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Assoc. Prof.in Dr.in DIin Hilda Tellioğlu
Fakultät für Informatik, TU Wien

Artifact-Based Design & User Research
Centre for Center for Technology & Society
European Society for Socially Embedded Technologies

hilda.tellioglu@tuwien.ac.at / hildatellioglu.com

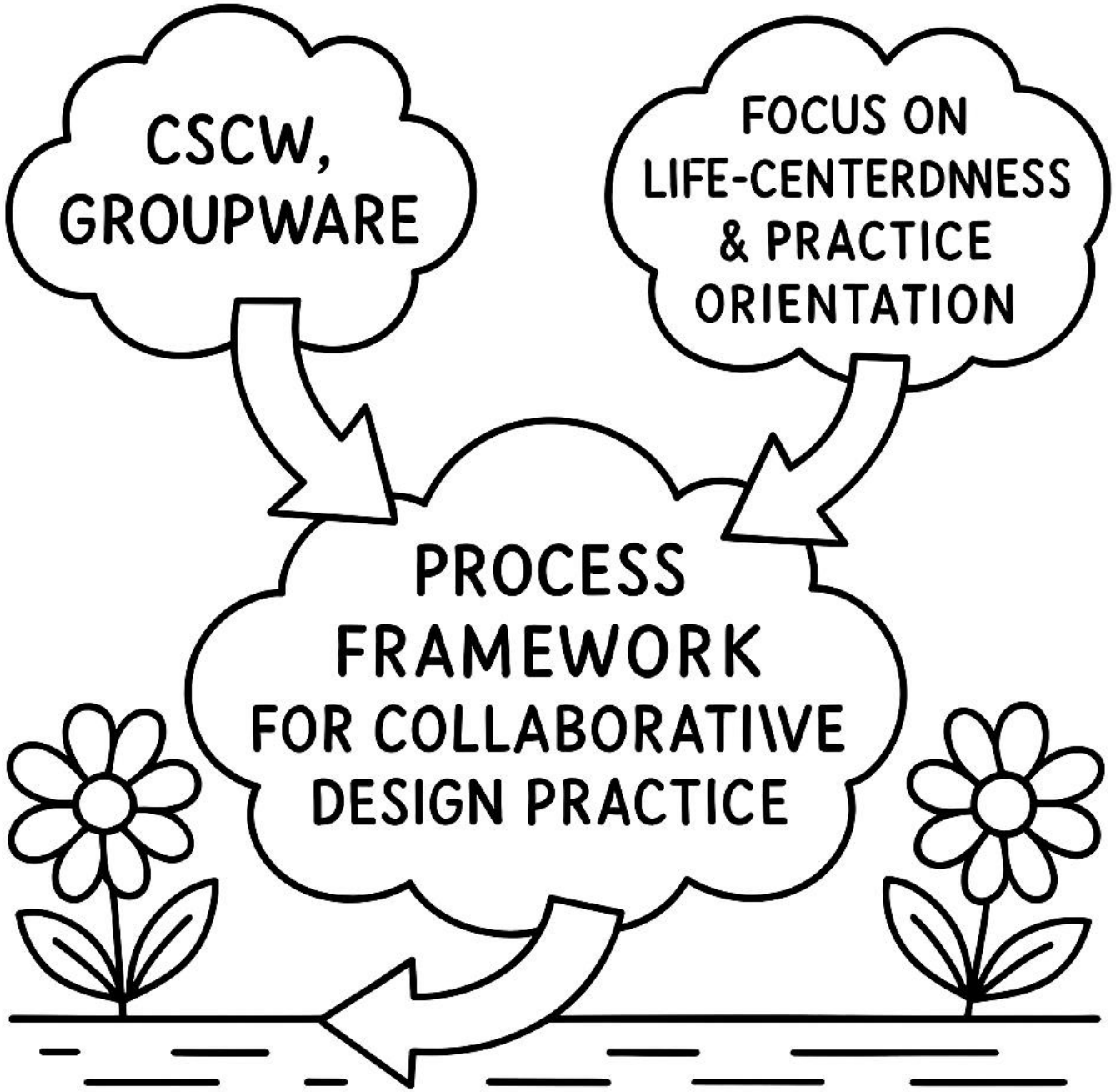
EUROPEAN SOCIETY FOR SOCIALLY EMBEDDED TECHNOLOGIES

ARTIFACT-BASED COMPUTING & USER RESEARCH

//CTS

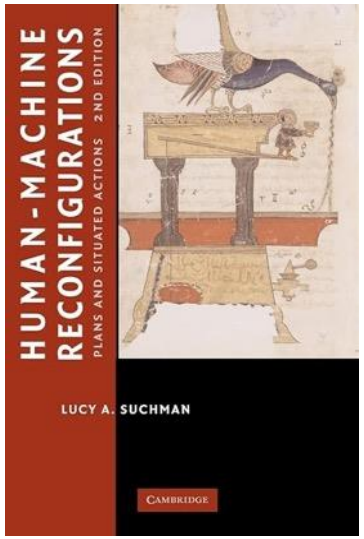
TU WIEN Informatics

Background: Theory



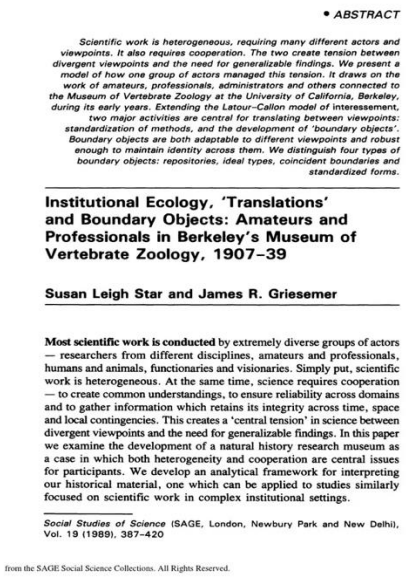
CSCW – started with

Backgroud: Theory



Lucy Suchman, Human-machine reconfigurations: plans and situated actions. Cambridge University Press, Cambridge, 2007.

The foundational principle that human actions—especially in technology use—are not simply the execution of pre-formed plans, but are always "situated," constructed in response to specific contexts, interactions, and contingencies



• ABSTRACT

Scientific work is heterogeneous, requiring many different actors and viewpoints. It also requires cooperation. The two create tension between divergent viewpoints and the need for generalizable findings. We present a model of how one group of actors managed this tension. It draws on the work of amateurs, professionals, administrators and others connected to the Museum of Vertebrate Zoology at the University of California, Berkeley, during its early years. Extending the Latour–Callon model of interessement, *two major activities are central for translating between viewpoints: standardization of methods, and the development of 'boundary objects'. Boundary objects are both adaptable to different viewpoints and robust enough to maintain identity across them. We distinguish four types of boundary objects: repositories, ideal types, coincident boundaries and standardized forms.*

Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907–39

Susan Leigh Star and James R. Griesemer

Most scientific work is conducted by extremely diverse groups of actors — researchers from different disciplines, amateurs and professionals, humans and animals, functionaries and visionaries. Simply put, scientific work is heterogeneous. At the same time, science requires cooperation — to create common understandings, to ensure reliability across domains and to gather information which retains its integrity across time, space and local contingencies. This creates a 'central tension' in science between divergent viewpoints and the need for generalizable findings. In this paper we examine the development of a natural history research museum as a case in which both heterogeneity and cooperation are central issues for participants. We develop an analytical framework for interpreting our historical material, one which can be applied to studies similarly focused on scientific work in complex institutional settings.

