SSE3: Advanced Software Technologies for Knowledge Management

Professor Uffe Kock Wiil
The Maersk Mc-Kinney Moller Institute
University of Southern Denmark

Lecture 7: Topics

- Application domains
  - Health care
    - Paper 11 (CIS)
    - Paper 12 (AwareMedia)
    - Paper 16 (CSR tool)
  - Planning
    - Paper 17 (production)
    - Paper 18 (agile software development)
    - LEGO (production)

Problem

- Lack of radiologists in most places in Denmark
- 102 unfilled positions in November 2007
- Baltic states (Estonia, Latvia and Lithuania) have available radiology resources
- Outsourcing of certain types of radiology examinations is a potential solution?

Field study

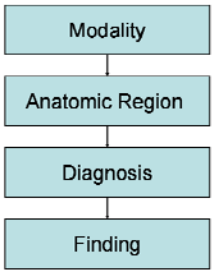
- Svendborg Hospital
  - Radiology department
  - Radiologists
- Common information space
  - Daily conferences to coordinate work
  - Shared artifacts
    - RIS: radiology information system
    - PACS: picture archiving and communication system
  - Classification schemes
    - Examination types (formal)
    - Informal common language

Issues in outsourcing

- Business relations must be set up
  - This has not been our primary focus
- Common information space
  - Distribution in both time and space
    - Makes coordination more difficult
  - Multilingual
    - Need for translation of radiology reports
- Workflow should not be altered
  - Hire a new colleague
  - Outsource examinations

Towards a solution

- Expanding the common information space to also include the outsourced locations
  - Develop classification scheme
  - Involve radiologists from
    - East Tallinn Central Hospital
    - Svendborg Hospital
  - Use
    - SNOMED CT health care terminology



- Using predefined findings enable automatic translation, etc.

Computer supported reporting tool

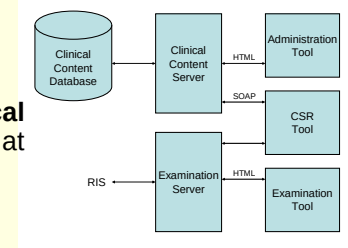
- Workflow remains the same for radiologists
  - Select modality
  - Select anatomic region
  - Select diagnosis
  - Add diagnosis to report conclusion
  - Add findings to report
- Anatomic filtering
  - Only relevant findings will be available

Computer supported reporting tool

- Basing CSR on a novel classification scheme with predefined clinical content enable
  - Automated translation between languages
  - Clinical guidance
  - Higher comprehensibility of reports
  - Faster reporting
  - Automated translation to patients
  - Easy and automatic testing

System overview

- The administration tool is used to create and manage the clinical content stored in the clinical content database
- Reports created with the CSR tool are stored in the examination server
- The examination tool is used by the **local** hospital to manage users (radiologists) at the remote hospitals and to add new tasks to be handled by the remote hospitals
- The examination tool is used by the radiologist at the **remote** hospitals to login to the system, to find their tasks, and to create radiology reports (by opening and using the CSR tool)



Evaluation

- The classification scheme currently only provides clinical findings regarding one anatomical region (the knee) and using one modality (x-ray)
- The CSR has been used in a test case involving Denmark and Estonia
  - A senior radiologist at Svendborg Hospital provided images
  - Tasks were added to the examination server using the examination tool
  - The images were examined by a senior radiologist and three medical students from East Tallinn Central Hospital using the examination tool and the CSR tool

Evaluation

- The users
  - found the system quite easy to use and clinically relevant
  - concluded that the system could be useful to structure reporting methods inside their own radiology department
  - concluded that the system would have even more value for outsourcing radiology reports
- Future work will focus on expanding the classification scheme with additional modalities, anatomical regions, and languages

CSCW / Hypertext?

- Did any CSCW concepts and techniques come into play?
- Did any hypertext concepts and mechanisms come into play?

CSCW / Hypertext?

