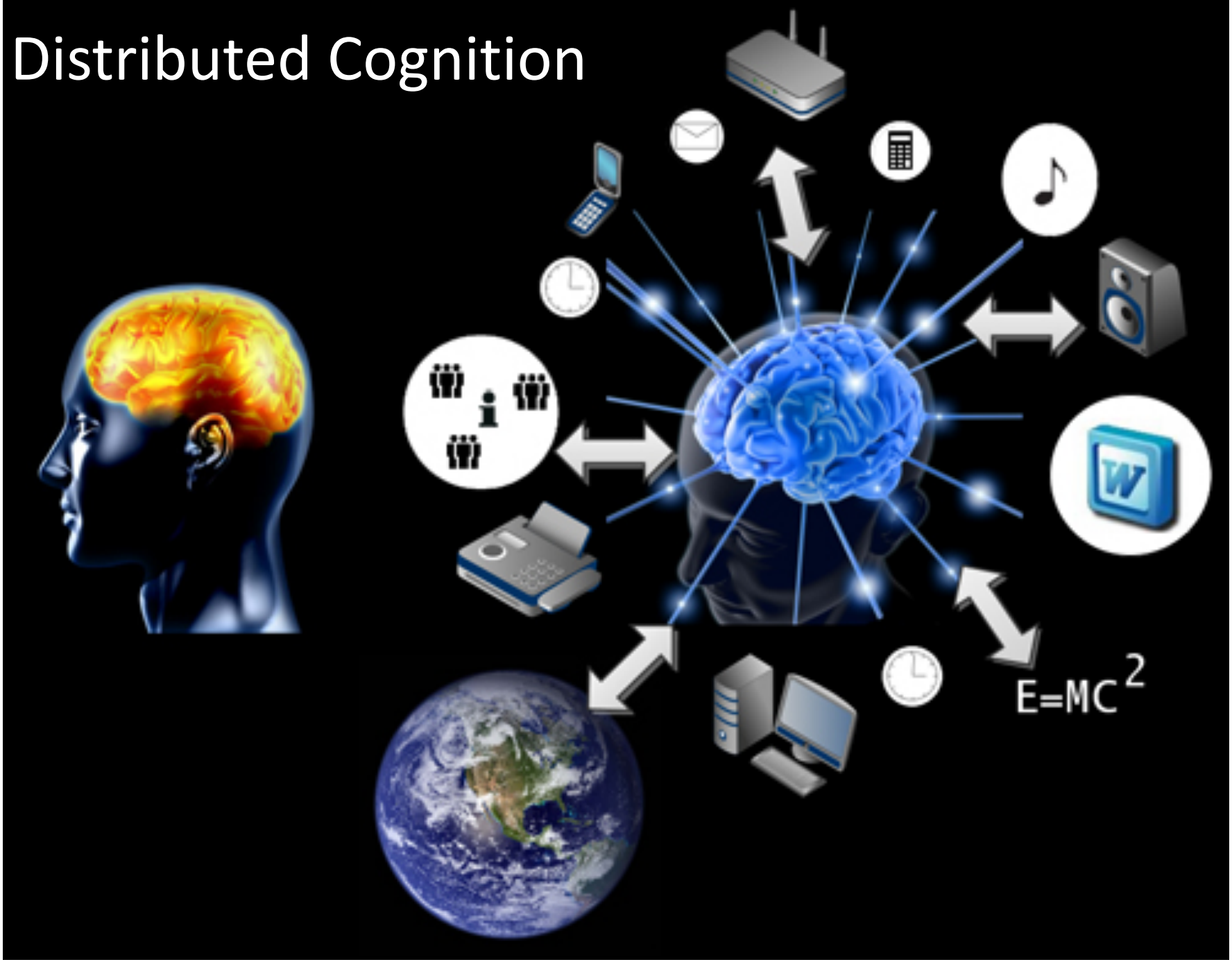
Distributed Cognition



Distributed Cognition

- Main reference: Hutchin's paper on Distributed Cognition (in the wild), see GitHub
- For a brief summary see: http://en.wikipedia.org/wiki/Distributed_cognition
- http://etec.ctlt.ubc.ca/510wiki/Distributed_Cognition