Social Studies of Science (SAGE, London, Newbury Park and New Delhi), Vol. 19 (1989), 387–420

Susan Leigh Star, and J Griesemer, Institutional ecology, translations and boundary objects: Amateurs and professionals in Berkeleys museum of Vertebrate Zoology, 1907-39. Social Studies of Science, 19, 1989, 387-420.

Boundary objects are materials (physical artifacts, documents, or ideas) that enable collaboration among different communities or groups working together, even when their perspectives, goals, or practices differ. These objects are flexible enough to be interpreted and used differently by each group, but stable enough to provide shared reference points and coordinate collective action.

CSCW – continued with

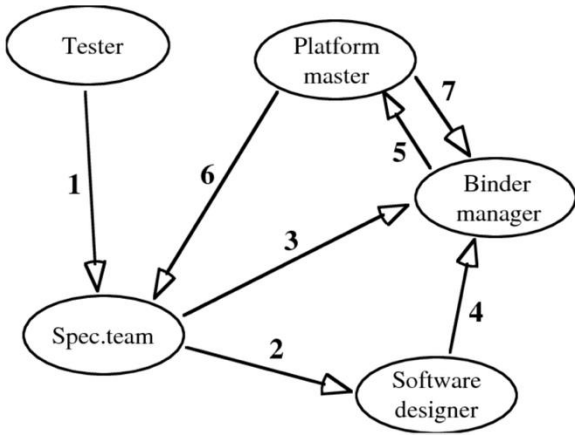
Heath, C. and Luff, P. Collaboration and Control: Crisis Management and Multimedia Technology in London Underground Line Control Rooms. *Comput Support Coop Work*, 1, 1992, 69-94.

A detailed ethnographic analysis showing how collaborative work in complex control rooms is achieved through tacit, situated, and often informal work practices, rather than solely through explicitly defined procedures or roles

Svensson, M. S., Heath, C. and Luff, P. *Instrumental action: The timely exchange of implements during surgical operation*. Springer, City, 2007.

A detailed ethnographic analysis of how the coordinated, moment-to-moment passing of surgical tools between staff relies on embodied interaction, tacit knowledge, and intense mutual awareness—rather than formal protocols or isolated expertise

CSCW – continued with



Schmidt, K. and Simone, C. Coordination Mechanisms: Towards a Conceptual Foundation of CSCW System Design. *Comput Support Coop Work*, 5, 1996, 155-200.

A framework for understanding and designing coordination mechanisms in collaborative work systems. The paper argues that CSCW technologies must support specific coordination mechanisms—the structures, artifacts, and practices people use to articulate, synchronize, and monitor collaborative activity

Schmidt, K. and Wagner, I. Ordering systems: Coordinative practices and artifacts in architectural design and planning. *Comput Support Coop Work*, 13, 2004, 349-408.

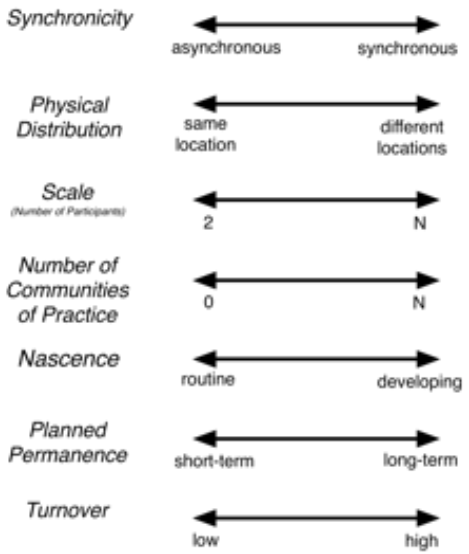
A detailed analysis of how ordering systems—coordinative artifacts and practices—enable distributed collaboration and articulation work in complex architectural and planning projects

CSCW – continued with

Backgroud: Theory

Bentley, R., Horstmann, T. and Trevor, J. The World Wide Web as Enabling Technology for CSCW: The Case of BSCW. *Comput Support Coop Work*, 6, 2&3, 1997, 111-134.

A demonstration that web-based groupware systems can support distributed, asynchronous collaboration by providing shared workspaces, artifacts, and coordination mechanisms accessible through standard web browsers



Lee, C. and Paine, D. From the matrix to a model of coordinated action (MoCA): A conceptual framework of and for CSCW. In *Proceedings of the CSCW,* Vancouver, Canada, 2015. ACM.

The Model of Coordinated Action (MoCA) is designed as a flexible framework to assist researchers and designers in systematically accounting for the complexities of coordinated activity that go beyond grids or matrices. It encompasses dynamic roles, overlapping actions, artifact mediation, and context-driven articulation, enabling nuanced analysis and fostering more responsive system design.

CSCW – continued with

Backgroud: Theory

Halverson, C., Erickson, T. and Ackerman, M. Behind the help desk: Evolution of a knowledge management system in a large organization. In *Proceedings of the CSCW* (Chicago, Illinois, USA, 2004). ACM.

A longitudinal ethnographic analysis revealing that knowledge management systems in real-world organizations are not merely technical solutions but evolve in tandem with social practices, local cultures, and ongoing negotiation between formal and informal work

Millen, D. and Fontaine, M. Multi-team facilitation in very largescale distributed meetings. In *Proceedings of the ECSCW* (London, 2003). Springer

An in-depth examination of the facilitation strategies, technological challenges, and coordination mechanisms required to support effective collaboration across multiple teams in massive distributed meetings.

Abraham, J. and Reddy, M. Re-coordinating activities: An investigation of articulation work in patient transfers. In *Proceedings of the CSCW* (San Antonio, Texas, USA, 2013). ACM

A detailed analysis of articulation work—the often invisible, adaptive tasks required to coordinate and synchronize team efforts—during the complex process of patient transfer in healthcare settings

CSCW – resulted in

Backgroud: Theory

Practice-based research with in depth workplace studies to understand practice as the basis for the design of cooperative technologies (= groupware)

Kjeld Schmidt and Liam Bannon Taking CSCW Seriously: Supporting Articulation Work. *Comput Support Coop Work*, 1, 1-2, 1992, 7-40.