- Classification scheme
- CIS
  - Before solution
  - After solution
- Field study focus
  - Persons
  - Time
  - Physical space

Supporting shop floor intelligence

- ABB Energy & Industry in Fredericia
  - Transformer stations i many sizes
  - Field study + prototype
- Self governing production groups
  - Local control and planning in small units
- IT systems does not match this form of flexible division of labor and planning
  - MRP – material resource planning
  - ERP – enterprise resource planning

Production principles

- Each product consists of a many component parts, in some cases thousands of components
- The production of each part may require that different processes be performed in a specific sequence, and the production of different parts thus requires different routings
- Different processes may require specialized tools and skills, and different parts thus compete for the same workstations
- Many products are being manufactured simultaneously, and at any given time a large number of products and their components coexist at different stages of completion
- In flexible manufacturing, with a large number of different models and variants to be manufactured in small volumes at short notice, different product models and variants are being manufactured simultaneously

Production models (MRP)

- Bill of materials
  - Hierarchical list of every part that makes up the finished product
- Routing (process) sheets
  - lists, in sequence, each manufacturing operation a part or sub-assembly must go through to be manufactured and, for each operation, the average set-up and processing

Planning / production forecasts

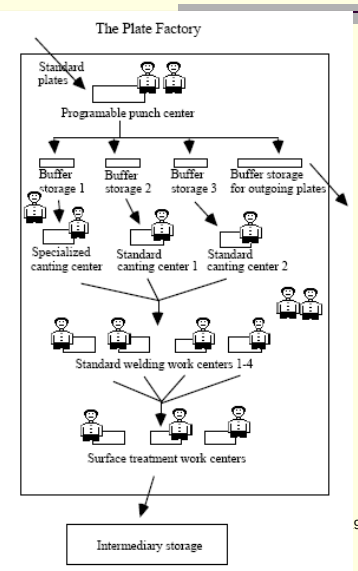
- Based on these models, coupled with the sales forecast, production status, and inventory, the MRP system decomposes the material requirements and computes the schedules for the production of each part, subassembly, and product
- A complete (master) plan is generated every night

CSCW approach

- The master plan only works if the system is “all-knowing”
  - Is that possible?? ☺
  - Detailed knowledge about the production is often only available in the production
- CSCW inspired approach
  - MRP generates overall plan
  - The people in the production generates a detailed plan based on the overall plan from the MRP system

Field study

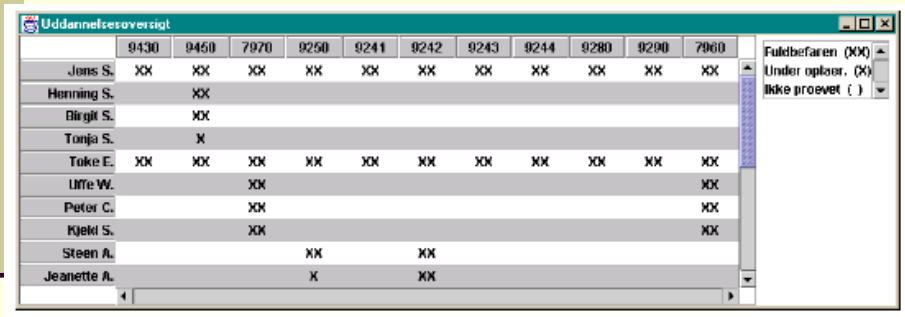
- Persons (roles)
  - Planner
  - QA
  - Personal planner
- Time
  - Morning meeting with central planner
- Physical space
  - Layout of production →



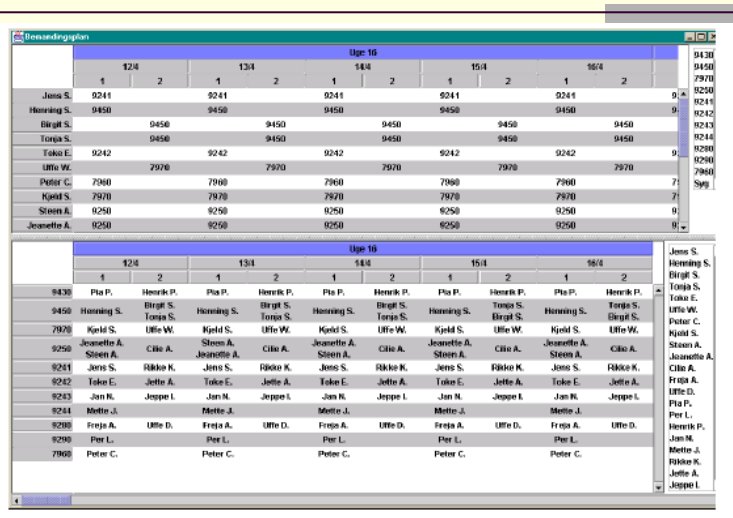
Principles and requirements

- To visualize production planning and control information in a clear and consistent manner to the production planner
- To identify and indicate potential problems that the production planner needs to handle
- To allow the production planner to manipulate directly the production planning and control information
- To visualize the immediate consequences of the production planner's actions