Distributed Cognition Theory

- Seeks to describe the organization of cognitive systems
- Unit of analysis is not the individual but the socio technical system
- Considers a broader class of cognitive events (not just within a head)

  e.g. memory involves manipulation of objects and external representations

Brings together two things

1. Cognitive Anthropology which is concerned to the real world settings and the role that artifacts play during work practice
2. Cognitive Psychology which concerns to the study of the individual in a technological environment

Cognition in the wild

- Cognitive processes may be distributed across members of a social group
- Cognitive processes may involve coordination between internal and external (material or environmental) structure
- Process may be distributed through time – with products of earlier events transforming nature of later events

Social organization as a form of cognitive architecture

- How are the cognitive processes of an individual distributed across a group of individuals?
- How are the cognitive properties of individual minds affected by participation in group activities?
- How does the social organization influence the flow of information?

Embodied Cognition

Minds are not passive representational engines..

Organization of the mind is an emergent property of interaction among internal and external resources

Culture and cognition

- Culture shapes cognitive processes that are distributed over agents, artifacts and environments

- The environment as a reservoir of resources for learning, problem solving and reasoning…

- Culture provides us with intellectual tools, but culture may also blind us…

How to study distributed cognition?

- Ethnography – not just of minds but also of artifacts and social processes – event centered, to develop a theory
  - Requires domain expertise and knowledge of the structure to study events
- Followed by experiments (to refine the theory)
- Back to more studies "in the wild"

The integrated research activity map

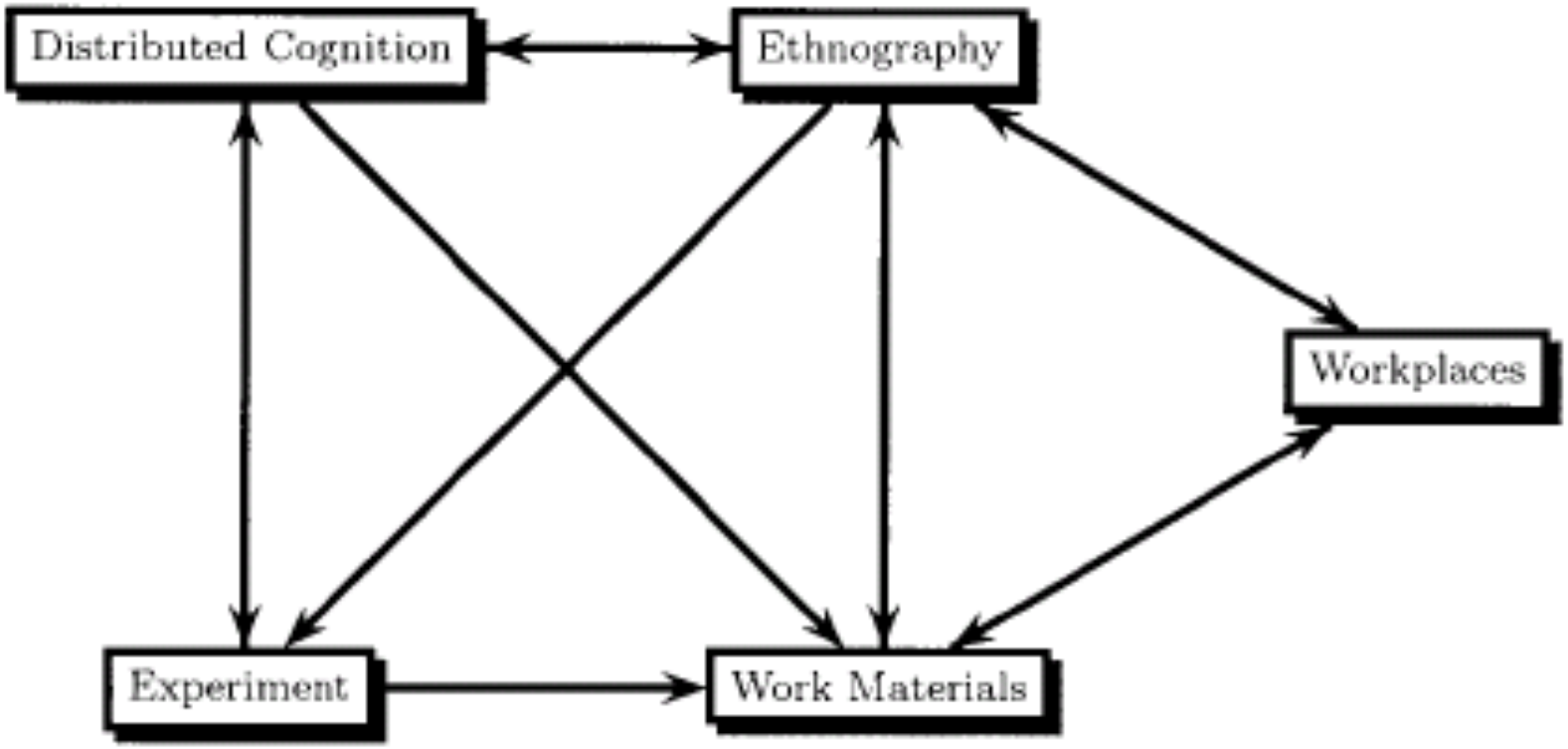
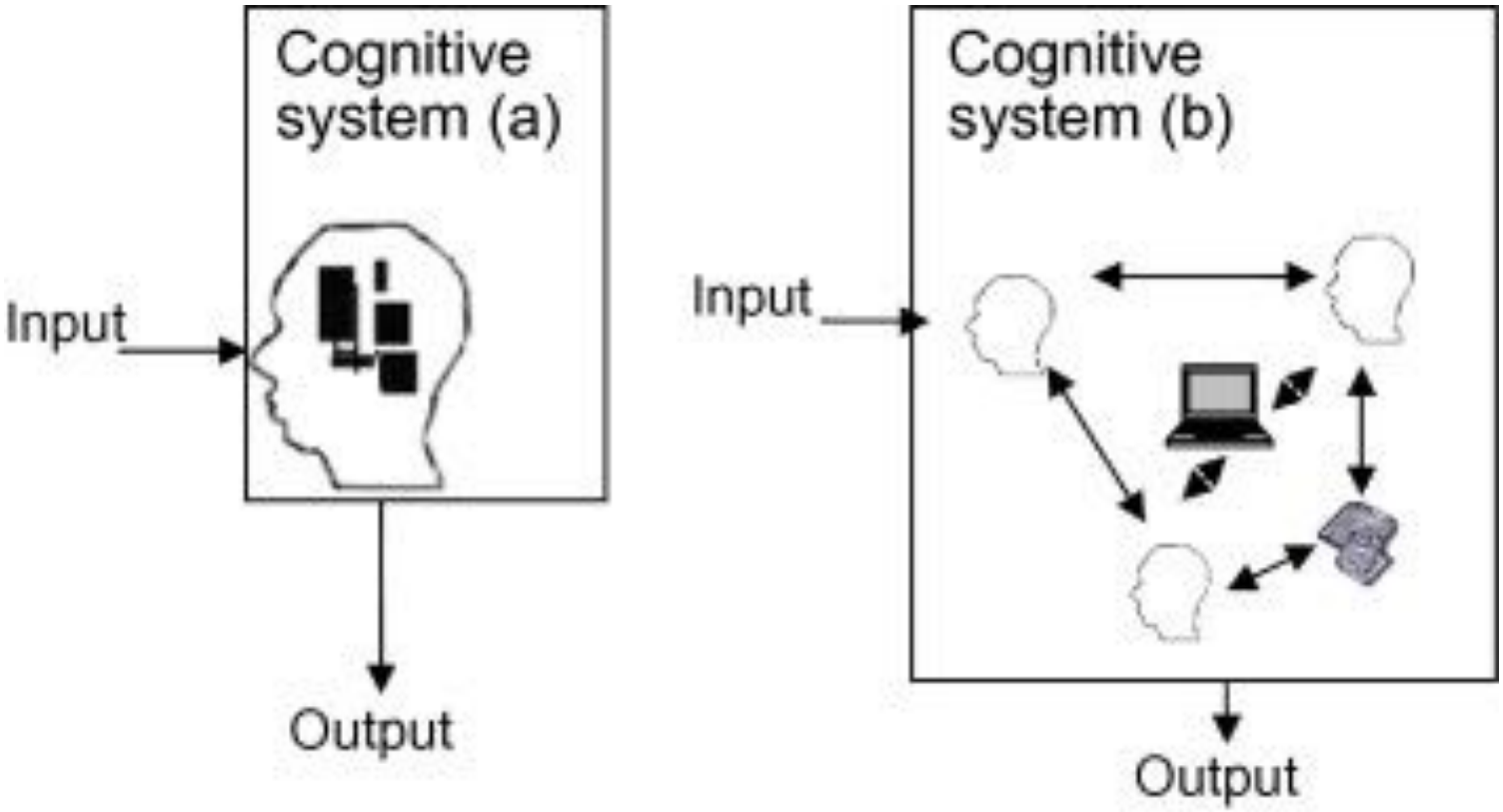


