of digital technologies and their interface with operations management.

Readings

R K Amit, Kulwant Pawar, R P Sundarraj, and Svetan Ratchev, *Advances in Digital Manufacturing*, Springer, *Forthcoming*. (Selected Chapters)

Amit Sinha, Ednilson Bernardes, Rafael Calderon, and Thorsten Wuest, *Digital Supply Networks: Transform Your Supply Chain and Gain Competitive Advantage with Disruptive Technology and Reimagined Processes*, McGraw-Hill Education, 2020. (Selected Chapters)

Recent papers from leading journals.

Grading

The grading for this course will be based on relative performance.

End-Quarter Exam: 30%

Class Presentations: 20%

Class Discussions: 20%

Poster Presentation (Group ≤ 3): 30% (presentation, uniqueness, and relevance)

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⊗ stands for readings.

We will use Acadly (<https://app.acadly.com/home>) as learning management system.



Course Topics

Operations Management Paradigms (3 Lectures)

What is “new” in operations and supply chain management? Emerging technologies and business models for operations management.

- ⊗ Chapter 1 (Sinha et al.)
- ⊗ Choi et al (2021). Disruptive Technologies and Operations Management in the Industry 4.0 Era and Beyond. Production and Operations Management (POMS).
- ⊗ Olsen and Tomlin (2020). Industry 4.0: Opportunities and Challenges for Operations Management. Manufacturing & Services Operations Management (MSOM).
- ⊗ Iansiti and Lakhani (2014). Digital Ubiquity: How Connections, Sensors, and Data Are Revolutionizing Business. Harvard Business Review (HBR).

Digital Operations Strategy (3 Lectures)

Enablers of digital operations: people, process, and technology. Advanced technologies: additive manufacturing, blockchains, industrial machine intelligence, industrial internet of things (IIoT), and platforms. Role of hardware and software for digital operations.

- ⊗ Chapter 3 (Amit et al.)
- ⊗ Chapter 3, 4, 5 (Sinha et al.)
- ⊗ Babich and Hillary (2018). Distributed Ledgers and Operations: What Operations Management Researchers Should Know About Blockchain Technology. Manufacturing & Services Operations Management (MSOM).
- ⊗ Lee et al., Industrial AI and predictive analytics for smart manufacturing systems, Smart Manufacturing, Chapter 5, Elsevier, 2020.

Digital Technologies in Inventory & Capacity Management (6 Lectures)

- ⊗ Neghab et. al. (2022). An integrated data-driven method using deep learning for a newsvendor problem with unobservable features. European Journal of Operational Research (EJOR).
- ⊗ Sgarbossa et. al. (2021). Conventional or additive manufacturing for spare parts management: An extensive comparison for Poisson demand. International Journal of Production Engineering (IJPE).
- ⊗ Boute et. al (2021). Deep reinforcement learning for inventory control: A roadmap. European Journal of Operational Research (EJOR).
- ⊗ Ban and Rudin (2018). The Big Data Newsvendor: Practical Insights from Machine Learning. Operations Research (OR).
- ⊗ Notz and Pibernik (2020). Prescriptive Analytics for Flexible Capacity Management. Management Science (MS).
- ⊗ Chen et al (2020). Retailing with 3D Printing. Production and Operations Management (POMS).

Digital Operations and Business Models (2 Lectures)

- ⊗ Chapter 5 (Amit et al.)
- ⊗ Richard D’Aveni (2018). Business models for additive manufacturing. Harvard Business Review (HBR).
- ⊗ Marshall W. Van Alstyne, Geoffrey G. Parker, and Sangeet Paul Choudary (2016). Pipelines, Platforms, and the New Rules of Strategy. Harvard Business Review (HBR).