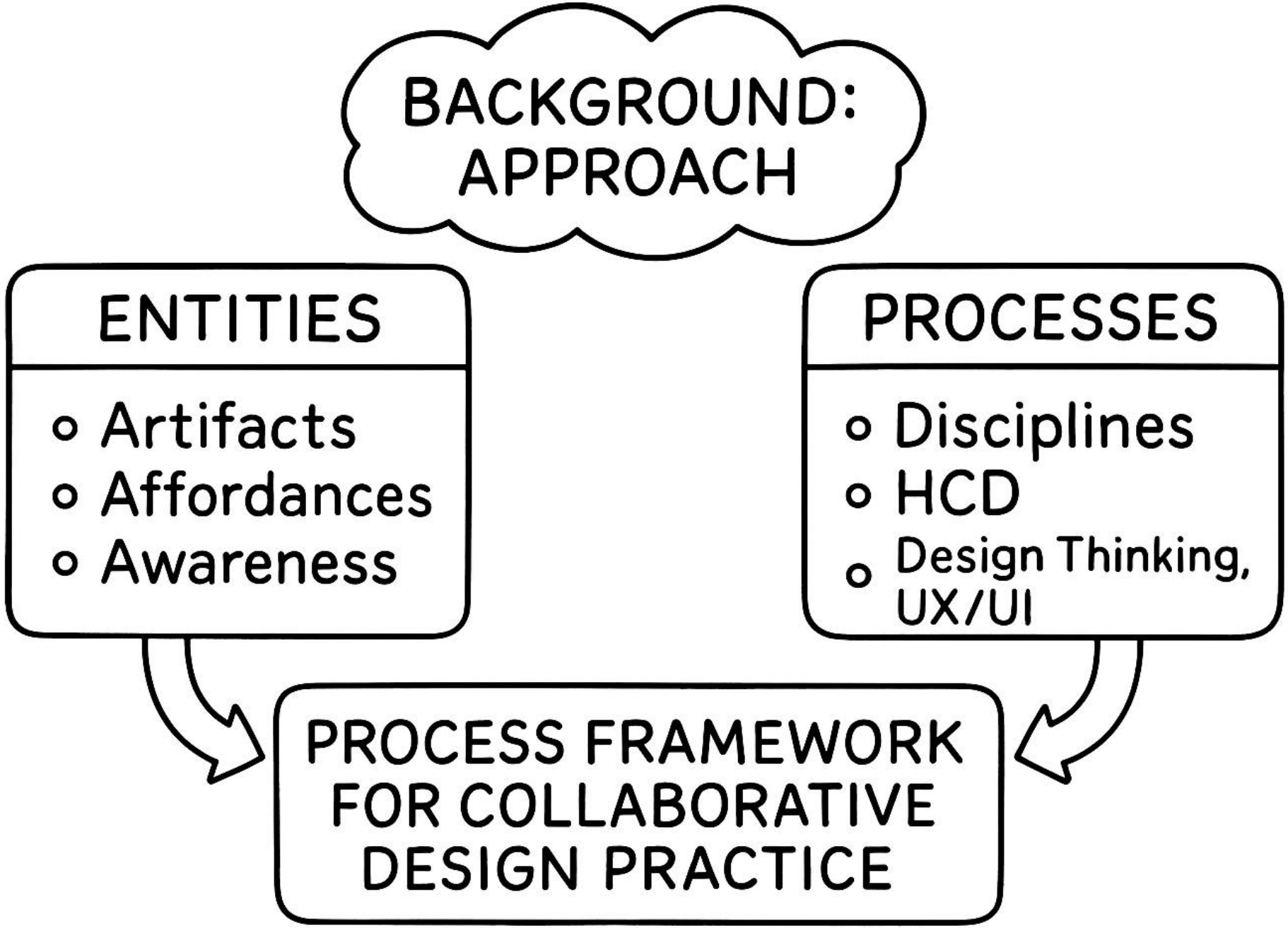
Articulation work refers to the arrangements by which distributed collaborative activities are knitted together: the creation, maintenance, and adjustment of alignment between interdependent actions, resources, and actors. For CSCW to be effective, systems must support not only the division of labor but also the ongoing articulation and re-articulation of work—particularly in the face of uncertainty, breakdowns, and changing conditions.

Randall, D., Wulf, V. and Schmidt, K. *Designing socially embedded technologies in the real world*. Springer, 2015.

In-depth formulation and demonstration of practice-oriented, ethnographically grounded, and participatory approaches to CSCW and system design

Bannon, L. and Kuutti, K. The turn to practice in HCI: Towards a research agenda. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI)* (2014). ACM

The shift to practice means focusing on the everyday routines, improvisations, and negotiations through which people make technology meaningful in ongoing, collective activity. Research should explore how practices form, change, and persist—investigating the interplay of actors, artifacts, and institutional contexts. This turn requires new theories and methods that move beyond usability and task completion, embracing the richness and complexity of lived experience.


BACKGROUND:
APPROACH
ENTITIES
Artifacts
Affordances
Awareness
PROCESSES
Disciplines
HCD
Design Thinking, UX/UI
PROCESS FRAMEWORK FOR COLLABORATIVE DESIGN PRACTICE

Entities

Artifacts

- Artifacts shape how people interact with the world and with each other (Grant & Fox, 1992).
- Designers influence artifacts' function, form, and societal impact through their decisions (Press & Cooper, 2016).
- Although designed for function and safety, artifacts also affect behavior, health, and quality of life.
- The human-made environment, composed of designed objects, continuously shapes human experience and well-being.

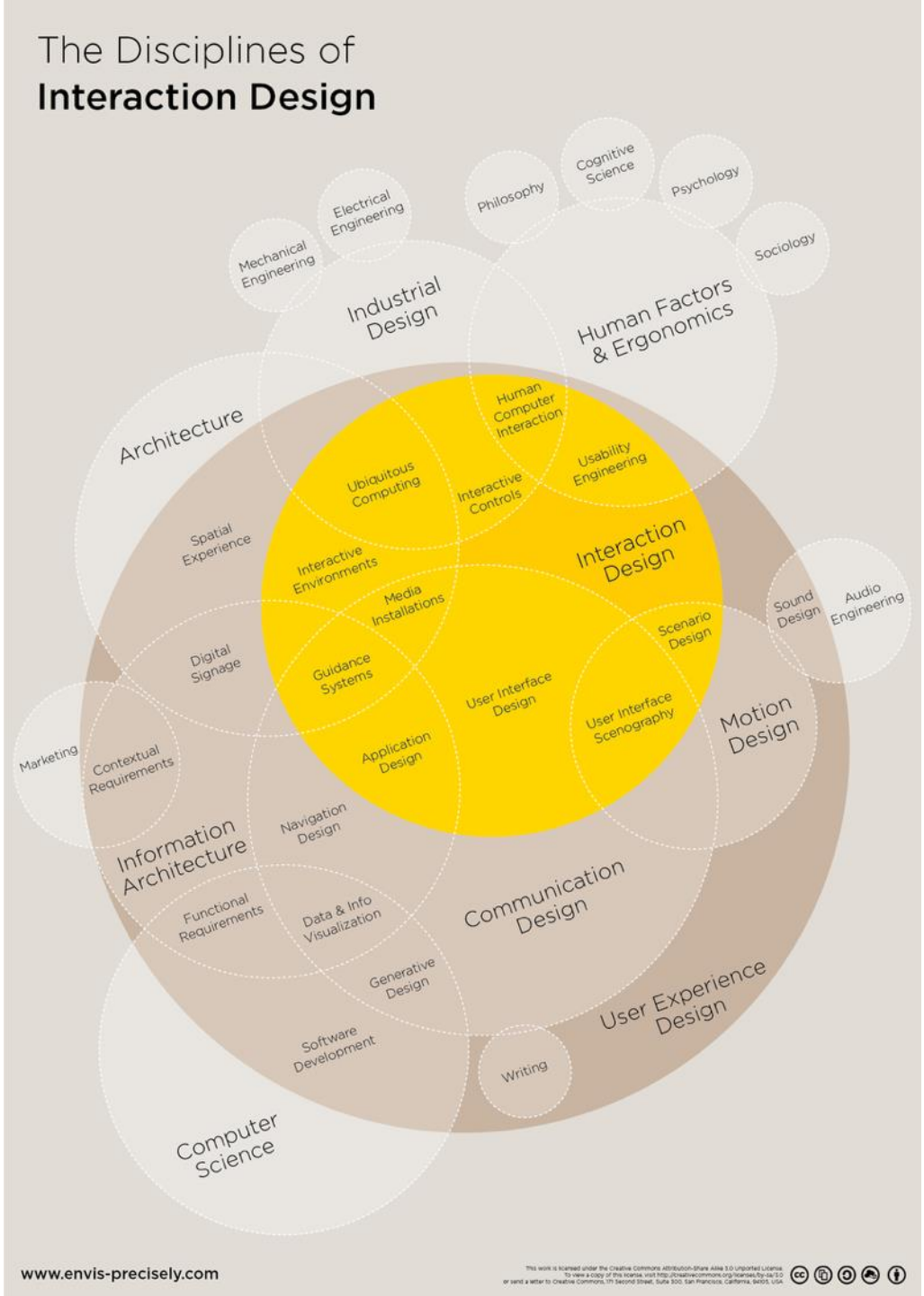
Artifacts have affordances enabling UX.