Fig. 1. Integrated research activity map.

A more intuitive view?



http://etec.ctlt.ubc.ca/510wiki/Wikis:_A_Theoretical_Perspective

Principles of distributed cognition theory

- People establish and coordinate different types of structure in their environment
- It takes effort to maintain coordination
- People off-load cognitive effort to the environment whenever practical
- There are improved dynamics of cognitive load-balancing available in social organization
- Studies reveal uses of representations that were not anticipated

Representations

- Direct manipulation and immediacy
- Representations and the things they represent – not the same thing but that is useful!
- How to design representations to facilitate flexible use?
- How to design representations that are more active and help decide what to do next?
- How to use representations to help us have a better understanding of what is going on?

Discussion..

- Why is ethnography the best way to discover how cognition is distributed?

- What role can experiments play?

Diary study…

- As a technique to study distributed cognition in terms of learning in a course
- Why might it not be the best technique?
- Is there a better approach?

Some more points for discussion

- What unexpected ways do you offload cognition to artifacts (e.g. pilots use of weather radar to remind about refueling)?
- Can you think of digital artifacts you have used that provide information about their history of use? (e.g. in email)
- What strategies do you use with digital representations of real objects to help you organize our work?
- How has the cloud enhanced our distributed cognition processes?

Discussion points from the blog

- “remember where I was feature” – what is the impact of that perhaps on collaboration?
- The importance of the history feature in tools
- Need to look at other theories, e.g., cognitive load theory

From a discussion

“You make a good point with the texting and driving example that although better solutions exist, people will tend to gravitate to the behaviors that they are most comfortable with. It is definitely true that people do ignore the risks of texting and driving in order to avoid the learning curve of learning how to read and write text messages using a voice assistant on their smartphones.”

“Linus Torvalds’s style of development – release early and often, delegate everything you can, be open to the point of promiscuity – came as a surprise. No quiet, reverent cathedral-building here – rather, the Linux community seemed to resemble a great babbling bazaar of differing agendas and approaches (aptly symbolized by the Linux archive sites, who’d take submissions from anyone) out of which a coherent and stable system could seemingly emerge only by a succession of miracles.” ~ The Cathedral and the Bazaar

(shared passion of creating something useful, but what is a group?)

[miruss]
“I absolutely loved this piece on using the theory of distributed cognition as a new foundation for HCI. It is clear from any amount of research into neuroscience that defining the borders of a system for cognition is complicated. In the same way that individual neurons work within in a coordinated fashion to accomplish a task for some subsystem of the brain or body, so too do these subsystems work together to accomplish some greater task, and so on. No cognition is done in a vacuum; information must come from some outside source to create knowledge, whether it is communication with another human or a basic sensory input. Putting a boundary at the limits of the neural subsystem limits what can be understood about how the systems work together to create some greater effect; restricting individual cognition to the brain limits our understanding of how our whole systems work together to influence our behaviour “

(great example of how you guys can bring your background into the classroom!)