Boundary Objects

Fundamentals of Human-Centered Computing

Boundary Objects

How do people really collaborate?

And how can computers help?

Today we will cover:

- What problems do Boundary Objects try to solve?
- How do Boundary Objects solve these problems
- How can we apply Boundary Objects?
- What are good and bad aspects of Boundary Objects?

The problems

What problems do Boundary Objects try to solve?

The problems

Distributed Cognition, Situated Action, and Activity Theory all reason about the social aspects of computing

DCog: As a cognitive system

SA: improvised coordination

AT: culturally embedded plans and actions

Realization: None of them *really* addresses how collaboration works, and how to support it!

Boundaries

In collaboration/coordination across heterogeneous entities...

e.g. different teams, different specializations, different groups of people

...there exist **knowledge boundaries**

Each entity has its own knowledge to bring to the table

Boundaries

This is what makes collaboration work...

i.e. specialization; crucial to the success of complex organizations (e.g. societies!)

But also what makes it difficult...

Communication is needed to align goals and practices

This communication is hard, **because** of specialization

Why is communication so hard? How can we fix this?

Syntactic

Communication across boundaries is hard because it has a low bandwidth

Communication can be improved by doing more of it, following an shared **syntax** (language)

> Create an environment for efficient information processing

But what if the situation changes?

Semantic

Communication across boundaries is hard because of differences in interpretation

- Especially when things change

Communication can be improved by resolving **semantic** differences by making tacit knowledge explicit

- Create an environment of mutual understanding

But what impact does it have on the communicators?

Pragmatic

Communication across boundaries is hard because it has consequences for the communicating parties

- Each party defends its hard-won knowledge
- But the parties are also mutually dependent

Communication can be improved by influencing/ transforming the knowledge of the other party, and being open to have one's own knowledge influenced/transformed

Tacit knowledge

The pragmatic view of knowledge and communication gives a new meaning to the concept of tacit knowledge

> It is not just hard to explicate; it is intrinsically connected to the practice itself

Tacit knowledge

Knowledge is localized

Each party has its own limited view; there is nobody who has the whole picture

Knowledge is embedded

It is hard to understand the knowledge without an intimate understanding of the practice

Knowledge is invested

It is built over time, and people are often unwilling to change it

The problems

When people collaborate, they influence each others' knowledge

This can create friction because the knowledge is localized, embedded, and invested

I.e. there may be a lack of common syntax, a lack of common semantics, and a lack of pragmatic adjustment

New goal of HCI: facilitate collaboration at the boundaries

Allowing users to represent, learn, and transform

The solution

How do Boundary Objects solve these problems?

The solution

Boundary Objects: objects that are shared and shareable across different problem solving contexts

Three types:

- Repositories/tools
- Standardized forms and methods
- Maps, models and objects

Let's discuss them one by one…

Repositories/tools

Repositories/tools provide a shared language to represent knowledge

e.g. shared data, measures, labels

They allow for a common representation of the work

They thereby cross the syntactic boundaries

Forms & methods

Standardized forms and methods provide a shared language as well as shared tools for explicating knowledge

e.g. reporting formats, problem-solving methods

They allow for people to learn about their differences and dependencies

They thereby cross the semantic boundaries

Maps/models/objects

Representations that can be used as a shared language, as shared tools for explicating knowledge, and as shared vehicles for resolving conflicts

e.g. sketches, mock-ups, simulations

They allow for people to transform their knowledge

They thereby cross the pragmatic boundaries

Note: models/objects operate at the practice level (resolving technical issues), while maps operate at the system level (resolving issues wit the coordination itself)

Implications

A good system fulfills all three functions:

- It provides a repository for representing
- It provides forms/methods for learning
- It provides maps/models/objects for transforming

As a boundary object, a system is both practical and political

It must facilitate a process of transforming knowledge that is localized, embedded, and invested

This process is called **interessement**

The method

How can we apply Boundary Objects?

The method

Mostly observational research

- Need to study all groups involved in the boundary setting

Focus on understanding the knowledge and practice of each setting, as well as how boundaries are navigated

- Look for processes of representing, learning, and transforming
- Look for objects that inhibit or facilitate this process

Focus

Highlight (a lack of) shared goals

- How do they motivate the collaboration?
- Is there a difference in commitment to these goals?
- If goals are not aligned, how can we align them?

How can tools/repositories, forms/methods, or maps/models/objects support this process?

Objects

Find tools/repositories that allow parties to talk to each other

Do they speak the same language? Can you institute one?

Find forms/methods that allow parties to learn each others' situation

Do they acknowledge each others' problems? What information is missing? How can it be gathered?

Find maps/models/objects that allow parties to converge

Do they work towards a solution? What is their common model for doing so?

Reflection

What are good and bad aspects of Boundary Objects?

Reflection

Criticism: This seems very organizational

Would this also work for consumer technology?

Response: Boundary objects have been used in social media research

Palen & Dourish: “Social privacy is a boundary negotiation”

Page et al.: “SNS users engage in boundary preservation”

Questions

Can you give a good example of a problem due to syntactic differences? Semantic differences? Pragmatic differences?

How would you resolve these issues (using boundary objects)?

Questions

How do boundary objects relate to Distributed Cognition?

To Situated Action?

To Activity Theory?

To Structuration Theory?