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FB Informatik

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JIM- & Master-Seminar 2009/10

System Thinking & System Dynamics for Software Project Management and Business Process Management

Motivation:

System thinking and system dynamics are approaches to (better) understanding the behaviour of complex systems over time. In particular, system dynamics tries to understand and predict the behaviour of such systems using feedback loops. (See for more information: Wikipedia on *Systems Thinking* and on *Systems Dynamics*)

In the software management and business process management world, the ideas of system dynamics are just about to be applied. Despite some initial contributions, e.g. Gerald Weinberg's seminal book on Software Quality, vol. 1: Systems Thinking (Weinberg 1991), Peter Senge's book 'The fifth discipline' and Checkland and Scholes' work on 'Soft systems methodology in action', many software and business process management approaches are still based on a linear cause-and-effect perspective: "We analyze the current processes, we improve them and then we roll them out. Now we have improved the processes."

Very often, the results of these straight forward Software development and Business Process Management approaches are far below the original expectations and they are not sustained over time. System Thinking and System Dynamics might help in overcoming this situation.

Approach and learning outcomes:

In the seminar we want to get familiar with basic ideas of System Thinking and with basic concepts of System Dynamics. We will thoroughly work through Weinberg's Seminal Book on Systems Thinking and we will directly apply these ideas to scenarios from

1. Software Project Management and
2. Business Process Management (if we still have time)

We will also try out some simulation software to get hands-on-experience with using System Dynamics ideas for Software Project Management and Business Process Management.

The final learning outcome is to get familiar with the spirit of systems thinking and systems dynamics as an alternative way of seeing, understanding and solving problems & challenges in our professional life.

Literature

1. Main textbook (compulsory reading for the seminar):
Gerald M. Weinberg: Quality Software Management - vol. 1: Systems thinking. Dorset House Publishing, New York, 1991. (Will be distributed at the seminar session).

2. Simulation Software (highly recommended for using it within the assignment):
Vensim PLE. Downloadable at: http://www.vensim.com/

3. How to prepare a presentation and a scienctific assignment
Justin Zobel: Writing for Computer Science. Springer Verlag London 2005. (Available at h_da library.)

4. Additional websites (if you want to quickly find out more on systems thinking & systems dynamics):
http://www.systems-thinking.org/
http://www.systemdynamics.org

5. Additional literature (if you want to deeply learn more on systems thinking & dynamics):

- Peter Checkland, Jim Scholes: Soft Systems Methodology in Action. Wiley & Sons, Chichester, New York 1990.
- Jamshid Gharajedaghi: Systems Thinking - Managing Chaos and Complexity. A Platform for Designing Business Architecture. Butterworth Heinemann. Boston, Oxford 1999.
- Donella Meadows: Thinking in Systems - A Primer. Sustainability Institute 2008.
- Peter M. Senge: The Fifth Discipline. Revised edition. Doubleday, 2006.
- John D. Sterman: Business Dynamics. Systems Thinking and Modeling for a Complex World. McGraw-Hill Higher Education 2000.
- John D. Sterman: System Dynamics Modeling: TOOLS FOR LEARNING IN A COMPLEXWORLD. In: CALIFORNIA MANAGEMENT REVIEW VOL. 43, NO. 4 SUMMER 2001.
- Gerald M. Weinberg: An Introduction to General Systems Thinking. Silver Anniversary Edition. Dorset House Publishing, New York 2001.

Seminar Requirements:

- All participants are expected to read the whole book of Weinberg.
- Academic analysis of the chapters assigned to you in the beginning of the seminar.
- Active participation in the critical discussion of the material (by all participants together).
- All participants are expected to be present for all seminar sessions.