Artifacts are main components needed to provide awareness.

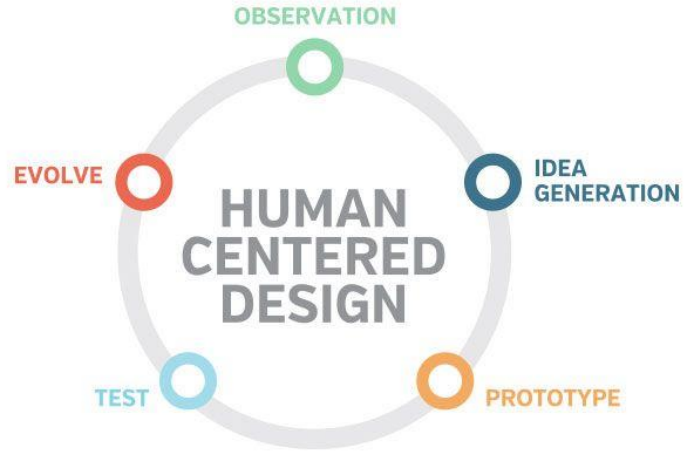
Affordances

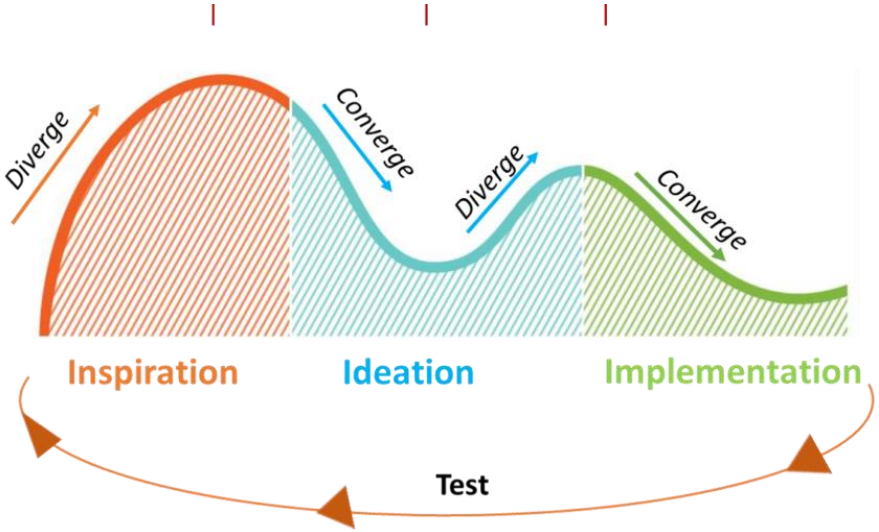
- Affordances describe actionable relationships between a person and the environment—what artifacts enable or constrain (Evans et al., 2017).
- Examples: a chair affords sitting, a door handle affords movement between spaces, a coin lock affords theft prevention (Davis, 2020; Gibson, 1979).
- Affordances emerge through the interaction between artifact and person, encompassing both real and perceived properties.
- Perceived affordances depend on what a person believes possible; real affordances depend on an artifact's physical properties (Norman, 1988).
- Current design often emphasizes artifact function, narrowing the range of possible design outcomes (Maier & Fadel, 2009).
- Designing with affordances can help create environments that promote positive human behavior and interaction.

Processes



Backgroud: Approach





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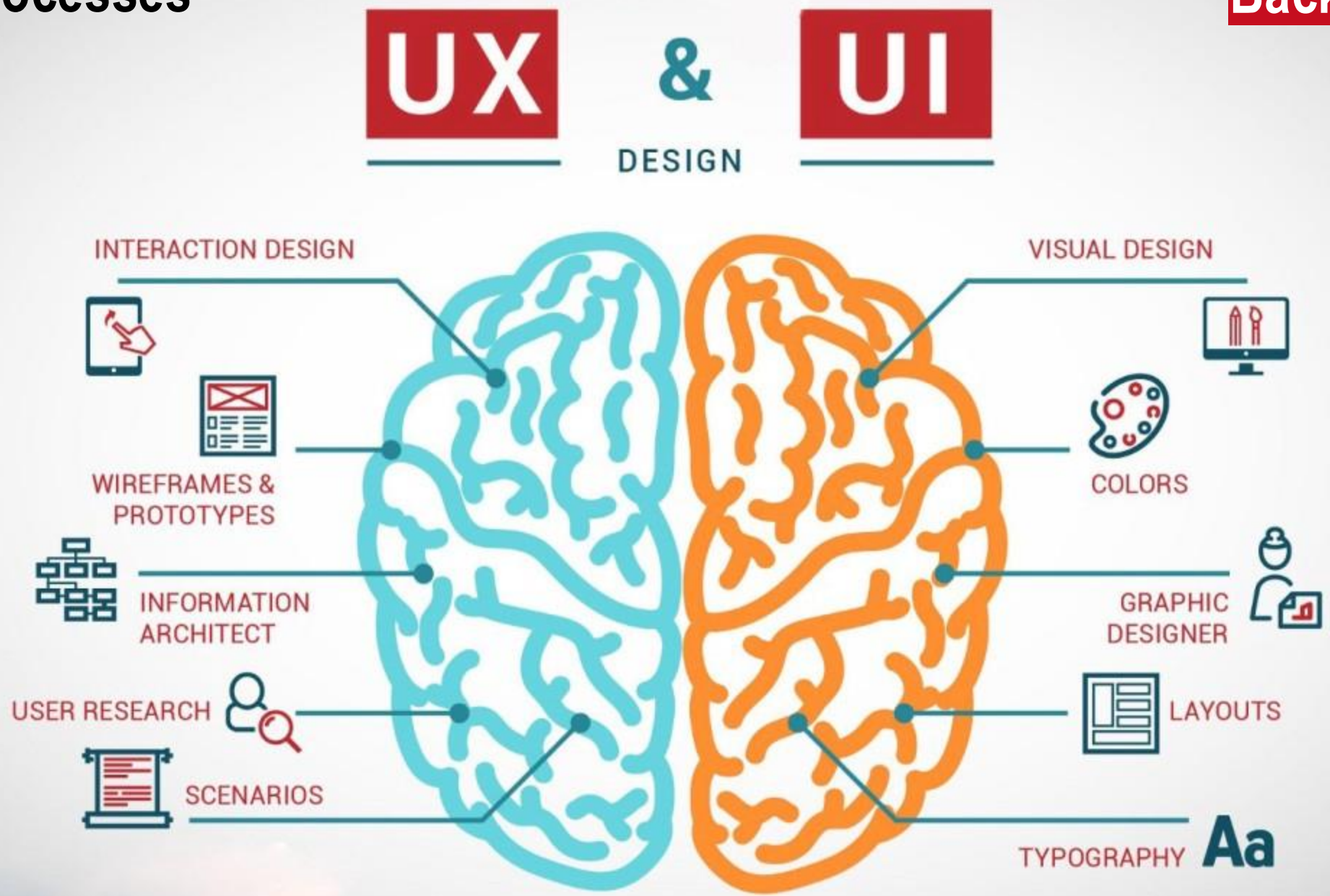

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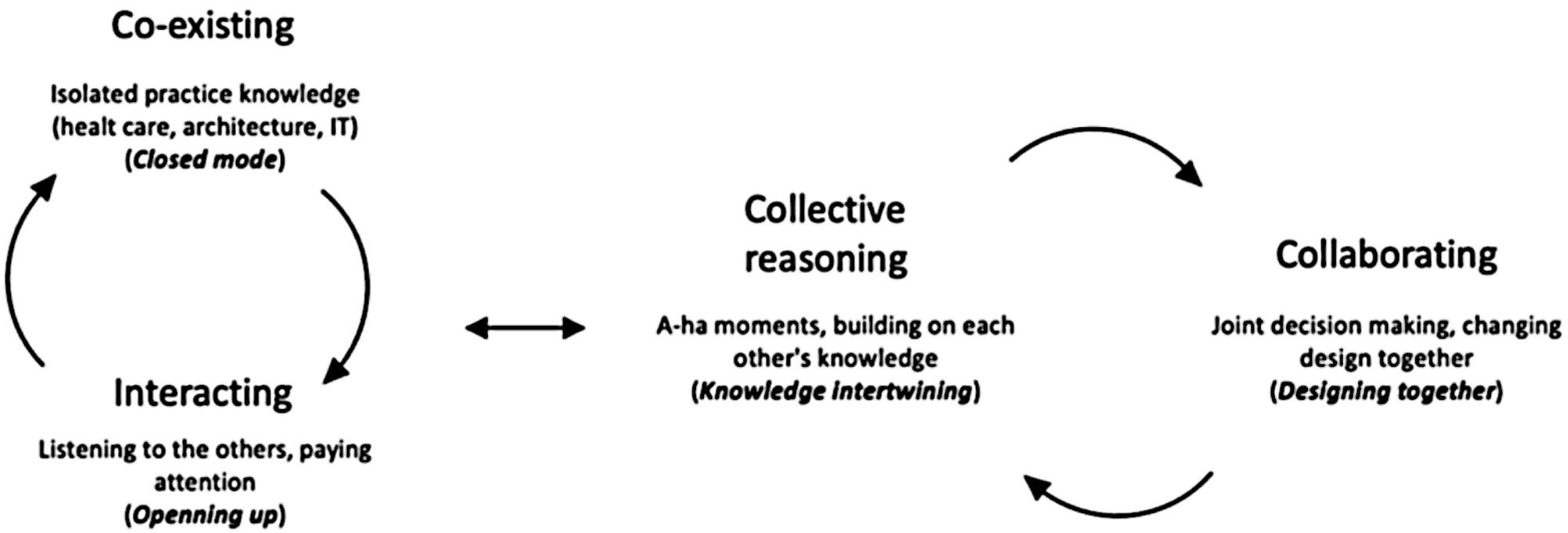
Process Framework for Collaborative Design Practice

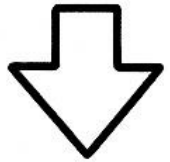
Backgroud: Approach



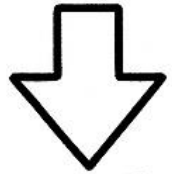
Räisänen, C., Ulutas Duman, D., Viklund Tallgren, M. et al (2024). Multimodal Interaction in Collaborative Design of a Healthcare Space: A Social Semiotic Approach. Studies in health technology and informatics, 319: 33-45. http://dx.doi.org/10.3233/SHTI240931

Human-Agent Collaboration

From Tools to Collaborators



New era of LLM-base Agents in HAC



New era, but still open...

From Tools to Collaborators

Human-Agent Collaboration

Agents as tools (Grudin, 2018; Shneiderman, 2022; Suchman, 1987)

From Tools to Collaborators

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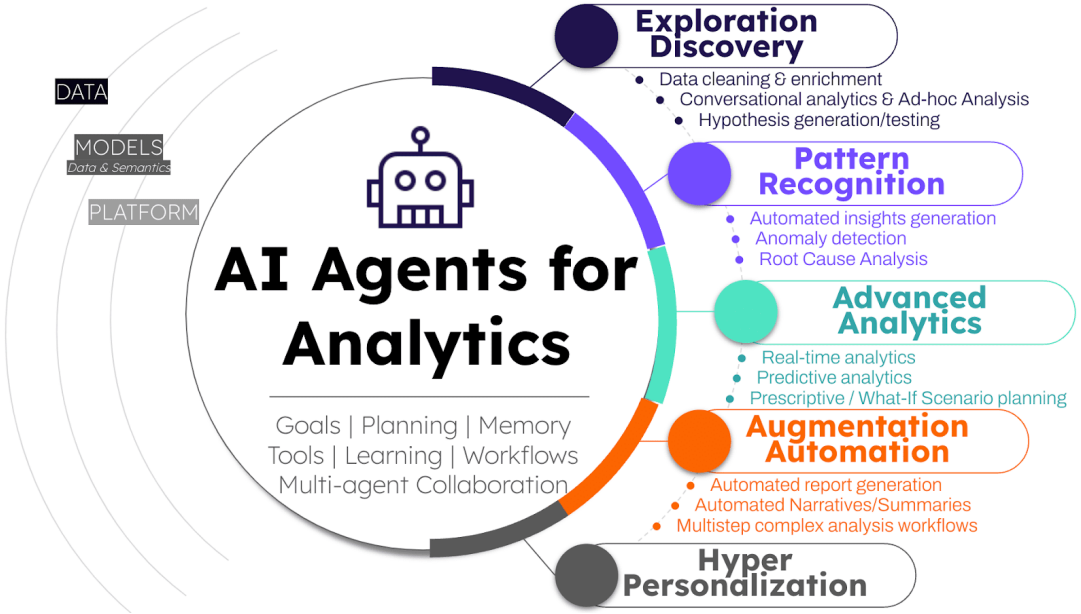

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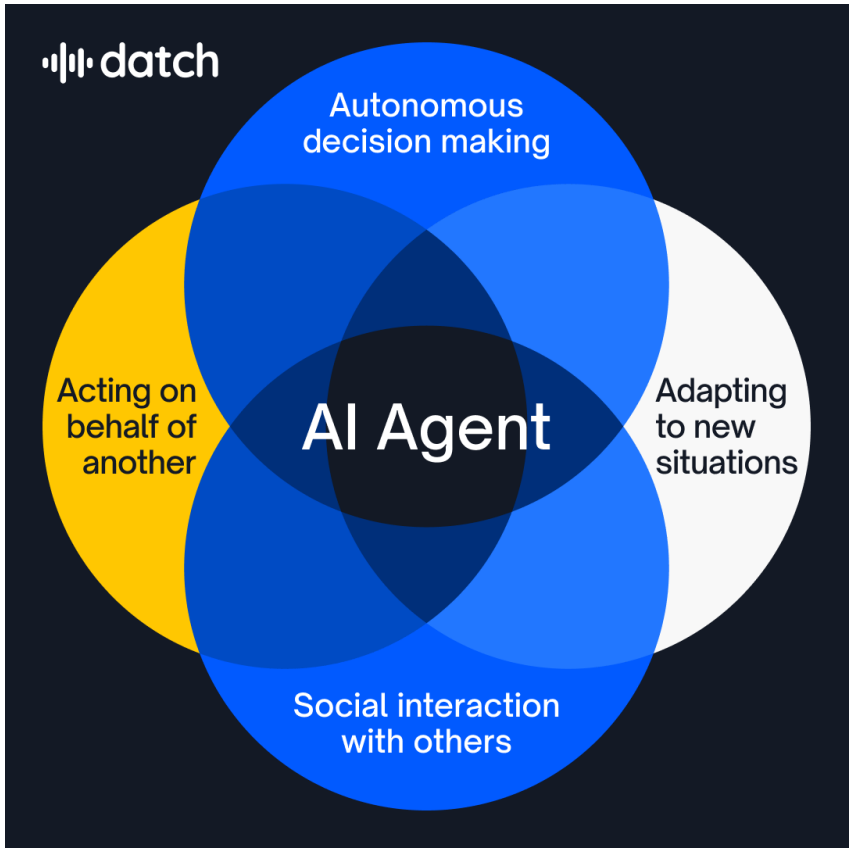

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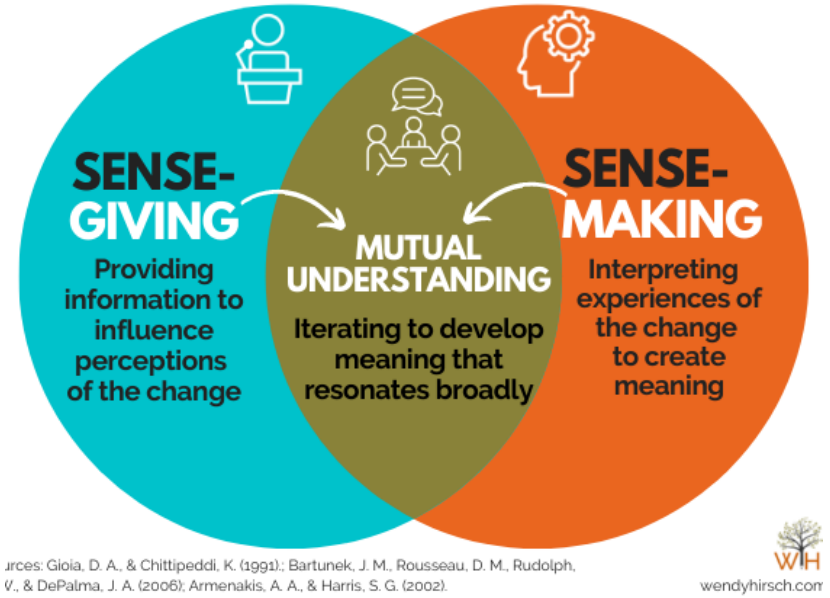

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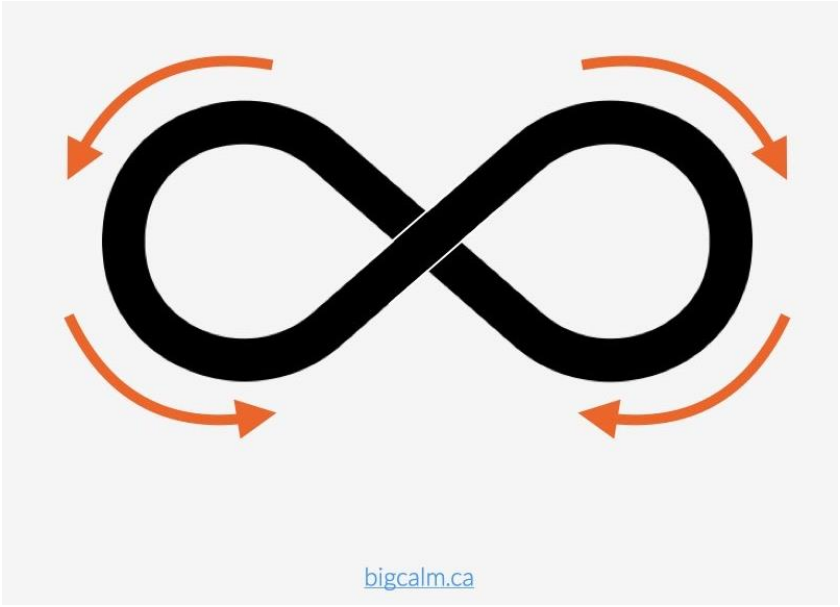

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- Effective coordination (Hinds & Bailey, 2003; Olson & Olson, 2000; Schmidt & Bannon, 1992)

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Agents as mutual collaborators with humans

Needed for effective partnerships

Examine collaboration dynamics:
Examine how social, communicative, and cognitive behaviors co-evolve

Image credit: https://www.linkedin.com/pulse/reimagining-customer-service-agentic-ai-from-response-ganesan-z12tc/

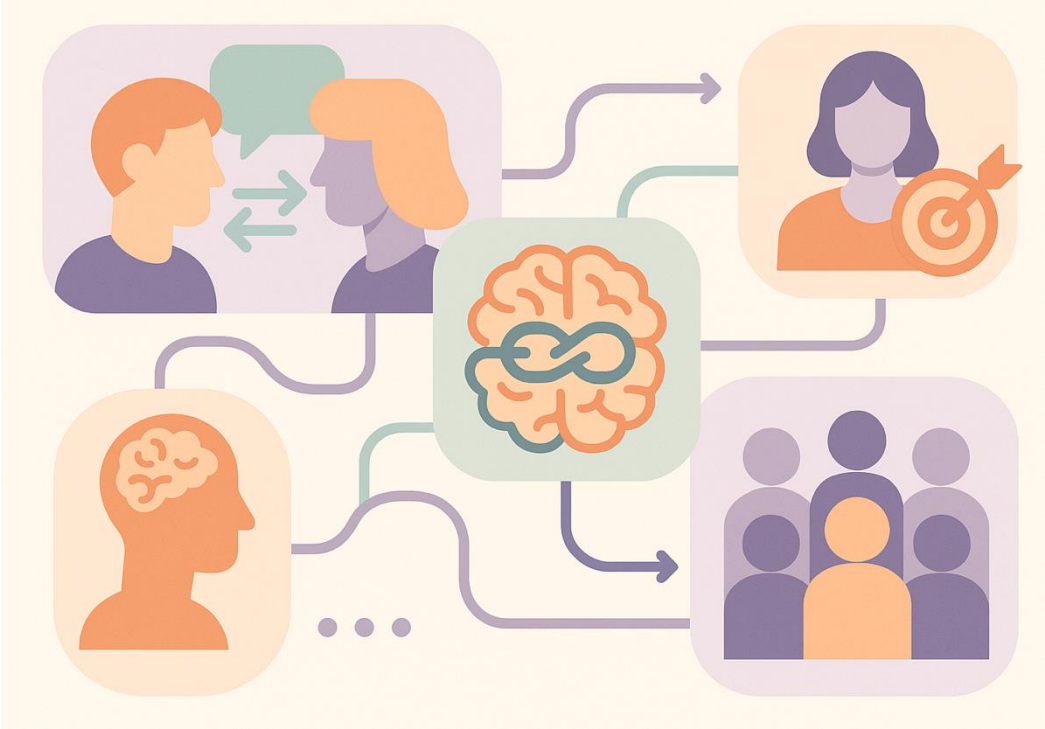
New Era of LLM-Based Agents

Human-Agent Collaboration

LLMs enable natural language as a shared medium
→ Shifts interaction beyond the rigid command structures into fluid, open-ended conversations

LLMs enable the chain of thought
→ Enables performing step-wise reasoning and planning for their predictions

Visible forms of system accountability and initiative that people can read and negotiate



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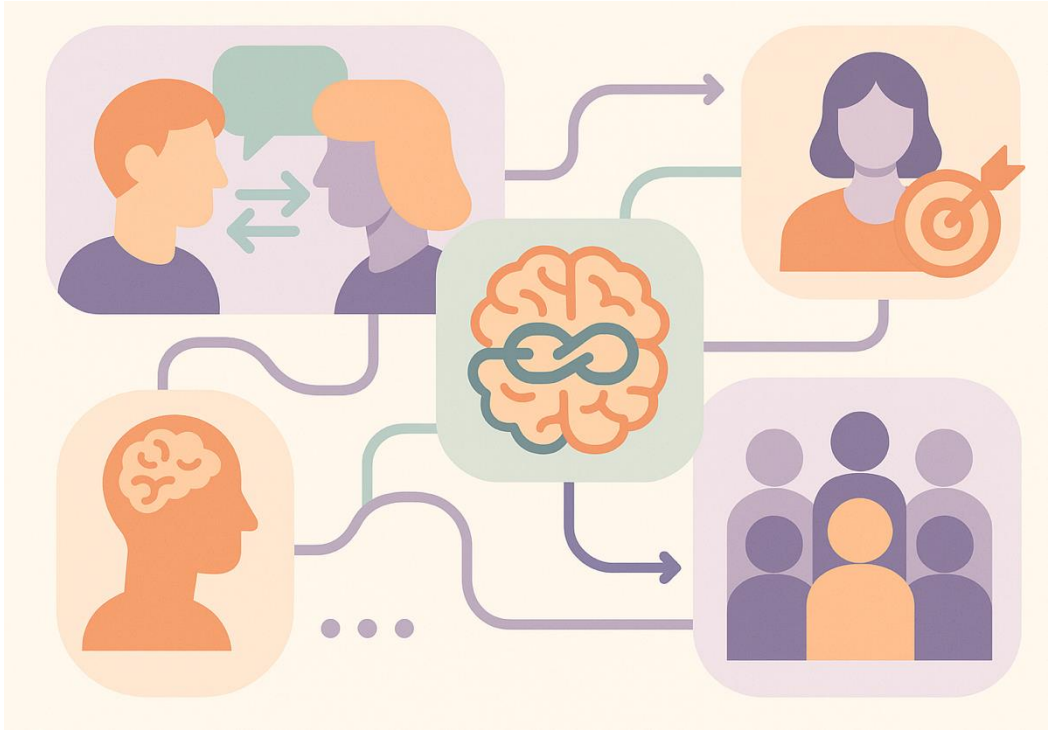
LLM role-playing agents
→ Adapt personas and goals to simulate complex social and cognitive behaviors over extended interactions

LLM agents as human surrogates for automated UX testing

LLM agents as tools for simulating populations and replicating classic findings in social science



New Era, but still open …

Human-Agent Collaboration

How to design interfaces and interaction paradigms between humans and LLM agents for collaboration needs identified in CSCW research

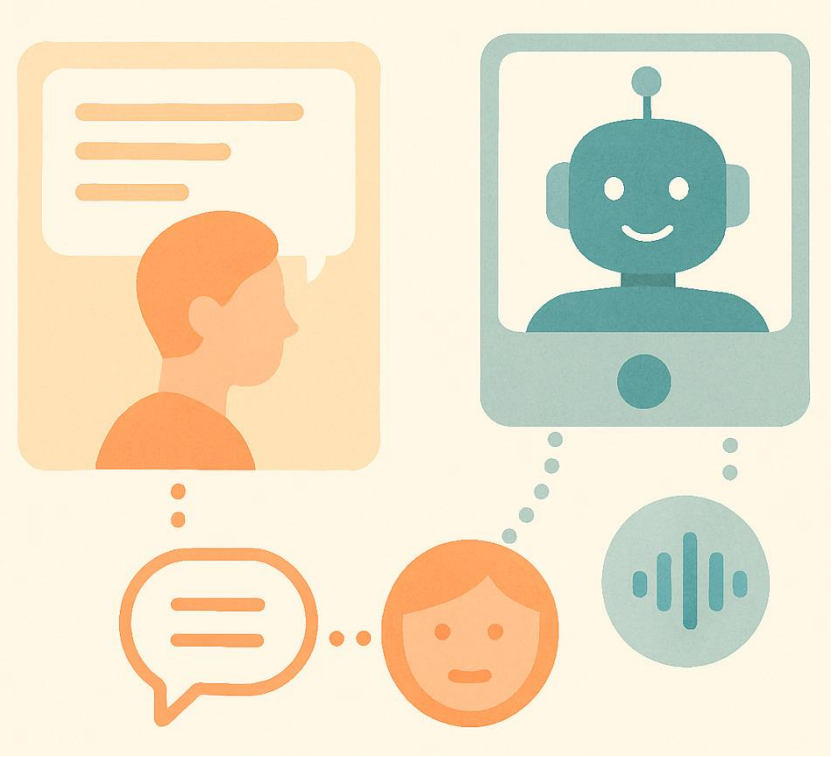
New Era, but still open …

Human-Agent Collaboration

How to design interfaces and interaction paradigms between humans and LLM agents for collaboration needs identified in CSCW research

