Week 4: Second Wave HCI (Part 2)

SESSION OVERVIEW

In this session, we will explore how Activity Theory and Distributed Cognition analyses can help consider how considerations for context affect human activity, and consequently how we can design interactive technology that supports it.

We will start with modelling a scenario as an activity system, using elements of Activity Theory, and identify potential *contradictions* in the modelled system. We will then look at a scenario and explore how it can be modelled as a distributed cognitive system. It then be great if we end the session with a group discussion and reflections contrasting Activity Theory and Distributed Cognition on the basis of your experience modelling these scenarios.

1 ACTIVITY THEORY

Activity Theory breaks down human activity into three levels: Activity (driven by high level motives), Actions (driven by goals) and Operations (determined by material conditions). Activity Theory is often considered with capture the top level motive of human activity, and focuses on how it leads to transformation and change, while taking into consideration the broader context of the activity.

To carry out an Activity Theory analysis from a given scenario (i.e. that we collected data about) we first:

- Identify the *subject*: the agent carrying out the activity and the locus of motive(s)
- Identify the *object*: the construct (thing, person, idea) that they wish to act on I order to transform in some way or another
- Identify the desired *outcome*: the result of the desired transformation
- Identify the *tool* or instruments that the subject relies on to carry out the activity (tools and instruments, could be objects or ideas)

Then, we consider the broader context that affect this basic/simple activity model, and so we also:

- Identify the *rules* or norms, laws, conventions, policies that govern the activity in question
- Identify the *community* that is the other agents that form the broader community of the subject in question
- And identify the *division of labour*: how the activity or actions are divided among relevant members of the community in question

Once we model the activity in this way, we can then start to think about potential *contradictions* in the resulting activity system. These are aspects of the activity that are likely to cause an imbalance that will have an impact on the ultimate outcome/transformation desired: i.e. that can lead to undesired or unexpected outcome.

In the lecture, we covered different levels of contradictions, including *primary, secondary, tertiary, and quaternary* contradictions. Here, we will focus on:

- *Primary contradictions:* those that occur within a particular element of the activity system and itself
- *Secondary contradictions:* those that occur between two elements of the activity system

Once we identify these contradictions, we can then be in a position to consider potential design interventions to resolve those contradictions, and therefore end up with insights for designing interaction.

Exercise:
With the above revision in mind (and do feel free to go back to the lecture slides), consider the following scenario:

A primary school teacher has just brought in a new interactive gadget called a Bee-Bot, a programmable floor robot, that she plans to use to improve children's understanding of basic maths. The teacher uses the Bee-Bot to engage the children in directional programming whiling playing the Snakes and Ladders game.

Data: We won't get to collect actual observation data to analyse this scenario, which usually precedes Activity Theory analyses, so watch this instead: https://www.youtube.com/watch?v=za6wHl50fJU

Your Task: In your gorups

1) Construct an Activity Theory diagram that models this scenario
2) Identify one primary and one secondary contradiction in the activity system you modelled
3) Suggest potential ways to modify the design of the Bee-Bot to resolve the contradictions that you have identified

2 DISTRIBUTED COGNITION

Distributed Cognition is also another theory that allows us to consider the influence of broader context of a given activity on problem solving processes and outcomes. In particular, the theory postulates that, when engaged in problem solving, humans are part of a system that is larger than themselves, and that such a system has cognitive properties of its own that cannot be reduced the cognitive properties of the individuals involved.

Specifically, Distributed Cognition says that cognitive processes in such a system are distributed across three levels:

- Across internal and external representations (as per what we covered in the External Cognition lecture)
- Across members of a given social group
- And across time such that results from earlier events in a process influence the nature of future events

So, in Distributed Cognition, we consider not just internal and external representations, but also the context constructed from social and physical interactions in a given scenario. The unit of analysis is the combination of people, artefacts, physical and social interaction

As we said in the lecture, to analyse a scenario as a distributed cognitive system, we need to do at least three things:

1) Identify what knowledge/information is relevant to the given situation and where this knowledge/information is stored
2) What sort of computation and processing takes place that makes use of this knowledge/information
3) How such knowledge/information flows between different parts of the modelled system to support this computation

Exercise:
Re-consider the above scenario, this time, work together in your groups to model it as a distributed cognitive system

Your tasks:

1) Identify a list of relevant information for learning maths with a Bee-Bot game
   → draw a graph (or graphs) about where this information is stored (hint: think about external representation, internal representation, social and physical interactions)
2) Outline the computation/processing that takes place that makes use of this information
3) Update your graph(s) to indicate how information flows from one of part of your system to another
4) Suggest potential ways to modify the design of the Bee-Bot to better support this distributed cognitive system

3 REFLECTIONS

Final task
In your groups, reflect on the sort of insights that you gain from doing an Activity Theory analysis and a Distributed Cognition analysis of the same scenario

- Were these the same? Were they different? How?
- Were the design recommendations that resulted from each analysis the same? Were they different? How?

- Consider why there were differences between the two analyses - if you agree that there were any..