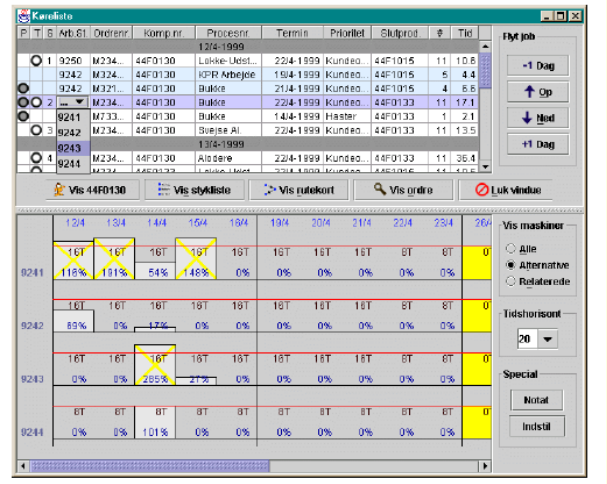
Worker training levels



Manning plan



Main window



Supporting shop floor intelligence

- Scenario (in the paper)
  - Communication between shifts (note)
  - Person called in sick
  - Detailed planning

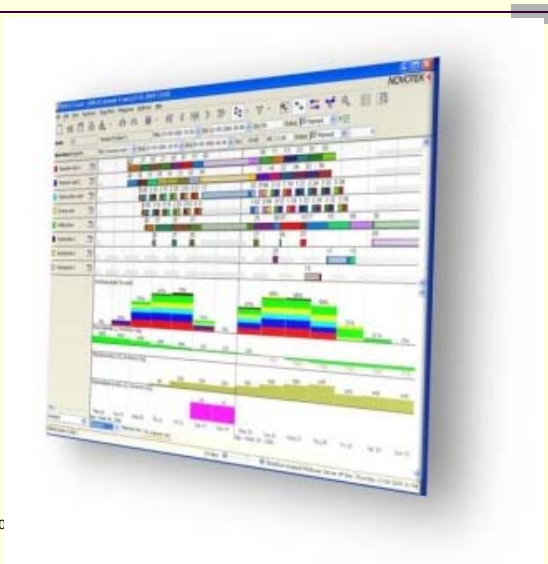
CSCW / Hypertext?

- Did any CSCW concepts and techniques come into play?
- Did any hypertext concepts and mechanisms come into play?

CSCW

- Cooperative work arrangement
  - System support
- Field study focus
  - Persons
    - Roles, education, function, division of labor
  - Time
    - Shifts, coordination meetings (artifacts)
  - Physical space
    - Layout, placement of artifacts
  - Workflow
    - Sequences of tasks/operations/actions
  - Machines (tools)
    - Supports specialized tasks

Novotek Planning Systems (ROB-EX)



IT Support for Production Planning

- **(2003 - 2004)** PIT: Production and IT Support
- **(2000 - 2002)** IDAK: IT Support for Decentralizing Responsibility and Competence
  - Additional field studies:
    - Blika, Brüel & Kjær, Lindø, …
- **(1998 - 2000)** FASIT: Future Work Organizations, Control, and IT Support

Implications for organizational change

- Groupware breaks down hierarchy, decentralizes control, undermines authority, ...
  - Potential problem for management
  - Provides possibility for success for tools for blue collar workers
- ”Workplace democracy”
  - Scandinavian tradition
  - Engage the users or workers meaningfully in the design process, a slow mutual education process that results in users becoming true members of the design team

Lego (2008)

- Visit in May 2008
  - Not field study
- New automatic packing line
  - Lego boxes
- Production planning for packing line
  - On whiteboards
  - With kanban cards
  - Manually
  - Data in and out of MRP/ERP system

Lego (2008)

Leg

Lego (2008)

33

Lego (2008)

- How would you optimize this planning workflow at LEGO?

ASAP: Agile planning tool

Project Planning in Agile Teams

Collaborative process relying on face-to-face communication and shared information to succeed.

Common Approach

[...] using a large table to plan iterations using paper cards to represent tasks to be carried out.

Planning Session is Over

[...] the plan is somehow recorded, and the cards are removed from the table.

One Downside

[...] cards' location on the table and their proximity to other cards may contain important information for the overall plan. When cards are removed from the table, their arrangement is often lost and with it so is the proximity and location information.

[1]

Overall Goal

develop a software tool to support agile planning, while preserving the benefits of physical card based planning.

Approach

... to work closely with local software companies to identify requirements for the planning tool

Feedback Resulted in 3 Overall Requirements

1. A planning tool should support the work of the agile team in a manner that resembles the physical card based approach.
2. A planning tool should be lightweight offering only the features that are necessary to solve the task at hand.
3. A planning tool should visualize the consequences of the planners' actions allowing them to make informed decisions regarding the plan.

