



Syllabus for



P06 - Engineering Product Development (EPD): A Critical Review of the Product Development Process (PDP)

Credits	5.0
Examiner	Anna Öhrwall Rönnbäck (Ola Isaksson, Johan Ölvander)
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Target group	Professionals and PhD candidates who want to get a deeper understanding of research in in Engineering Product Development.
Prerequisites	MSc in Engineering or similar. This is a basic PhD course.
Aim	The course aims to provide a theoretical reference base for conducting research in product development.
Teachers/tutors	Anna Öhrwall Rönnbäck, professor LTU, LiU; Ola Isaksson, professor Chalmers, and senior specialist in product development GKN; Johan Ölvander, professor LiU

Fee for industrial members

7 500 SEK

Learning outcomes

Upon completion of the course the participants should have:

- Gained increased awareness of research on the product development process.
- Improved their ability to critically review and make use of established and recent research literature.
- Independently written a critical review of research literature on the engineering product development process.
- Trained evaluation of other course participants' written literature reviews
- Improved their ability to communicate orally and in written about the EPD process in a research context.

Contents

The course covers the following areas:

- **1st session:** Content: Introduction. Presentation of course literature.
- **2nd session:** Process Modelling of the PDP. (Large corporations, small businesses.)
- **3rd session:** Degree of formalism of the Product Development Process and its implication.
- **4th session:** A Systems and Life Cycle Engineering view on the PDP for Complex Products.
- **5th session:** Participants' review papers, presentation and discussion of implications. Compilation of a report.

Organisation

The course is organized in the following way:

Each session will be structured as follows:

1. Introduction by course examiners
2. Reports from reading and discuss implications (academic and in practice)
3. Introduce literature assignment for the next session

At the end of the course participants are expected to write their own review paper over the product development process, summarizing the reading assignments, which is presented to the group. This final assignment also includes reviewing others' work. After review, each contribution can become a chapter of an EDP published report.

Literature

Separate list below.

Examination

The course is examined through active participation at the seminars and the written review of literature as presented and discussed in the course during the time schedule.

LITERATURE LIST (PRELIMINARY)

Literature for Session 2: *(Every participant reads the same collection of papers/book. Relate your reading to your own research area.)*

Cooper R. G. (1990), Stage-Gate Systems: A New Tool for Managing New Products, *Business Horizons*, May-June.

Cooper R. G. (2014), What's Next? After Stage-Gate, *Research-Technology Management*, January—February.

Gericke, K, Eckert, C. (2015), The Long Road to Improvement in Modelling and Managing Engineering Design Processes, International Conference on Engineering Design, ICED15, 27-30 July, Politecnico Di Milano, Italy.

Ulrich K. & Eppinger S. (2012), *Product Design and Development*. Fifth edition. New York, McGraw-Hill. ISBN: 978-007-108695.

Also see: <http://www.ulrich-eppinger.net>

General literature, suggested:

Wikberg-Nilsson Å., Törlind P., Ericson Å. (2015), *Design – Process och metod*. Lund. Studentlitteratur. ISBN: 9789144108858. [In Swedish.]

Literature for Session 3: Books "Classics"

(These are suggestions, choose 1 to read (you can choose the same as somebody else in the course), and choose 1 more recent article to discussion and compare with. Relate the classic book and the article to your own research area.)

Allen T. (1977), *Managing the flow of technology*, Boston: MIT Press. <https://mitpress.mit.edu/books/managing-flow-technology>

Andreasen M. M. and Hein L. (1987), *Integrated Product Development*, London: IFS (Publications) Ltd/Springer-Verlag.

Burns T. and Stalker G. M. (1961), *The Management of Innovation*, London: Tavistock.

Clark K. B. and Fujimoto T. (1991), *Product Development Performance: Strategy, Organization, and Management in the World Auto Industry*, Boston: HBS Press.

Clausing, D. (1994). *Total Quality Development – a Step-by-step Guide to World-class Concurrent Engineering*. ASME Press, NY, USA.

Dussauge P., Hart S., and Ramantoso B. (1987), *Strategic Technology Management*, Chichester: John Wiley & Sons.

Fine, C.H., (1998), *Clockspeed*, Perseus Books, Reading, Mass.

Hamel G. and Prahalad C. K. (1994), *Competing for the Future*, ch 2. Boston: Harvard Business School Press.

Hines, P., (1994), *Creating World Class Suppliers*. London, Pitman.

von Hippel E. (1988), *The Sources of Innovation*, Oxford University Press.

Nishiguchi, T (ed) (1996), *Managing Product Development*, New York: Oxford University Press.

Pahl G. and Beitz W. (1996), *Engineering Design: A Systematic Approach*, London: Springer-Verlag.

Prasad, B. (1996). *Concurrent Engineering Fundamentals – Integrated Product and Process Organization*, Volume 1. Prentice Hall. Upper Saddle River. New Jersey.

Pugh, S. (1991), *Total Design – Integrated Methods for Successful Product Engineering*. Addison-Wesely Publishing Company. United Kingdom.

Pugh S., *Creating Innovative Products Using Total Design*, Addison-Wesley Reading MA, 1996.

Randall, D., Harper, R., Rouncefield, M. (2007), *Fieldwork for design – theory and practice*. Springer-Verlag, London.

Roozenburg, N.F.M., Eekels, J. (1995). *Product Design: Fundamentals and Methods*. John Wiley & Sons, Chichester.

Suh N. P. (1990), *The Principles of Design*, Oxford University Press.

Ulrich K. T. and Eppinger S. D. (1994), *Product Design and Development*, New York: MacGraw-Hill. (*newer version compulsory reading session 2*)

Utterback J. (1994), *Mastering the Dynamics of Innovation*, Boston: HBS Press.

Wheelwright S. C. and Clark K.B. (1992), *Revolutionizing Product Development: Quantum Leaps in Speed, Efficiency, and Quality*, New York: Free Press.

Womack J. P., Jones D. T., Roos D. (1990), *The Machine that Changed the World: Based on the MIT 5-million-dollar 5-year Study on the Future of the Automobile*, New York: Rawson Associates.

Other suggested literature for Session 3: Articles “Classics” (suggestions)

Allen, T. J. (1986), Organizational Structure, Information Technology, and R&D Productivity, *IEEE Transactions on Engineering Management*, vol EM-33, no 4, November, pp. 212-217.

Eppinger S D, Whitney D E, Smith R P, Gebala D A (1994), A Model-Based Method for Organizing Tasks in Product Development, *Research in Engineering Design*, 6: 1-13.

Eisenhardt K. M. and Tabrizi B. N. (1995), Accelerating Adaptive Processes: Product Innovation in the Global Computer Industry, *Administrative Science Quarterly*, vol 40, March, pp 84-110.

Griffin, A, and Hauser, J R (1996), Integrating R&D and Marketing: A Review and Analysis of the Literature, *Journal of Product Innovation Management*, 13, pp 191-215.

Hamel G., Doz Y., and Prahalad C. K. (1989), Collaborate with Your Competitors – and Win, *Harvard Business Review*, Jan-Feb, p 133-139.

Handfield R. B., Ragatz, G. M., Petersen K. J., and Moncza R. M. (1999), Involving Suppliers in New Product Development, *California Management Review*, vol 42, no 1, Fall.

Helper S (1996), Incentives for Supplier Participation in Product Development: Evidence from the U.S. Automobile Industry, chapter 7 in Nishiguchi, T (ed), *Managing Product Development*, New York: Oxford University Press.

Parker, H. (2000), Interfirm Collaboration and the New Product Development Process, *Industrial Management and Data Systems*, 100/6, pp 255-260.

Patnaik, D., Becker, R. (1999). Needfinding: The Why and How of Uncovering People's Needs. *Design Management Journal*. 10 (2), 37-43.

Pava, C H P (1983), Designing Managerial and Professional Work for High Performance: A Sociotechnical Approach, *National Productivity Review*, Spring, p 126-135.

Rittel, H., Webber, M. (1973). Dilemmas in General Theory of Planning. *Policy Sciences*, 4, 155-169.

Takeuchi H. and Nonaka I. (1986), The New New Product Development Game, *Harvard Business Review*, Jan-Feb.

Thomke S. and Fujimoto T. (2000), The Effect of "Front-Loading" Problem-Solving on Product Development Performance, *Journal of Product Innovation Management*, vol 17, iss 2, March, pp 128-142.

Literature for Session 4: Articles on "Systems Engineering" (Every participant reads the same collection of papers. Relate your reading to your own research area.)

ARTICLES (to read for every participant)

Crawley E., De Weck O., Magee C., Moses, J., Seering W., Schindall J., Wallace D. and Whitney D. (2004), *The influence of architecture in engineering systems*, The ESD Architecture Committee, Engineering Systems monograph, MIT report.

Jiao, J., Simpson, T. W., and Siddique, Z. (2007). Product family design and platform-based product development: A state-of-the-art review. *Journal of Intelligent Manufacturing*, 18(1), 5–29. <http://doi.org/10.1007/s10845-007-0003-2>

Sihna K. and De Weck O. L, (2016), Empirical Validation of Structural Complexity Metric and Complexity Management for Engineering Systems, *Systems Engineering*, vol. 19, no. 3, pp. 193-206.

Simpson T. and Martins J., Multidisciplinary design optimization for complex engineered systems: Report from a national science foundation workshop, *Journal of Mechanical Design, Transactions of the ASME*, vol. 133, no. 10, 2011.

BOOKS (extra reading)

- **Systems Engineering and Analysis**, by Blanchard and W J Fabrycky (originally from 1981)
- **Design Process Improvement - A review of current practice**, By [John Clarkson](#), [Claudia Eckert](#) (2010)
- **System Architecture: Strategy and Product Development for Complex Systems**, by Ed Crawley, B Cameron and D Selva (2016)

Literature for Session 5: Your own papers. (Every participant reads 5 other participants' review papers.)