- Live presentation of the main contents of your chapters. If you find relevant additional material that might help in better understanding the ideas of your chapters (e.g. own project experiences), you are free to include them in your presentation. **(30% of the total score).**
- A written assignment ('mini-paper') consisting of
    - a summary of the main contents of the your chapters including additional topics of the discussion in our plenary session (you might add your slides as appendix)
    - a systems thinking model of 1 system model with respect to either software project management or business process management that you find interesting. You might just use some of the models from Weinberg's textbook or examples from your own professional background. Please include a textual explanation of that model including an explanation for its behaviour. (You are free to extend your system model into an executable simulation model, which will give extra credits. For the system modelling and simulation task, please use the software Vensim PLE, which is freely available for academic purposes at http://www.vensim.com/)
    - a concluding section in which you comment on your learning experience: do you think that this seminar on systems thinking & systems dynamics has improved your professional problem solving skills. What were your expectations and how did we meet them? What improvements would you suggest for the seminar?
    - **The assignment accounts for 70% of the total score. It has to follow the standard rules for scientific writing as e.g. explained in the book of Justin Zobel – Writing for Computer Science, Springer Verlag London 2005.**

Hints for preparing your presentations and assignments (mini-papers):

- All chapters that are assigned to you for the **presentation** should be presented to the group with the following goal in mind:
  help the group understand the most important messages and the specific value of using systems thinking and systems dynamics for the problems described in these chapters. **Do not present every detail as all participants have already read the text.**
- The number of text pages for your **assignments** should be in the range of approx. 15 pages (plus title page, toc etc.).
- Please use Powerpoint, Open-Office or pdf for your presentations, and please use MS-Word, Open-Office or pdf for your assignments.
- If you have developed systems thinking models using e.g. Vensim, pls. include also the source code files of your models.

Seminar schedule & submission dates:

#	Date	Main Topic	Downloads & Tasks
S1	20.10.	Introduction - discussion about initial downloads – Q&A organizational topics	Wikipedia on Systems thinking, System dynamics Introduction to Systems thinking(1) Introduction to Systems thinking (2) Classes of Systems System archetypes **Homework for session on 03.11.2009:** Everybody thoroughly reads ch. 1 – ch. 3 prior to the session.
S2	03.11.	Group discussion of part 1 – final group formation for presentations and assignments	– Group discussion of Part 1 - Patterns of Quality (Weinberg 1991), ch. 1 – ch. 3: p. 1 – 50. – Questions & Answers regarding content and seminar organization – Final group formation
S3	01.12.	Short presentations – Progress review –Q&A	– Short presentations (10 + 5 min. each) for parts 2 – 5 of (Weinberg 1991) – Questions & Answers regarding content and presentations
	14.12.	**Due date for final presentations**	Please send your presentations via e-mail to: u.andelfinger@fbi.h-da.de
S4	15.12.	Final presentations	Final presentations (30 + 15 min. each) for parts 2 – 5 of (Weinberg 1991)
	08.01.	**Due date for draft of assignment**	Please send your drafts via e-mail to: u.andelfinger@fbi.h-da.de
S5	12.01	Review session for draft of assignment	Depending on the types of quality issues and open questions to be solved, this session will be held either as a plenary session of approx. 2hrs. or as individual group sessions of approx. 30 min. each.
S6	26.1.	Demos of your systems thinking models	Each group gives a short presentation of its systems thinking model from the assignment (15 + 5 min. each).
	30.1.	**Due date for final assignments**	Send your assignments via e-mail to u.andelfinger@fbi.h-da.de

Groups for presentations and assignments:

Chapters	Presenters
Part 2: Patterns of Managing (Weinberg 1991), ch. 4 – ch. 8: p. 51 – 126.	P1: P2: P3:
Part 3: Demands that Stress Patterns (Weinberg 1991), ch. 9 – ch. 11: p. 127 – 180.	P1: P2: P3:
Part 4: Fault Patterns (Weinberg 1991), ch. 12 – ch. 15: p. 181 – 244	P1: P2: P3:
Part 5: Pressure Patterns (Weinberg 1991), ch. 16 – ch. 18: p. 245 – 298.	P1: P2: P3: