Lecture 1b – Activity theory (Verksamhetsteori)

Chapter 11 in Carroll, Beaudouin-Lafon, 2004

Kaptelinin et al. 1999

Tan & Melles. 2010

WHY ACTIVITY THEORY IN HCI?

- Reaction towards what was seen as the limitations of HCI at that time:

  - The role of the artefact poorly explored
  - Focus on novice users
  - Limited possibility to use task analysis to describe activity and terms for activity
  - Focus on automating of routine tasks
  - Focus on one user – one computer
  - View of the user as merely a study object

HISTORY

- Origin: Culture-Historical school in former Soviet
  - 1920-30
  - Lev Vygotsky
  - A. N. Leontjev
  - A. Luria
    - *"The Making of Mind"* (1976)
    - *" ...in order to have a theory of brain-behavior relations, it is necessary to have a theory of both the brain and behavior"*

- People contributing to the adaptation/adoption of AT to HCI:
  - Susanne Bødker, 1987 --
  - Yrjö Engeström, 1987 --
  - Victor Kaptelinin, 1991 --
  - Bonnie Nardi, 1992 --

ACTIVITY THEORY CONCEPTS

- activity
- action
- operation
- need
- motivation
- subject
- Object/objective
- division of labour
- tools
- rules

- community
- object-oriented
- hierarchical structure of activities (HSA)
- mediation
- internalisation-externalisation
- development
- zone of proximal development
- focus shift
- breakdowns

WHAT ARE ACTIVITIES?

tool

subject   object
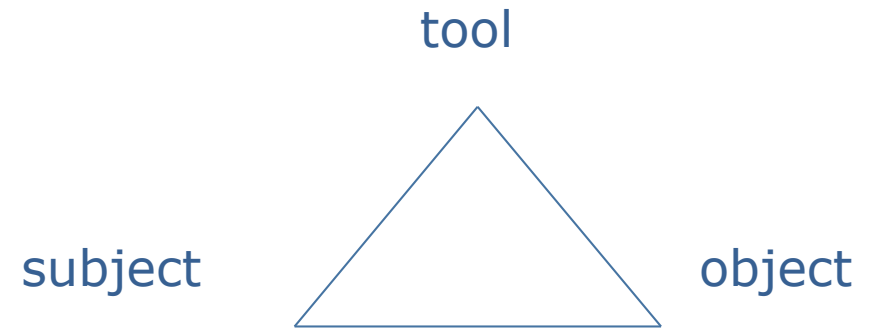
- **Activity**: the minimal purposeful unit for analysing what humans do

  - Is **motivated** by certain **needs**
  - Is directed towards an **object**
  - Is characterised by constant change = **development**
  - Humans interact with (and change) their environment by using **tools** (language, other artefacts, symbols)

TWO BASIC IDEAS

- 1) Human's mind develops, exists and can only be understood within the context of Human's interaction with the world

- 2) this interaction - *activity* - is socially and culturally defined/created

"Man's activity is the substance of his consciousness."
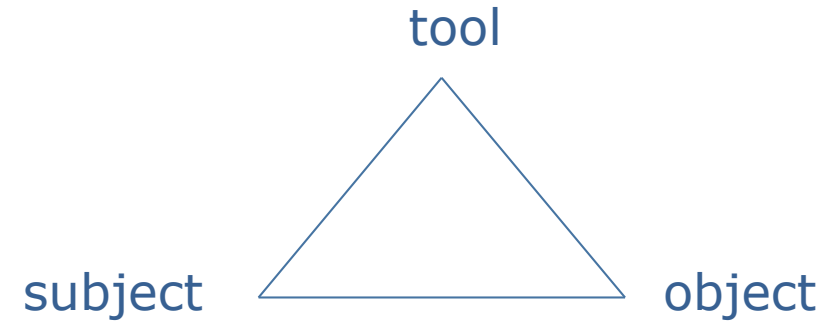
Leontjev 1977

FIVE BASIC PRINCIPLES

Principles that must be considered when analysing an activity and to understand human activity:

- **Object-Orientedness**

- **Hierarchical Structure of Activity**

- **Internalisation and Externalisation**

- **Mediation**

- **Development**

Object-orientedness

tool

subject — object

(triangle diagram with vertices labeled tool (top), subject (bottom left), object (bottom right))

- Human activity is always directed toward an object (or *objective*) that is in focus
- Objects can be
  - Things
  - people
  - physical objects
  - mental constructs (theories, models)
  - Social or cultural phenomenon

Mediating tools

tool

subject   object
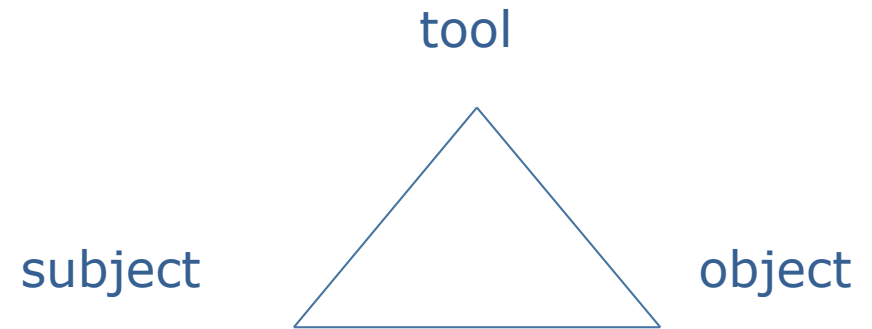
- Tools shape the way we interact with reality
- When external activities are shaped, internal activities are as well
- Tools reflect earlier users' experiences
  - Knowledge about the use
  - The physical properties of the tool
- Tools can be physical or artificial/mental
- The situation determines whether an artefact functions as a tool that mediates activity (not the focus of the activity) or as the object of activity. Here a **transformation** can take place:
  - *Tool* ⟷ *Object*

Hierarchical structure of activities

Activity (verksamhet)

- Fulfils a motive, behind which a need exists that the activity aims to suffice
- Is defined by which object is in focus
- Consists of:

Actions (aktiviteter)

- Conducted in a conscious way, goal-driven
- Consist of:

Operations (operationer)

- Conducted unconsciously, do not have their own goals

transformation

UMEÅ UNIVERSITET

transformation

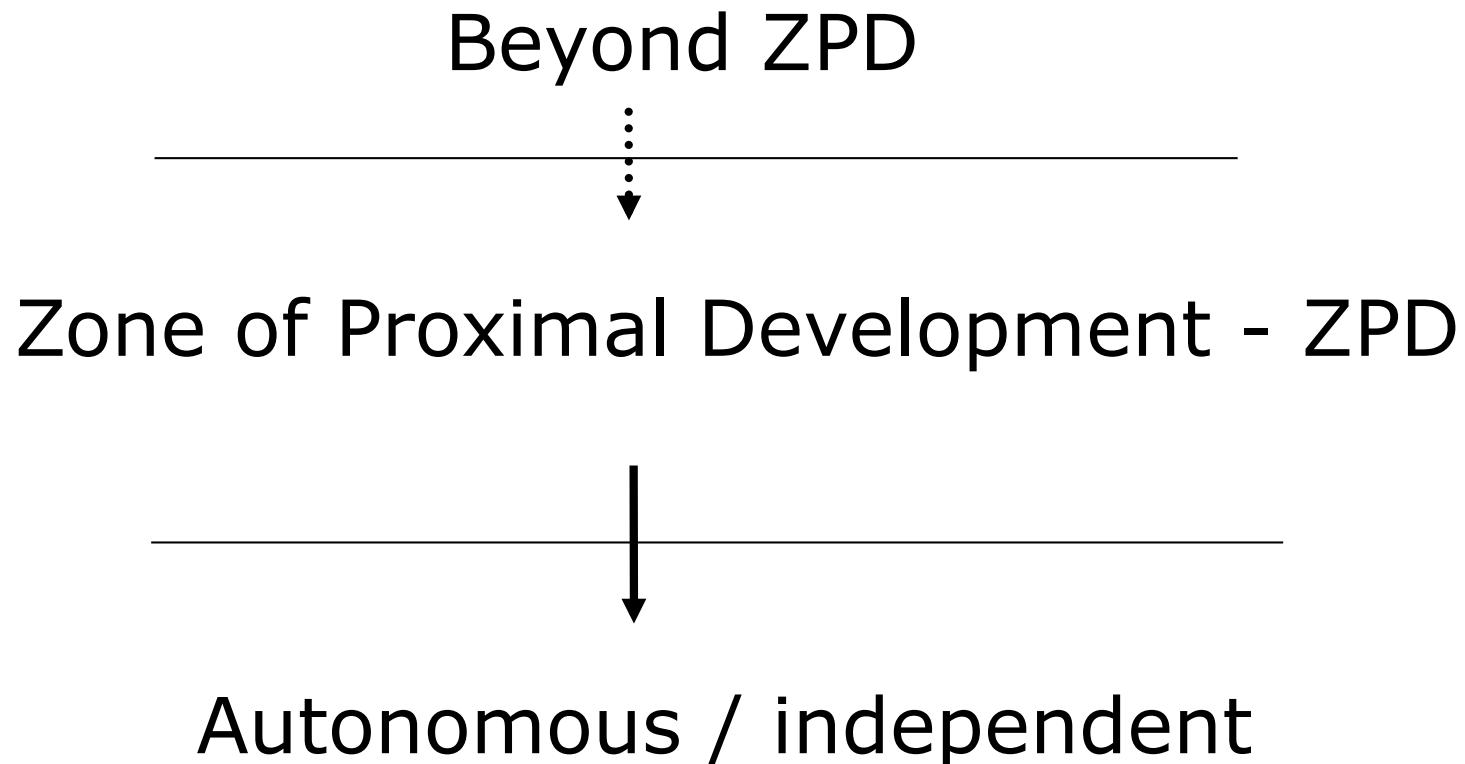# INTERNALISATION ⟷ EXTERNALISATION

- Internal activities– cognition
- External activities (executed outside the body) can be internalised (e.g. calculation)
  - The activity as a whole is important in this process: motor behaviour (keystrokes) as well as using artefacts

- Internal activities can be externalised for the purpose of involving others in the activity or by a focus shift

- This continuous transformation is viewed as the base for human cognition and activity

DEVELOPMENT

- What triggers **transformations**?
  - **Conflicts** built into activity systems
    - Changes in the environment
    - Changes in an individual's abilities or resources

  - Causes "**breakdowns**" -> **transformations** -> development
    - Consequently, breakdowns are viewed as something positive

- Development is viewed as a general research methodology – "formative experiment"

- ZPD – "*Zone of Proximal Development*"

Levels of development

(individual's performance in relation to an activity)

Beyond ZPD

Zone of Proximal Development - ZPD

Autonomous / independent

The 5 keys once again

- Activity is oriented towards an object that is to be changed

- Tools that mediate activity

- Dynamic and hierarchical structure of activity
  - Motive-activity
  - Goal-action
  - Condition-operation
- Externalization ←→ Internalization of activities

- Development
  - Conflicts – "Breakdowns", causing Focus shift
  - ZPD - Zone of proximal development

*"design of a computer application is
design of conditions for the whole use activity."*

Bödker 1999

All keys are necessary in order to understand the activity:
- What is the activity?
- What is the object?
- Which is the motive?
- Which are the tools? (internal-external)
- How do these change? (identify breakdowns)

...even if focus is on one of the phenomena, e.g., the software as a mediating tool in the context...
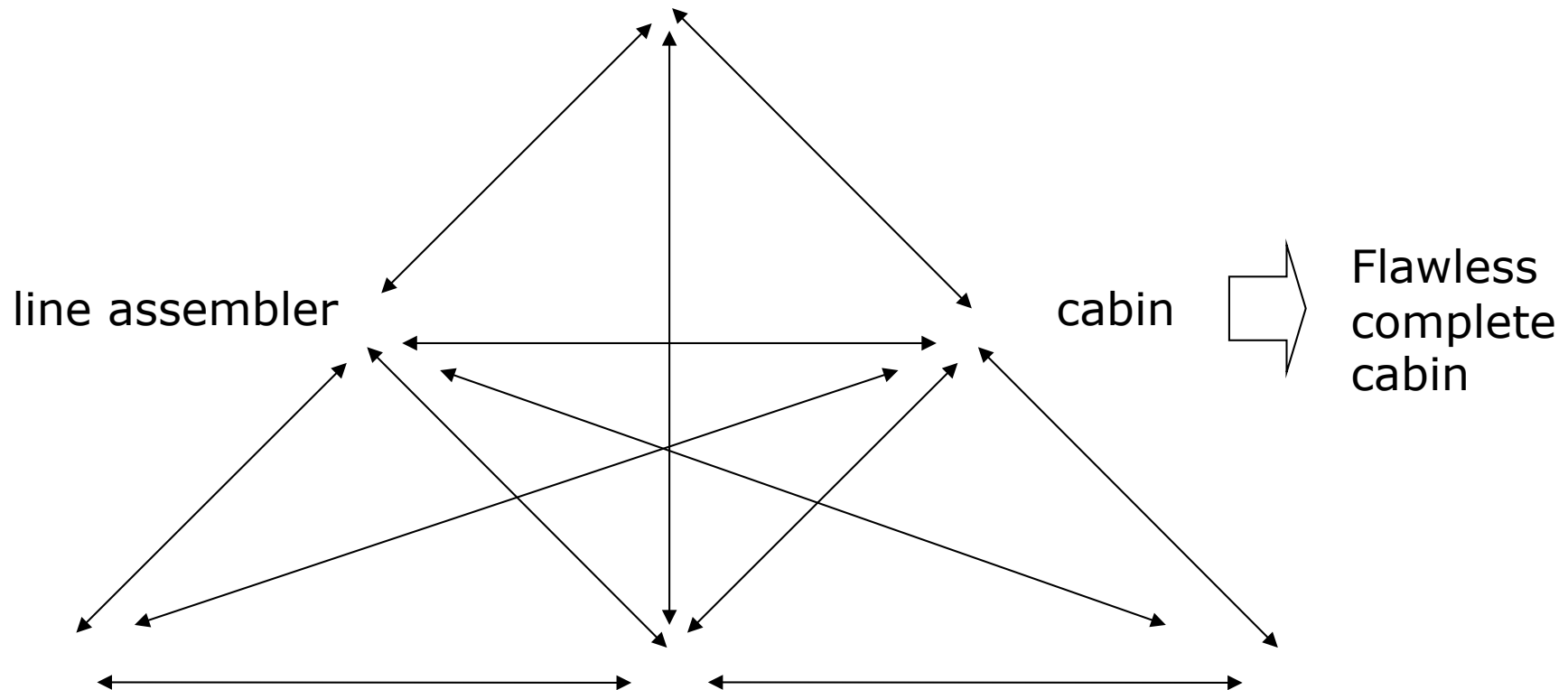
Or was the software the object..?

Activity: Assembling
Actions: assembling parts, ordering more parts when there is a deficit (when they are out parts)
**Operations**: screw, fetch

PDA, assembly tools, lists

line assembler

cabin

Flawless complete cabin

Activity: Handle materials to be delivered to the line
Actions: Receive orders, fetch goods, deliver goods,
   refill goods in storage, order goods from supplier
Operations: drive truck, use computer, check codes

computer, truck, list, code no., trolleys

truck driver

material handling

Suitable materials delivered in time at lowest possible cost?
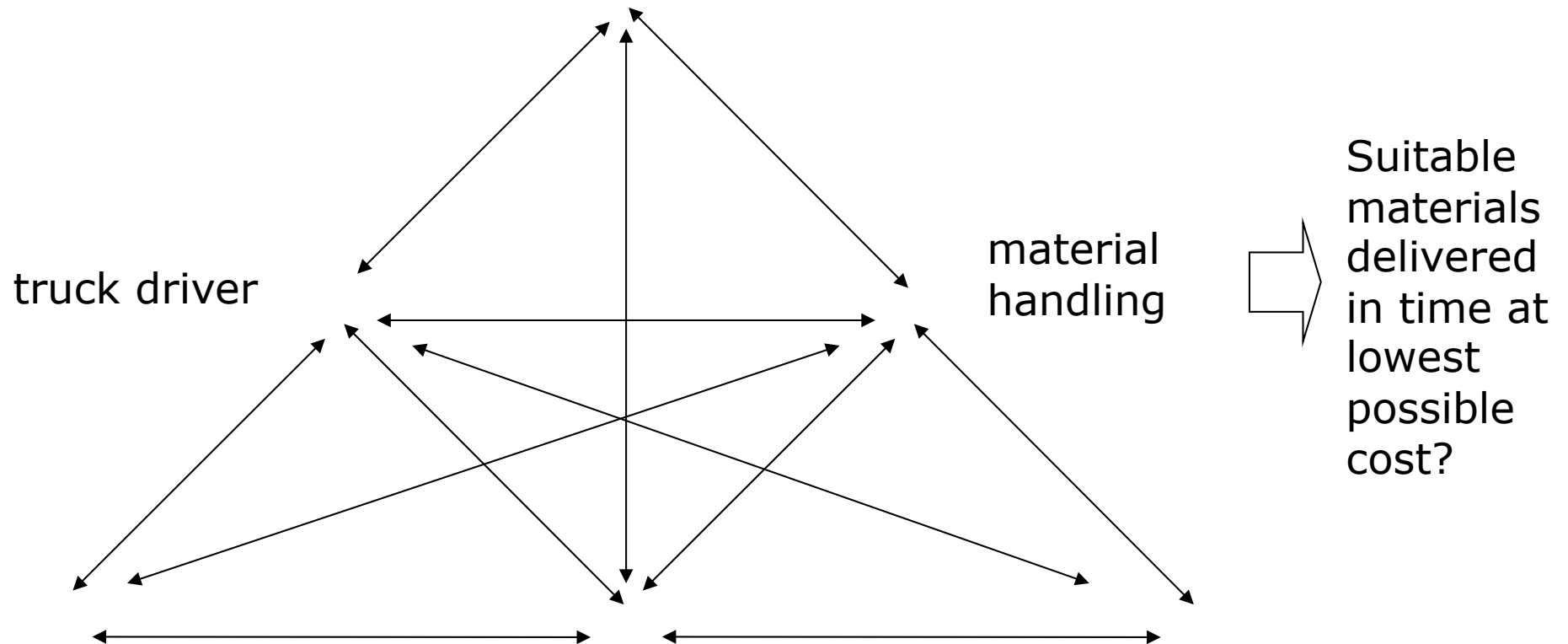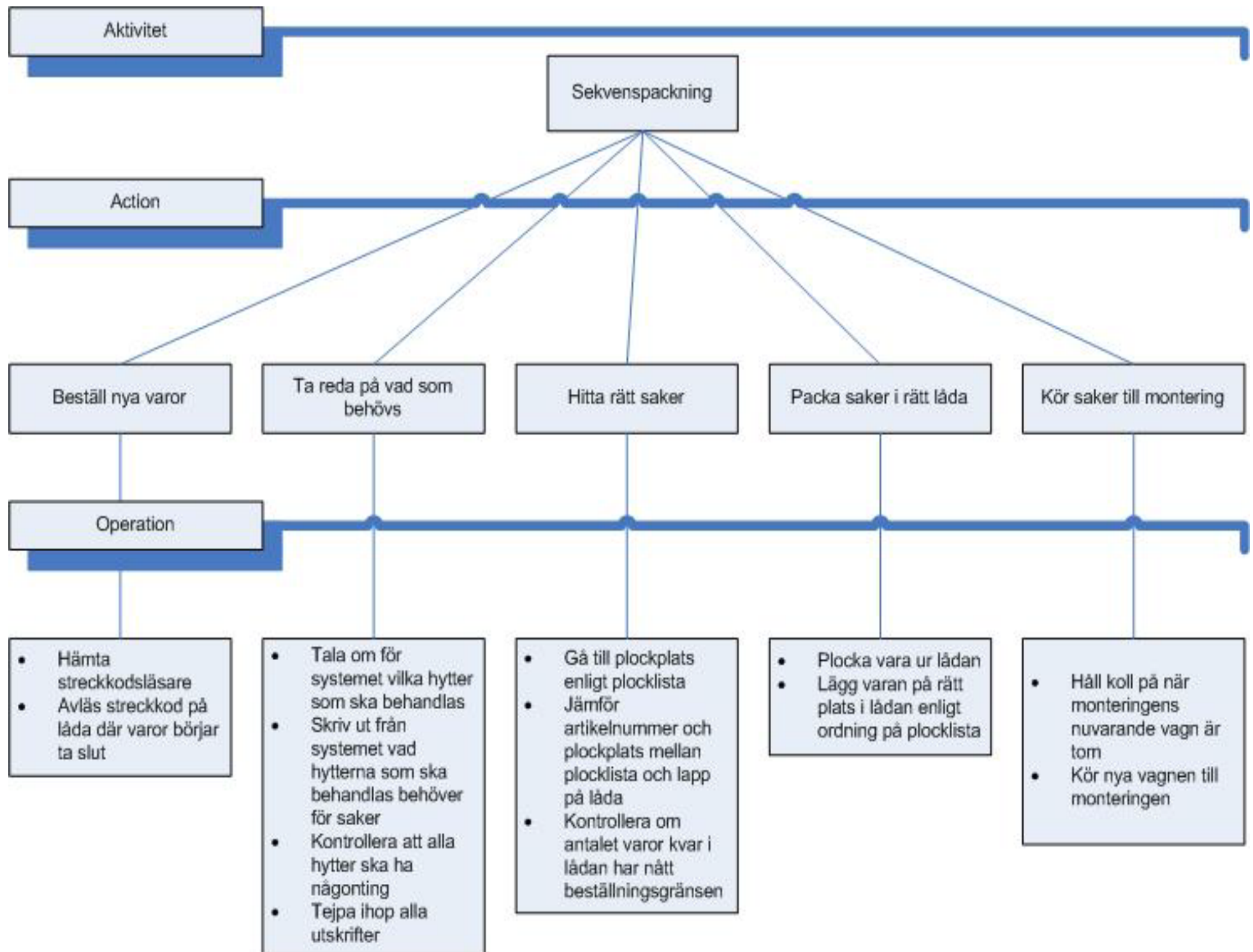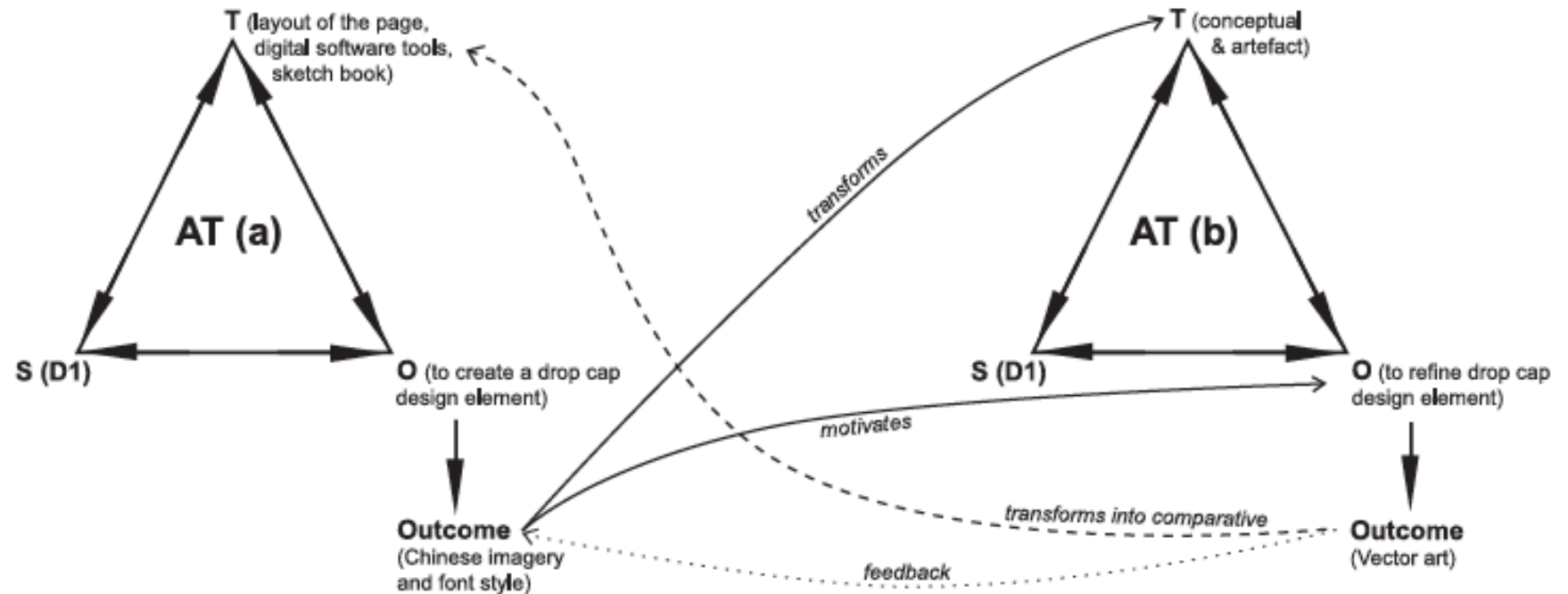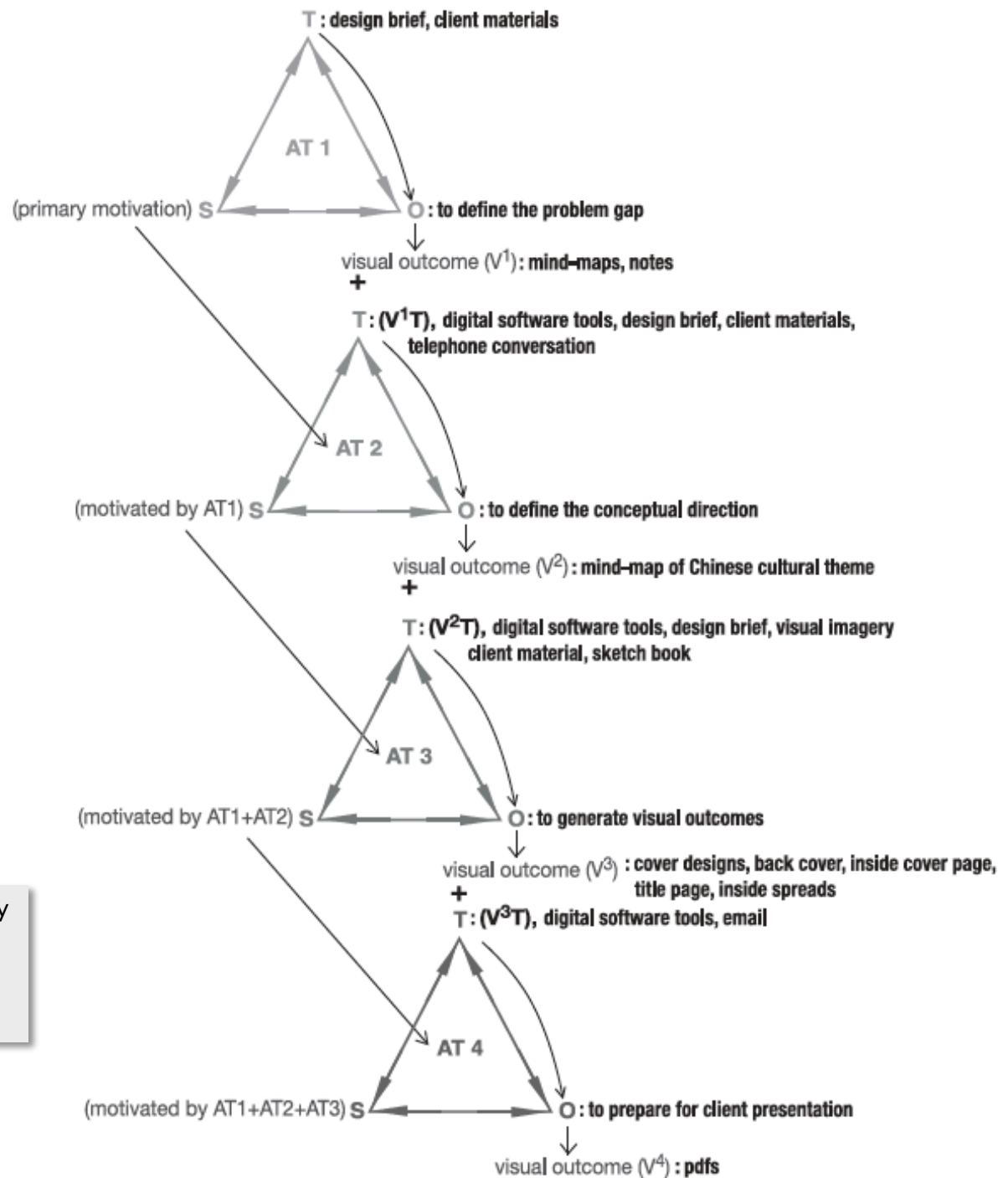
Example of Iteration

Figure 5 An example of D1's iterative process

* Tan, Stella & Gavin, Melles. 2010. An activity theory focused case study of graphic designers' tool-mediated activities during the conceptual design phase. *Design Studies* 31, 461-478.

T : design brief, client materials

AT 1

(primary motivation) S — O : to define the problem gap

visual outcome (V¹): mind-maps, notes
+

T : (V¹T), digital software tools, design brief, client materials, telephone conversation

AT 2

(motivated by AT1) S — O : to define the conceptual direction

visual outcome (V²): mind-map of Chinese cultural theme
+

T : (V²T), digital software tools, design brief, visual imagery client material, sketch book

AT 3

(motivated by AT1+AT2) S — O : to generate visual outcomes

visual outcome (V³) : cover designs, back cover, inside cover page, title page, inside spreads
+

T : (V³T), digital software tools, email

AT 4

(motivated by AT1+AT2+AT3) S — O : to prepare for client presentation

visual outcome (V⁴) : pdfs

* Tan, Stella & Gavin, Melles. 2010. An activity theory focused case study of graphic designers' tool-mediated activities during the conceptual design phase.
Design Studies 31, 461-478.

Figure 10 D1's overall design process from an activity theory perspective

TASK: APPLY THE FOLLOWING

- What is the activity?
- What is the object?
- Which is the motive?
- Which are the tools? (internal-external)
- How do these change? (identify breakdowns)
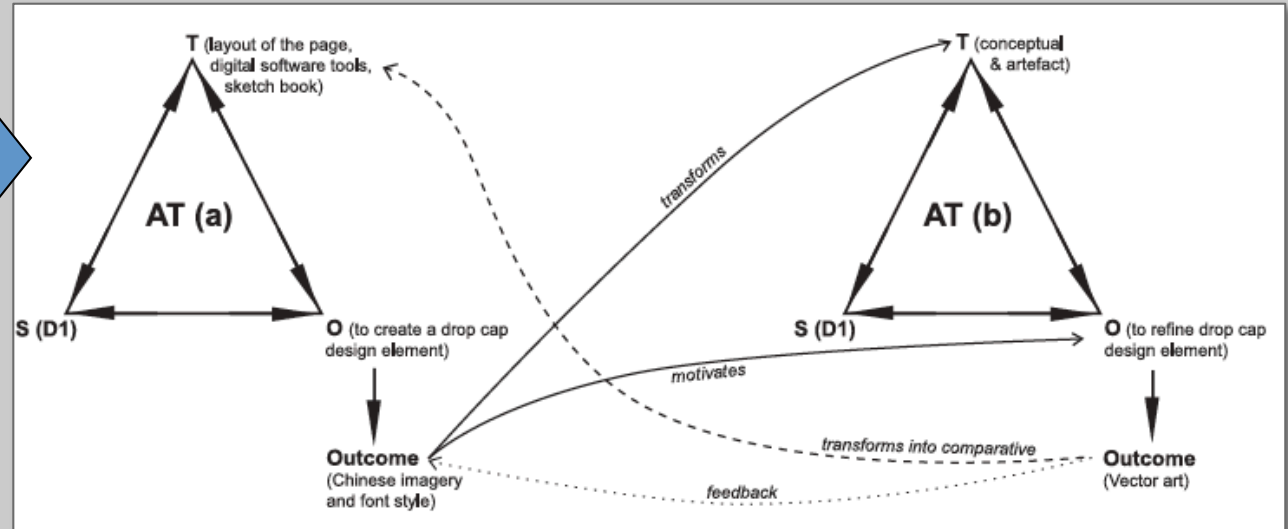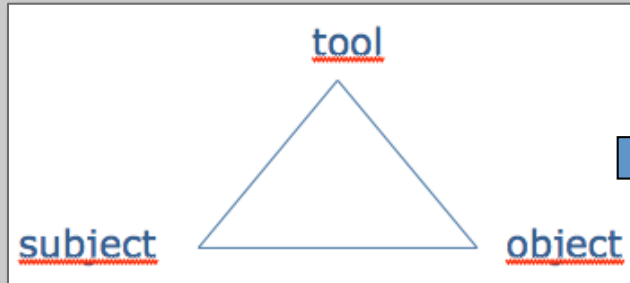

