Theories in CSCW
Activity Theory

What and Why?
Hani
Scientific theory: Different definitions

• “A coherent group of tested general propositions, commonly regarded as correct, that can be used as principles of explanation and prediction for a class of phenomena”
Synonyms: principle, law, doctrine.

• “A particular conception or view of something to be done or of the method of doing it; a system of rules or principles”:

Source:
http://dictionary.reference.com/browse/theory
(accessed 20.02.2014)
• The **United States National Academy of Sciences** defines scientific theories as follows:

“It refers to a comprehensive explanation of some aspect of nature that is supported by a vast body of evidence”

• The **American Association for the Advancement of Science**:

“is a well-substantiated explanation of some aspect of the natural world, based on a body of facts that have been repeatedly confirmed through observation and experiment”

**Source:**
(accessed 20.02.2014)
• Computing Dictionary:

“The consensus, idea, plan, story, or set of rules that is currently being used to inform a behavior”

Source:
http://dictionary.reference.com/browse/theory
(accessed 20.02.2014)
Scientific theory: Some Characteristics

• Foundation to further develop scientific knowledge
• A set of principles devised to explain/predict some facts or phenomena
• Developed from hypothesis
• Based on observation, experimentation, and reasoning
• Tested and confirmed as a general principle: well-supported by many independent strands of evidence
• Makes falsifiable predictions
• Can be modified as more information is gathered, so accuracy of the prediction becomes greater over time
• A good theory, like Newton’s theory of gravity, has unity: “It consists of a limited number of problem-solving strategies that can be applied to a wide range of scientific circumstances”.
• It is formed from a number of hypotheses that can be tested independently.

(accessed 20.02.2014)
Hypothesis

• Unproved theory

• Assumption, supposition, conjecture- lack indorsement

• Suggested explanation of facts or phenomena as “likely to be true”, or as a basis for further verification (working hypothesis)
# Theory vs. Hypothesis

<table>
<thead>
<tr>
<th></th>
<th>Theory</th>
<th>Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition</strong></td>
<td>well-substantiated, unifying explanation for a set of verified, proven hypotheses</td>
<td>A suggested explanation for an observable phenomenon or prediction of a possible causal correlation among multiple phenomena.</td>
</tr>
<tr>
<td><strong>Based on</strong></td>
<td>Certainty, evidence, verification, repeated testing.</td>
<td>Suggestion, possibility, projection or prediction, but the result is uncertain.</td>
</tr>
<tr>
<td><strong>Testable</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Falsifiable</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Well substantiated</strong></td>
<td>Yes</td>
<td>NO</td>
</tr>
<tr>
<td><strong>Data</strong></td>
<td>Based on a very wide set of data tested under various circumstances</td>
<td>Usually based on very limited data</td>
</tr>
<tr>
<td><strong>Instance</strong></td>
<td>General: A theory is the establishment of a general principle through multiple tests and experiments, and this principle may apply to various specific instances.</td>
<td>Specific: Hypothesis is usually based on a very specific observation and is limited to that instance.</td>
</tr>
</tbody>
</table>

Source:
[http://www.diffen.com/difference/Hypothesis_vs_Theory](http://www.diffen.com/difference/Hypothesis_vs_Theory)

(accessed 20.02.2014)
Theories in CSCW of interest to us

• Strauss’ Theory on work:
  Schmidt & Bannon; Star; Carstensen & Sørensen; Gasser; Corbin & Strauss, ……
  (Relevant concepts: social, cooperation, situated actions, mapping, coordination, articulation, …)

• Activity Theory (AT); Cultural Historical Activity Theory

• Actor Network Theory (ANT)
Activity Theory (AT)
Why Activity?

- Fundamental concept in HCI research and practice (Moran, 2006)
- Modern work at organizations is cooperative
- People perform different tasks for specific goals
- Understanding the “meaning” of tasks and activities for designing assistive technologies
- Interactive technologies are widespread and integrated into modern work-practices
- Technology based activities better supports new task forms and developing “smart solutions”
- Developing Joyous activities offer us joyful experiences
AT demonstrates:

• Activity context in HCI studies

• Usefullness of tools and their limitations
Why Activity Theory?

• To streamline our common understanding of the concept of activity
• Platform to scientifically analyze complex work activities
• Differentiate between work/ non-work activities
• Differentiate between «activity analysis» and «task analysis»
• Relates human cognition to collaborative activity
• Connects human activity, motives, operations, mediating artefacts (physical or psychological), and the mediation process together
• Offer researchers a common established platform to guide their CSCW research
Activity triangle

subject

community

object
What is Activity Theory?
• Descriptive
• Originator: Vygotsky, Leont’ev, Luria, and others starting in the 1920s.
• Summary: Activity Theory is a framework or “descriptive tool for a system”.
• People are socio-culturally embedded actors
• Hierarchical analysis of motivated human action (levels of activity analysis).
• The role of group interactions in constructing and coordinating different work activities
Leontiev’s framework

• activity is represented as “S ⇔ O”.

• There are two key aspects differentiating activity from other types of interaction:

• (a) subjects of activities have needs, which should be met through an interaction with the world, and

• (b) activities and their subjects mutually determine one another; or, more generally, activities are “generative forces” that transform both subjects and objects.
• Activity occurs between a subject, an object and a community. Subject and object relate through mediation of artifacts, subject and community relate through norms and regulations, and object and community relate through different power relationships and division of labor.
Levels of activities

• Hierarchical structure of activity towards an object/ objective/ goal

• The top layer is the activity itself, which is oriented toward a motive, corresponding to a certain need. The motive is the object that the subject ultimately needs to attain

• Actions are conscious processes directed at goals which must be undertaken to fulfil the object.
• Actions are implemented through lower-level units of activity, called operations.
• Operations are routine processes providing an “adjustment of an action” to the ongoing situation.
• The unit of analysis is motivated activity directed at an object (goal).
• Includes cultural and technical mediation of human activity, artifacts in use (and not in isolation).
• Activities consist of goal-directed actions that are conscious. Constituents of activity are not fixed; they can dynamically change.
Activity System

Engestrom’s model is useful to understand how a wide range of factors work together to impact an activity for a specific objective.

In order to reach an objective, it is necessary to produce certain mediating “objects”/artefacts (e.g. tools used, documents, recipes, etc.).

Activity is also mediated by an organization or community, where the community may impose rules that affect activity.

The subject works as part of the community to achieve the object. An

Activity normally features a division of labor.
Principles

• Object-orientatedness

• Internalization/externalization. Internal activities cannot be understood if they are analyzed separately from external activities.

• Internalization provides means for people to try “potential interactions with reality” without performing “actual manipulation with real objects” (mental simulations, conceptual models, considering alternative plans, etc.)

• Externalization transforms internal activities into external ones.
• Mediation
• Activity Theory emphasizes that human activity is mediated by tools in a broad sense
• Tools are created and transformed during the development of the activity itself and carry with them a particular culture.
Development

• Research methodology

• Active participation with monitoring of the developmental changes of the study participants.

• Ethnographic methods that track the history and development of a practice
Some relevant literature