How to provide structured and explicit information channels, such as text or voice

How to provide access to non-verbal cues, like facial expressions and tone, that shape face-to-face interaction



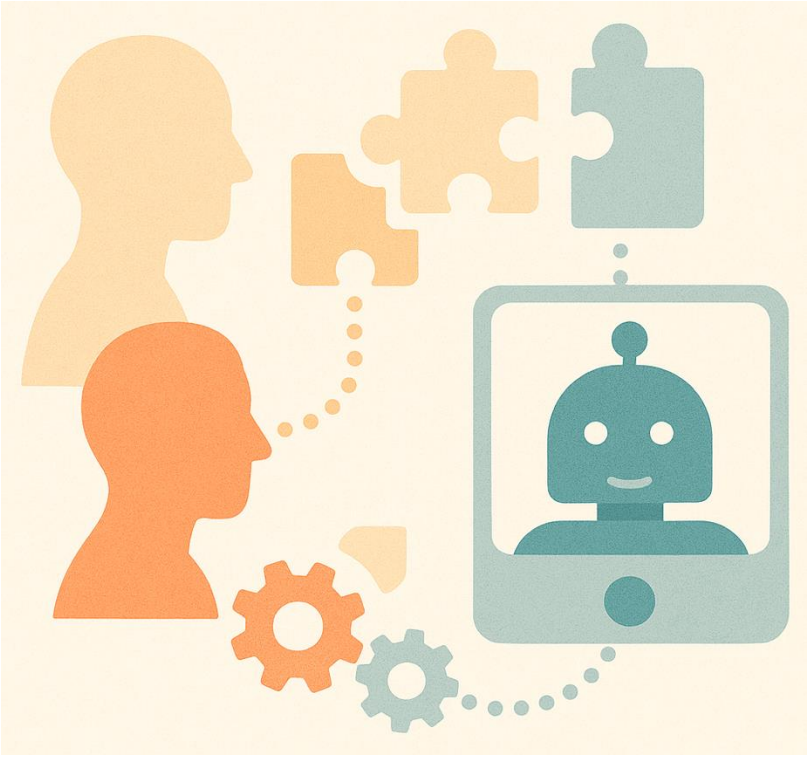
New Era, but still open …

Human-Agent Collaboration

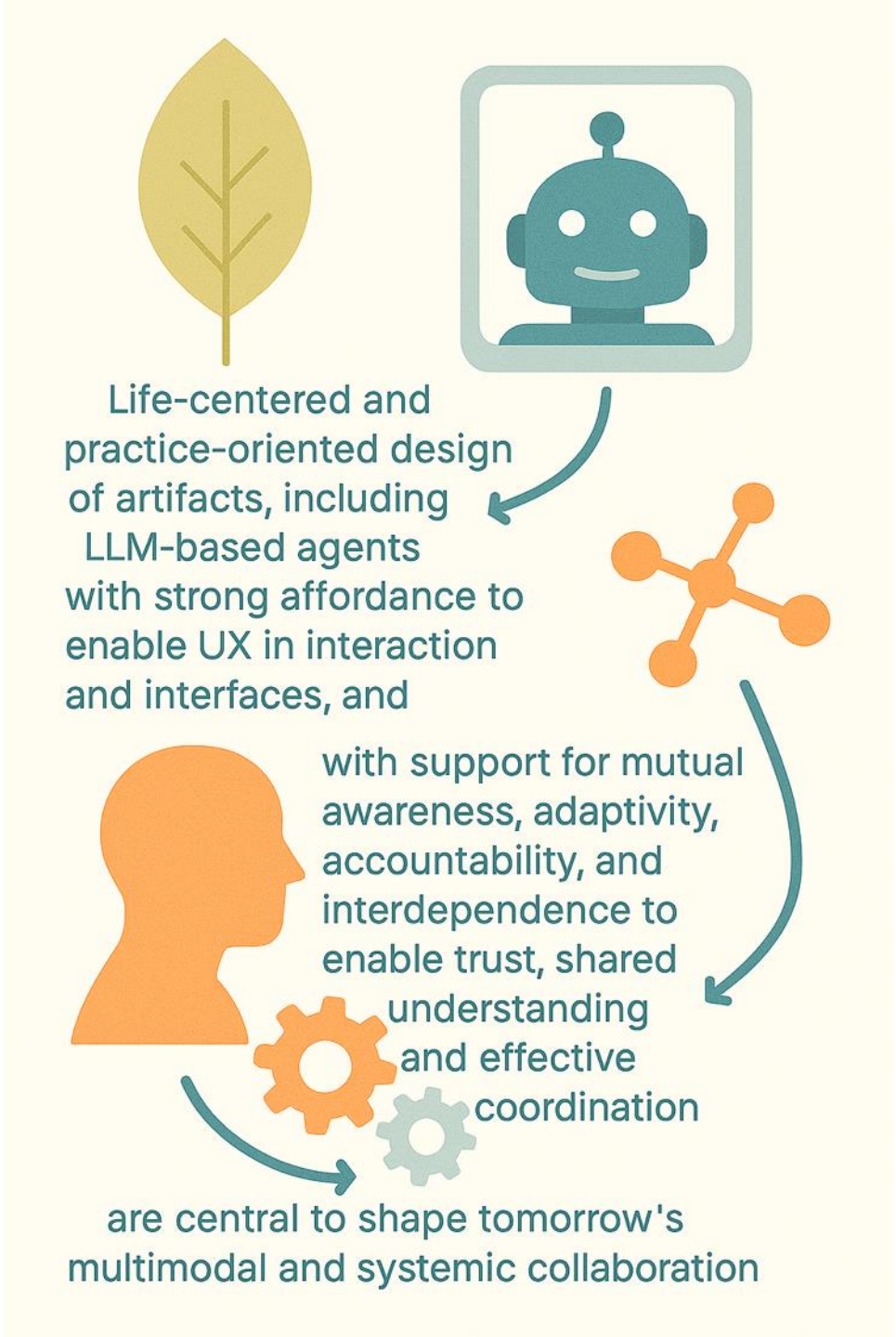
How to design interfaces and interaction paradigms between humans and LLM agents for collaboration needs identified in CSCW research

How to solve mutual knowledge problems that arise when collaboration lacks common ground

How to provide task structure and coupling, because distance matters, and coordination is needed under variable latency and partial information



Shaping Tomorrow’s Collaboration Through Design



Shaping Tomorrow's Collaboration Through Design

Keynote at MERCADO Workshop @ IEEE VIS 2025
November 2, 2025, Vienna, Austria

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Artifact-Based Design & User Research
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Thank you