HIERARCHICAL STRUCTURE OF ACTIVITIES

transformation

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INTERNALISATION ⟷ EXTERNALISATION
transformation

- Internal activities– cognition
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LEVELS OF DEVELOPMENT

(individual's performance in relation to an activity)

Beyond ZPD

Zone of Proximal Development - ZPD
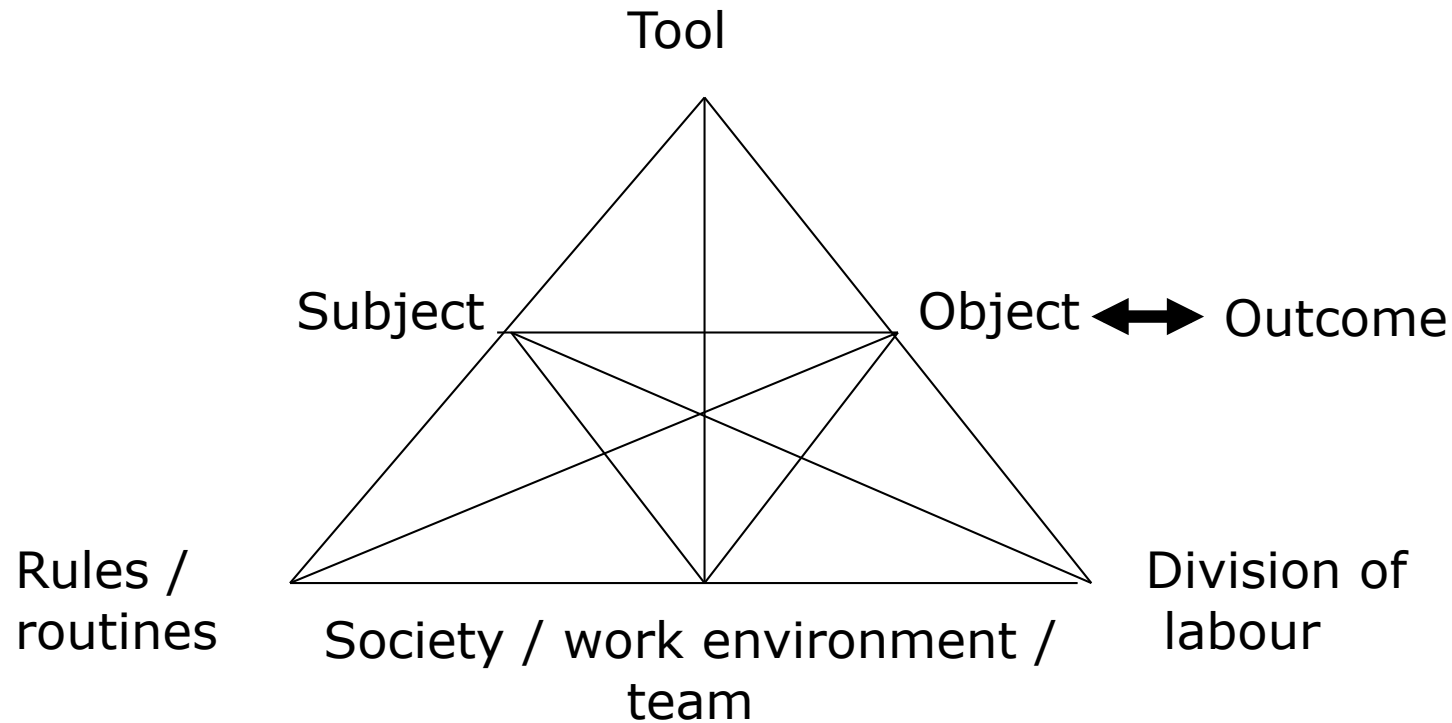
Autonomous / independent

21
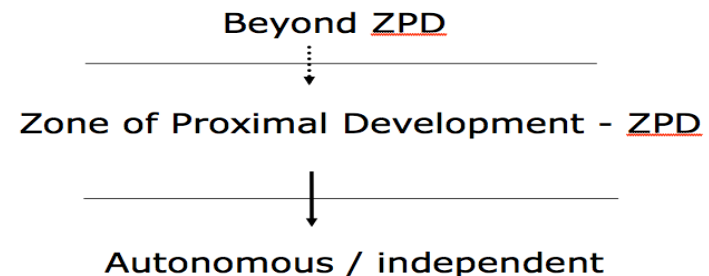
Scenario outline: Delivering this Course

- We have a common experience of this particular course and therefore we will use it for this task.
- The course started with your registration to the course or the first lecture (the first event in time). Disregard any preparations done by e.g., lecturer before this date.
- The course ends with a written examination including its valuation (decision-making), which will be the focus to adjust and include in a future scenario

- Vision: computer-based and dialogue-based (formal argumentation) alternative method for examination.

- Be free to use any appropriate level or scope of this scenario to solve each tasks

Engeström's "Activity System"

Tool

Subject   Object ⟷ Outcome

Rules /
routines   Division of
                                            labour

Society / work environment /
team

Engeström, Y. 1999. Expansive visibilization of work: An activity-theoretical perspective. *Computer Supported Cooperative Work* 8, 63-93.

