



Comparing theories

Fundamentals of Human-Centered Computing



Comparing theories

Let's make a deeper comparison

of Distributed Cognition (DCog), Situated Action (SA),
and Activity Theory (AT)

We will compare their:

- Underlying philosophy
- Theoretical concepts
- Methodology

And finally, we will revisit some of our critical questions



Philosophy

How do DCog, SA, and AT see the world?



Philosophy

The shared philosophy between DCog, SA and AT is that they all study systems in the **context** in which they are used

DCog: the context is the system

SA: the context is the situation

AT: the context is the plan (anticipatory reflection)



Philosophy

There are however important differences in:

- The fundamental structure of the analysis
- How they treat humans versus artifacts
- Their intended intellectual merit
- The generalizations that may result from the analysis



Structure

DCog: The system (a combination of subjects and artifacts that together perform a task) provides the context of the analysis

Why? Because the system has intentionality (i.e. plans and goals) in and of itself

Systems are inherently context-rich, hence the goals become contextual



Structure

SA: Structure (situation) is defined by the researcher

Why? Because goals and activities do not really exist!
(they are emergent)

Goals are retrospective reconstructions of what happened;
the situation is the driving factor (not the user)

This focus on the situation restricts the researcher to study
actions in context, without goals or activities

Result: the analysis is inherently (and exclusively)
contextual



Structure

AT: The intentionality of the subject defines the structure of the analysis

Why? Because goals originate from the subject's intentionality

Goals are “objects” on the activity level, and “goals” on the action level

Plans (goals, objects) are anticipatory reflections, and because activities and actions happen in context, the plans are contextual as well



Humans v. artifacts

DCog: Humans and artifacts are qualitatively and practically equivalent

Artifacts are pulled to the human side, and assigned cognitive capabilities



Humans v. artifacts

SA: Humans and artifacts are qualitatively different, but practically equivalent

Interaction with artifacts is communication at a lower bandwidth

Since there is no intentionality, humans are pulled to the artifact side



Humans v. artifacts

AT: No equivalence between humans and artifacts

Humans control their activities; artifacts are just the mediators these activities

This difference is why automation often doesn't work



Intellectual merit

DCog: Provides a formal analysis of artifacts and how they are used, and produces comparative data across settings

Acknowledges that interaction is contextual

Is often overly “rationalistic”: situational influences are hard to model as part of the system, and thus often abstracted away

Lack of intentionality makes reasoning about the individual difficult



Intellectual merit

SA: Studies how people interact with artifacts in the context of a specific situation

Acknowledges the fluidity of goals and plans

Almost anti-comparative

The exclusive focus on the situation may reduce its usefulness, because there is no account of intent, interest and knowledge



Intellectual merit

AT: Provides a formal analysis of artifacts and how they are used, and produces comparative data across settings

Treats consciousness at the individual level

Situation influences but does not determine the actions



Generalizations

DCog: Generalizations happen, even though the work is seen as context-specific. Candidates for generalizations:

- Planning and problem-solving (through the manipulation of artifacts)
- Communication/Coordination (because these manipulations happen collaboratively)
- Knowledge creation and sharing (tracking the transformation and representation of artifacts as they permeate through the system)



Generalizations

SA: Generalizations do not happen, due to the idea of moment-by-moment analysis. However, less purist versions suggest:

- Distributed coordination (ad hoc division of tasks)
- Plans and procedures (comparison against actual behavior to distinguish routine from improvisatory behavior)
- Awareness of work (communication of status)



Generalizations

AT: Generalizations can occur; the key is the “anticipatory reflection” aspect of plans:

Anticipatory reflection can be uncovered by looking at the historical development of activities

Artifacts find a place as mediators between subject and activity



Theoretical concepts

How do DCog, SA, and AT treat the main theoretical concepts of HCI?



Theoretical concepts

As contextual theories of HCI, DCog, SA and AT all say something about:

- The unit of analysis of the study
- The activities and goals that are being analyzed
- The role of artifacts in the activity
- The role of context



Unit of analysis

DCog: The sociocultural system (combination of people, systems, and artifacts)

The sociocultural system is treated as a cognitive architecture

SA: The situation (the relation between person and setting)

The situation (not goals) is treated as the driving force behind actions

AT: The activity (a person trying to achieve an objective)

Not just the current instance, but the historical context



Activities and goals

DCog: Activities are the propagation of information throughout the system, which controls the goal

Cognitive view on activity; no individual intentionality

SA: Activities and goals are emergent

Actions are improvised, so planned activities do not formally exist

AT: Activities are goal-directed at all levels

Individuals act intentional within context; activities are not fully deterministic but also not fully improvised



Artifacts

DCog: Artifacts are part of the system

They have the potential to be agents, to represent information, and to cognize (almost like people)

SA: Artifacts are unique to a setting

Focus on improvisation with tools; making them fit

AT: Artifacts mediate activity

They best support the activity if they contain structure but allow for flexibility



Context

DCog: The system is the context

Focus on cognitive consequences of de- and re-contextualization

SA: Context and action co-occur

There is no action without context; action can only be studied in a particular context

AT: Activities, actions and operations occur within a context

They are shaped by the context through the anticipatory reflection of plans



Methodology

How are DCog, SA, and AT studies performed?



Methodology

DCog, SA and AT all study HCI with a **real-world focus**

However, they differ in the exact methods used to study HCI, particularly when it comes to:

- The analytical practice
- The timeframe of the phenomena that are (and can be) studied



Analytical practice

DCog: Interviews and ethnography

Perform artifact analysis, study information flows

SA: Video recording (no interviews!)

Perform conversation analysis, study actions

AT: Interviews and ethnography (interviews might be enough)

Use interviews to uncover the goals; ethnography to study the behavior



Timeframe

DCog: Long-term analysis of system functioning

The unit of analysis is a “system performance” (something observable that happens within the system)

SA: Short-term analysis; one episode (~30 minutes)

Reconstruct the action and situation on a moment-by-moment basis

AT: Long-term (3+ months), to uncover historical context

Study activity by activity; broken down into actions and procedures



Questions

How can we critically appraise DCog, SA, and AT?



Questions

According to these theories:

- How are goals established and upheld?
- How much are our goals dictated by the situation?
- How much regularity is there in our actions?
- How can we best support context?
- How does learning occur?
- What is cognition?
- Where do consciousness and intentionality reside?