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# Work analysis as a basis of interventions

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# Why the role of work analysis has increased?

- The complexity of work processes increases
- Interventions that are not based on the analysis of work process can improve only some part of the work process but they can also cause problems in some other part of the work system
- Complex work processes require high level competence of the workers

# What makes systems complex?

- Large problem spaces
- Heterogeneous perspectives
- Group work (the subject of work process is not one person)
- Distribution of tasks
- Dynamics of the processes (e.g. time delays)
- Hazards
- Automation
- Uncertainty
- Mediated interaction
- Disturbances
- (Vicente 1999)

# Can analysis of work process be

- A method to improve the work process?
- A method to support creation of work process knowledge?
- A method to support well-being at work

# What kind of analyses are needed?

- Tens of methods in task analysis (e.g. Hollnagel, Handbook of cognitive task design, 2003)
- But in complex work environments contextual analyses of work process are required, like e.g.
- Formative work analysis (Vicente 1999)
- Analysis of work as an activity system (Engeström 1987)
- Core-task analyses (Norros 2004)

# Modelling of work process as an example

- method was developed to study and develop the work processes in paper production
- applied in chemical industry, metal industry, food industry, kitchen work, design of technical renovations, and in knowledge work
- the internal coaches or supervisors of organizations have used the method

## Background and new interpretations of the method

- Systematic analysis of work process
- Subject of work process development (participative approach to work development, "communities of practice")
- Analysis of work process in the real work groups (externalization of knowledge, distribution of knowledge)
- Analysis of the work process in the group of blue-collar and white-collar workers (theory-reality constraints)
- Analysis of the critical phases of work and habits of acting in them (development of real work activity, story telling)
- Analysis of co-operation between work processes (system as a whole)

## What is analyzed?

- Object of work and products
- Raw materials
- Production process
- Machinery, equipment and their use
- Ways of controlling the process and the human-information technology relations
- Habits of acting during the critical tasks (start-ups, shut-downs, disturbances, maintenance)
- Work organization and division of work
- Co-operation of the work community, between the work communities, between the phases of production, and in the organization
- Development needs that come up in the analyses

# Participants in the analysis of work process

- All blue-collar and white-collar workers in the work process analyzed, and
- Marketing and production planning personnel in the analysis of products
- Quality control personnel in the analysis of products and raw-materials
- Maintenance personnel in the analysis of the technical production system
- All those mentioned in the analysis of co-operation, and also the personnel of the production phases before and after the production process analyzed

# Analysis of the technical process (machinery)

- Why the part of machinery is important for the process?
- What are the characteristics of the machine, that allow it to function as required
- Analysis of human-machine surface and interaction

# Analysis..machines

- Worker responsible of the operation of the part
- Development needs
- How the part is maintained, preventive maintenance
- Safety aspects

# An example of the types of analyses: human-machine interaction

- What is operated/controlled (e.g. surface of a tank)?
- From where is it operated (in control room/i the field)
- How is it operated ( manually, through it)
- Information from the functioning of the target operated
- Can the operator sufficiently (from the viewpoint of the functioning of the process) adjust the part of the process?
- Is the place to do the adjustment the right one?
- Is the information given to the operators sufficient?  
Usability/ ergonomics of the operating system?
- Development needs?

# Analysis of the disturbances

- What is a disturbance
- What kind of disturbances come up in the process
- Analysis of various types of disturbances
- -how they are noticed or recognized
- -how they could be anticipated and prevented
- Information and material of a real disturbance situation
- Information of the history of the disturbance -  
measurements in different phases of production, copies  
of the information from the automatic operating system,  
pictures, video tapes etc.

# Analysis of a real disturbance

- what is the problem in the situation
- which of the problems is the worst
- would it have been possible to prevent the disturbance
- what extra information could have helped to prevent the situation
- would that information be available in the system

# Analysis of a real disturbance

- What were the ways of acting in the situation?
- Would another way of acting have been more efficient?
- How the ways of acting should be changed?

# Analysis of the development needs

- Idea
- Proposal for development actions
- Positive and negative outcomes of the action proposed
- Prerequisites for the realization of the actions
- Who decides of the realization of the actions
- Nomination of the executor for the action
- Schedule for the actions
- Plan for the follow-up

# What kind of interventions – Kitchen work as an example

- Re-organization of tasks in the central organization of the school kitchens
- Rotation of tasks (e.g. salad maker, baker, "organizer"), distribution of tasks
- Improvement of working methods and tools

# Interventions in other studies

- Changes in technical production system
- Changes in the personnel's ways of acting
- Changes in the renovation plans of a production process
- Changes in the co-operation of personnel in different phases of the production process

# Outcomes

- Learning: Work process knowledge has improved 10-20 % after the processes
- Experiences: Work characteristics have changed positively
- Behavior: Changes in the habits of acting
- Orientation: to improve work process further
- Organization: economically successful

# Applicability of the method

- Improvement of the production process
- Improvement of co-operation
- Improvement of work process knowledge
- As a tool in the design of technical changes (to elicit the experiences and development needs of the users)
- Development of ways of acting in the core task or critical situations.

- The programs must be tailored and guided
- Both the intervention processes and the changes in the context must be followed-up intensively.