Reqs: 3 Overall → 8 Functional

Studies of Related Work + Interactions with local software companies

↓

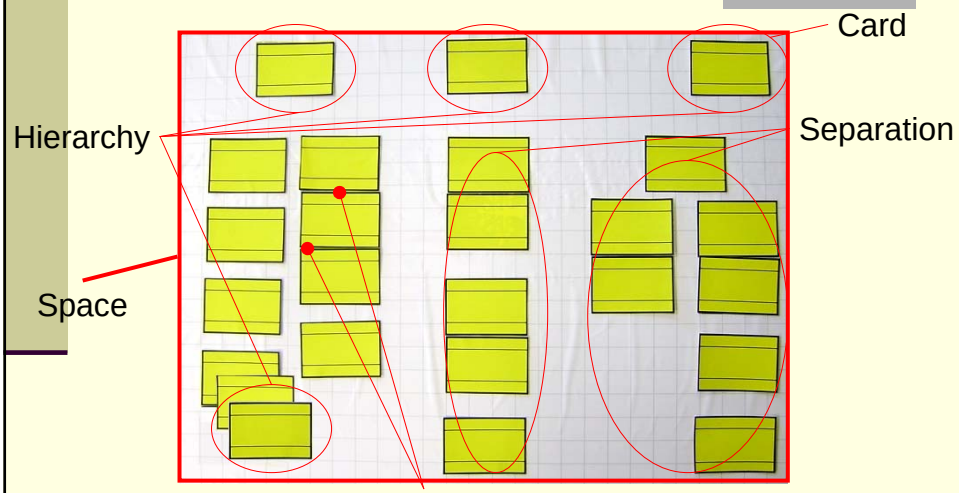
3 Overall Requirements:

- ❑ A planning tool should support the work of the agile team in a manner that resembles the physical card based approach.
- ❑ A planning tool should be lightweight offering only the features that are necessary to solve the task at hand.
- ❑ A planning tool should visualize the consequences of the planners' actions allowing them to make informed decisions regarding the plan.

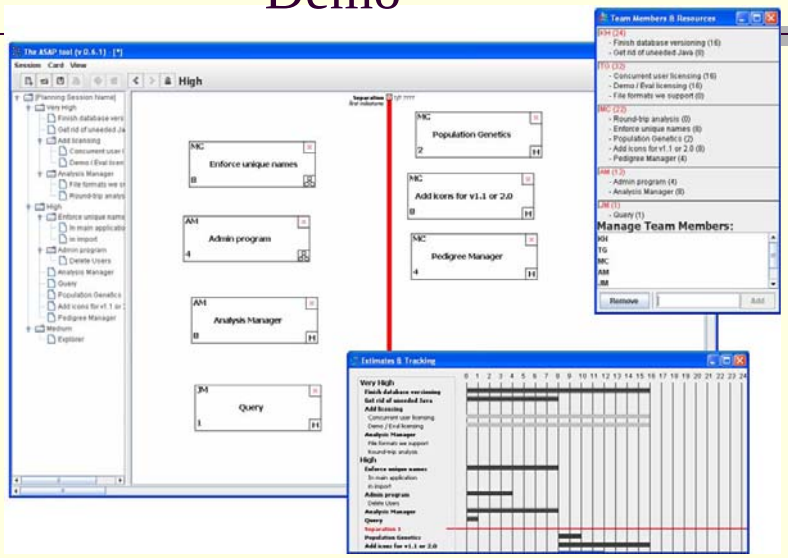
↳

1. **Supporting agile planning objects.** creating, editing, and deleting task cards
2. **Organizing agile planning objects.** move task cards around freely and organize them
3. **Supporting multiple iterations.** short term […] and longer term outline planning
4. **Supporting hierarchies of planning objects.** breaking down tasks into subtasks → handling complexity.
5. **Visualizing consequences of planning actions.** allow planners to make informed decision
6. **Supporting estimation and tracking.** overview of the duration of iterations and single tasks.
7. **Managing team members and resources.** Assigning tasks to team members → Plan resources
8. **Re-using experiences from past planning sessions.** Include past experiences in current planning sessions

Design Concepts & Features



Demo



39

CSCW / Hypertext?

- Did any CSCW concepts and techniques come into play?
- Did any hypertext concepts and mechanisms come into play?

CSCW / Hypertext?

- CSCW
  - No, not really
  - Would be a really cool master project though

- Hypertext
  - Spatial hypertext application
  - Additional structuring mechanism introduced