* Tan, Stella & Gavin, Melles. 2010. An activity theory focused case study of graphic designers' tool-mediated activities during the conceptual design phase. *Design Studies* 31, 461-478.
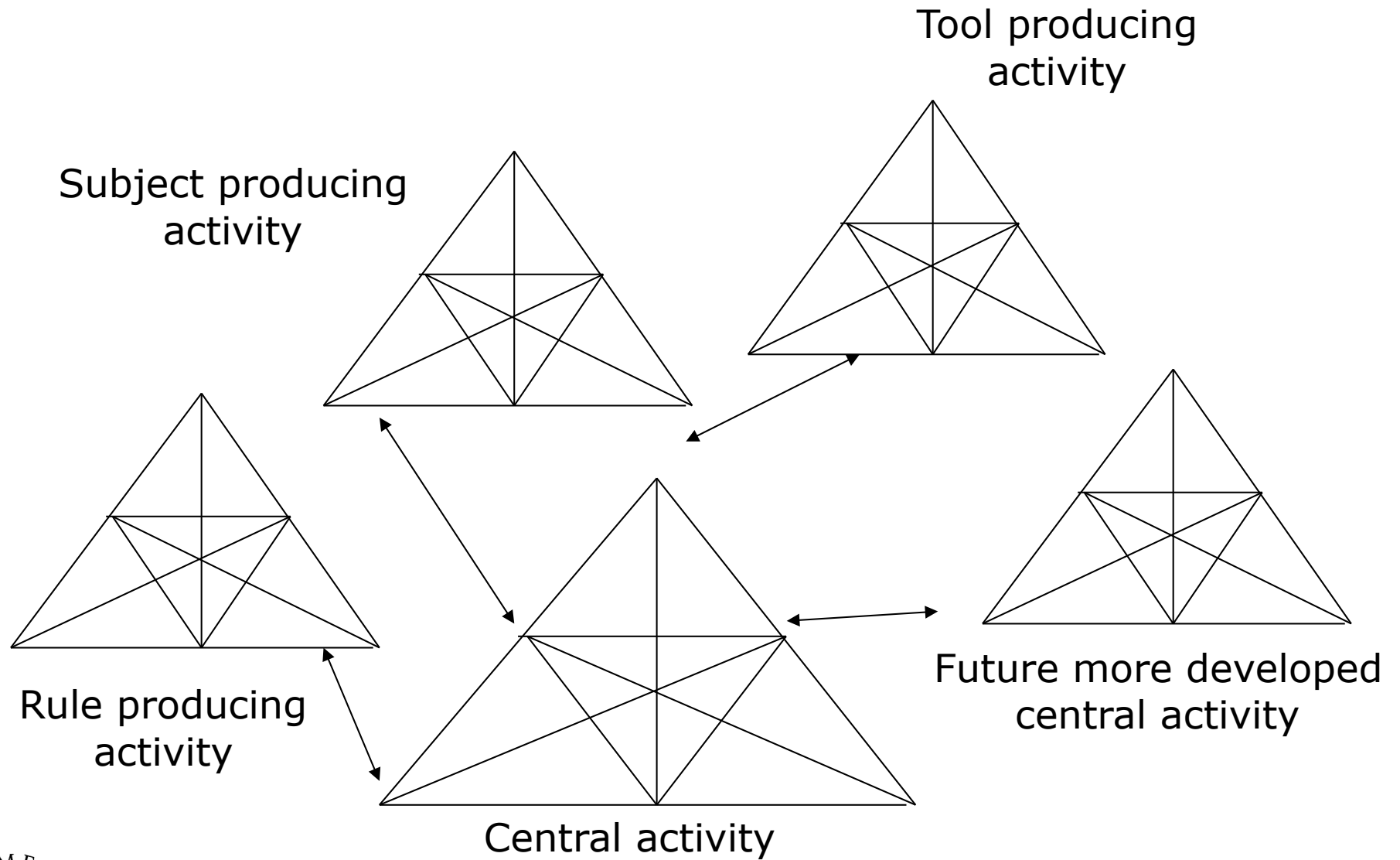
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Contradictions (Engeström)
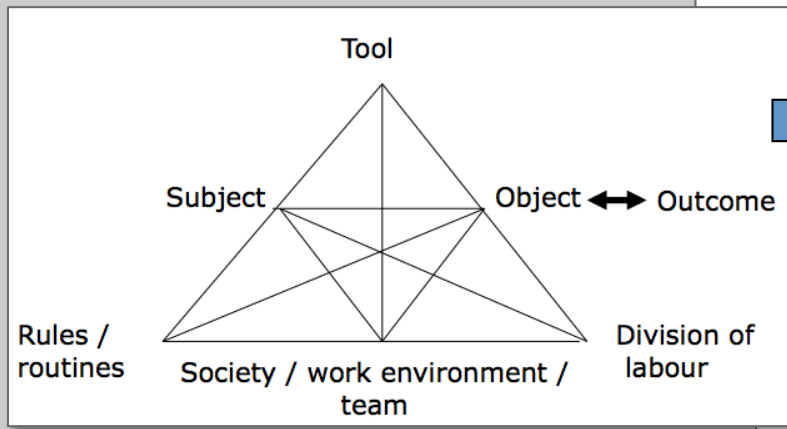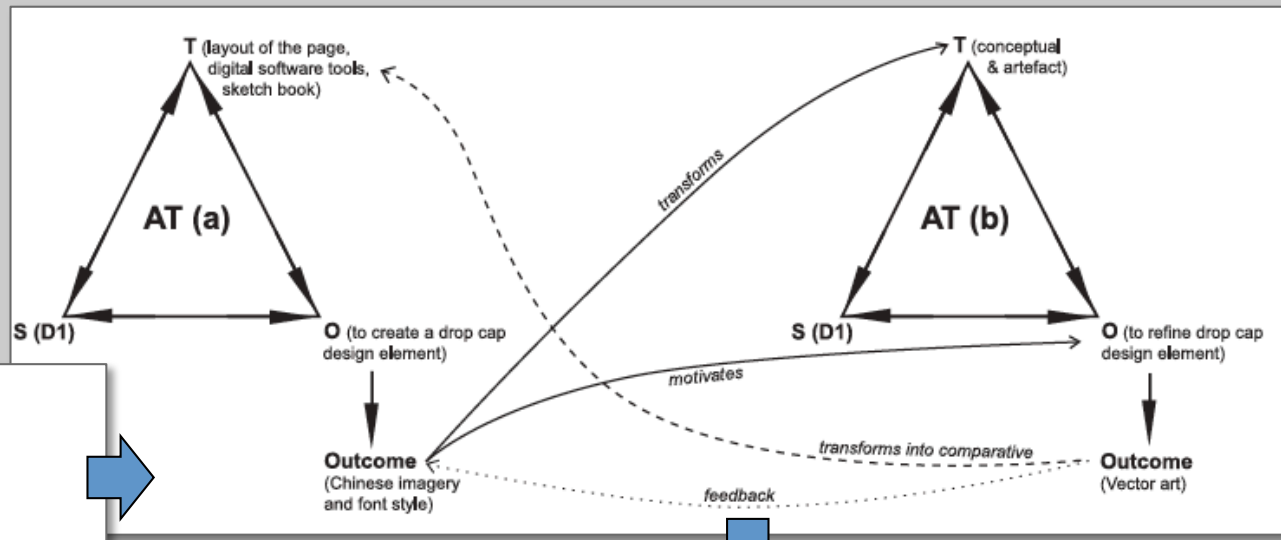
Types of contradictions:

1. resources vs. demands of results

2. internally within the system

3. towards "neighbour" activities

4. contradictions between how the activity is performed today and how it may be performed in the future

"Web of activities"

Tool producing activity

Subject producing activity

Rule producing activity

Central activity

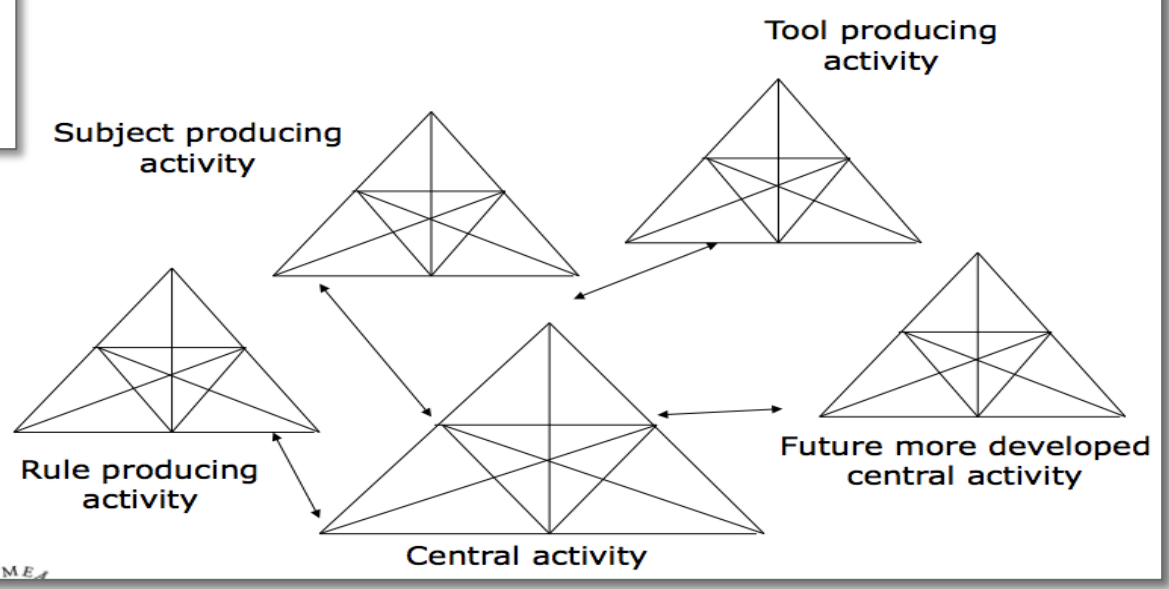Future more developed central activity

Task: Apply the following

- What is the activity?
- What is the object?
- Which is the motive?
- Which are the tools? (internal-external)
- How do these change? (identify breakdowns)

T (layout of the page, digital software tools, sketch book)

AT (a)

S (D1)   O (to create a drop cap design element)

Outcome (Chinese imagery and font style)

transforms

T (conceptual & artefact)

AT (b)

S (D1)   O (to refine drop cap design element)

motivates

transforms into comparative

feedback

Outcome (Vector art)

Tool

Subject   Object ⟷ Outcome

Rules / routines

Society / work environment / team

Division of labour

2013-01-22

"Web of activities"

Subject producing activity

Tool producing activity

Rule producing activity

Central activity

Future more developed central activity

"Crystallized" Activity Theory

- The theory in itself has been considered difficult to be used in practical design work
  - "The individual is a moving target" - *Norman*
- Researchers have developed tools based on AT that are useful in practice:
- Checklists
  - Bødker (fig. 11.8 in [1])
  - Korpela et al. (fig. 11.9 in [1])
  - Focus and **focus shift** (fig. 11.10 in [1])
  - The Activity Checklist, [2]
  - The AAIMA protocol, [3]

[1]* Olav W. Bertelsen & Susanne Bødker. Activity Theory. Chapter 11 in Carroll, John M. (2003). *HCI Models, Theories, and Frameworks*. Elsevier Science.

[2]* Kaptelinin Victor, Nardi Bonnie, Macaulay C. The Activity Checklist: A Tool for Representing the "Space" of Context. *Interactions*, July, August 1999

[3] Lindgren, H., Winnberg PJ, Winnberg P. (2011) Domain Experts Tailoring Interaction to Users – an Evaluation Study. In P. Campos et al. (Eds.): INTERACT 2011, Part III, LNCS 6948, pp. 644-661, Springer 2011.

2013-01-22

THE ACTIVITY CHECKLIST

Purpose:

- helps to keep the focus early in the design phase
- when evaluating existing systems

Two versions:

- design version
- evaluation version

- Covers contextual factors that might influence how IT-systems are used
- To be studied before meeting with organisation representatives

STRUCTURE OF THE CHECKLIST

Focus on using computer technology, emphasis on **tool mediation**

- Means / ends
- Environment
- Learning / cognition / articulation
- Development

Literature

- Bødker, S. (1991) *Through the Interface: A Human Activity Approach to User Interface Design*. Hillsdale, N.J.: Lawrence Erlbaum.

- Nardi, B. ed. (1996) *Context and Consciousness: Activity Theory and Human-Computer Interaction*. Cambridge, Mass.: MIT Press.

- * Kaptelinin, Victor, Nardi, Bonnie, & Macaulay, Catriona (1999).
  The Activity Checklist: A Tool for Representing the "Space" of Context*. Interactions: new visions of human-computer interaction*, 6 (4), 27-39.

- * Activity theory: Olav W. Bertelsen & Susanne Bødker (2003). Activity Theory. Chapter 11 in Carroll, John M. (2003). *HCI Models, Theories, and Frameworks*. Elsevier Science.

- Kaptelinin, V. & B. Nardi (2006) *Acting with technology – Activity Theory and Interaction Design*. Cambridge, MA: MIT Press.

- * Tan, Stella & Gavin, Melles. (2010) An activity theory focused case study of graphic designers' tool-mediated activities during the conceptual design phase. *Design Studies* 31, 461-478.

CONTRIBUTIONS OF ACTIVITY THEORY TO HCI

- Extending the scope of HCI
  - HCI needs to move its focus from only "human factors" towards the wider perspective "human actors"
  - Collective learning
  - Knowledge generation
  - Shift from bureaucratic to dynamic organisations
  - "action research"

- Adding dynamic properties to previously over-simplified concepts such as *transparency, affordance, direct manipulation*