LEARNING SUPPORT OF ICT’s IN CONSTRUCTION PROJECTS – CASE STUDY APPROACH

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Goal

- to study how the Information and Communication Technologies (ICTs) support currently the learning in public construction projects
- what kind of learning is required and how ICT supports it and in optimum case could support the learning
The research is based on four case studies in public construction projects in Finland. The projects' budgets were from 4 Million euros to 10 Million euros. We have used theme interviews and collected artefacts of the projects like drawings, memos, and observed the meetings in two projects.

**CASE STUDY**

**The four construction projects**

- Renovation of a school that had mould problems, total area 7000 m² and budget of 4 Million euros. Project started 1997 and ended 2002.
- Renovation and partly new construction of a school that had mould problems, total area 3000 m² and budget 2.7 Million euros. Project started 1998 and ended 2005.
- Hospital for senior citizens, the renovation of the nursing home, total area 7000 m² and budget 5.7 Million euros. Project started 1996 and is still on-going.
- University project, 24000 m². Alteration of an old factory into a university and partly new construction. The project started 1997 and finished at 2004.
Construction industry

- Construction industry is an old industry with old, traditional ways of doing things
- Construction Industry's nature is very fragmented
- Large group of people are involved in the projects
- People represent various organizations and occupational groups
- The design phase is separated from production in construction projects
- There is enormous amount of information even in small building project

Problems in Construction Projects

- Budget exceeding
- Work doesn't run in time
- End results (buildings) are not what the end users want
- End results (buildings) can be even unhealthy
- Informal and unstructured learning process
- Lack of co-ordination
- Lack of communication
- Lack of customers focus
- Lack of cross-project learning
Incident: collapsing of the roof

Experiences and Learning challenges in Case Projects

- In the building projects there were people to whom the project is once in the lifetime project.
- These people had no background knowledge and they needed to learn what kind of information they need to deliver to the professionals also the professionals need to learn from them.
Challenges

- The end-users of the buildings need more visual presentations of the designed building
- The site personnel are concerned about things they have not noticed and which are written only in someone’s private papers
- The jargon problems where people of different branch don’t understand each others
- The designers of the projects emphasize the commitment and trust between members in construction projects
- The constructability problems

Learning in construction projects

- The designers learn from the end users how the building shall be used
- The users learn from the professionals how the building can support their operations
- The site personnel learn how the building should be built
- Some participants felt that they had learnt about project work and project management
- They have learned the importance of communication and understanding other parties in the project
- It is likely that all the learning could be made more purposeful and the ICT tools could help in this
Organizational learning (Huysman)

- Individual learning bias > WHO
  - If learning is done by an individual or by an organization
- Active agency bias > HOW
  - If learning is voluntary or determined
- Purposeful learning bias > WHEN
  - If learning is purposeful or accidental
- Improvement bias > WHY
  - Perceive learning in positively valued outcomes

Artefacts (Wartofsky, 1979)

- Knowledge creation does not happen only by working with pure knowledge but working with different types of artifacts
  - Primary artefacts are tools and practices directly used in human labor like knife or telephone
  - Secondary artefacts are “symbolic externalizations” like drawings
  - Tertiary artefacts are abstracted and derived from secondary artefacts and provide a basis of creating visions and foreseeing changes
Artefacts in Construction Project

- Project based work uses both material and conceptual artefacts.
- Construction project workers use design documents, time-tables, cost estimates and other secondary artefacts to help the thinking and to carry the knowledge to other parties.
- All the design documents, even the 3D models, are secondary artefacts. There were also found tertiary artefacts: the model room, the space definition cards.

Communication levels (Bateson)

- Bateson found out that people often talk in different levels and then their talk may be misunderstood
  - first level there are straightforward ‘fact’ statements
  - second level ‘gulf between context and message’
  - third level the gulf appears in the context itself
    - “Unix may be used to run the software”
    - “Unix users are evil – we are Mac people”
HOW ICT support learning

- The current computer systems are not yet utilized so effective that they support the learning as effectively as one would wish to.
- The ICT supports learning by 3D models or simulations but also they are presented in face to face discussions.
Conclusion

- ICT is used in the processes
  - but it could be used more effectively in assisting the learning of the parties and in confirming that the required learning has occurred
- ICT is a good tool to assist learning.
  - Without trust, support of the top-management and active interaction between members even good techniques are useless.
- ICT supports the production of high quality artefacts.
  - When the artefacts are linked to the success of the project the better quality artefacts improve the project success