

Activity Theory

A FRAMEWORK OF KNOWLEDGE

Activity Theory is a framework of knowledge that seeks to explain the unity and inseparability of doing and thinking. It does so by focusing on the idea of the indivisibility of organism and environment, of the individual as inseparable from the social context within which s/he exists. This is a notion that coalesced into its present form during the 19th century. It went hand in hand with new theories in philosophy, the natural sciences, and the social sciences which focused on the role of material productive activity. These new modes of thinking were themselves related to the rise of capitalist society and the development of global commerce and production.[1] According to Yrjö Engeström, this focus is evident in philosophy, the natural sciences, and the social sciences. In philosophy, for example, the German philosopher G.W.F. Hegel proposed a “theory in which human consciousness is formed under the influence of knowledge accumulated by society and objectified in the world of things created by humanity.”[2] In the natural sciences, the work of Charles Darwin laid the foundations for a natural scientific conception of man. These two viewpoints were synthesized in the writings of Karl Marx and Frederick Engels, whose work in the social sciences put forth the notion that humankind was not only a product of evolution and an assimilator of culture, but a creator and transformer as well:[3]

Organism and environment, man and society, were no more seen as separate entities, but as integral systems within which retroactive causality and internal transitions prevail. These breakthroughs meant that man and society could no longer be understood as stable, unchanging entities but only as something characterize by qualitative transformations requiring a historical perspective.[4]

As a framework, however, Activity Theory not only proposes a view of the human as a systemic and historical being, but also, attempts to model the basic structure of human activity.

In Activity Theory, the basic unit of analysis is the activity itself. This later is defined as the “smallest unit that still preserves the essential unity and quality behind any complex activity.”[5] The term seeks to describe the relationship between the actor and her objectified motive, or “the way in which the subject sees her practice.”[6] Activity is not static, but rather, is constantly changing. The models utilized must be able to depict the dynamics and transformations of the system.[7] This system that activity forms is tightly integrated in the system of societal relationships. This is why the models have to focus on the relationships between the individual

and the outside world.[8] This may be why activity has been described as a prism “through which our interaction with the world is reflected in inner and outer processes.”[9] Activity, however, is not an ordinary prism. As a result of the process of learning, activity is a prism that changes all the time.

Activity Theory is concerned with learning as the creative expression of human behavior. The theory seeks to address basic questions such as: How can a structure generate another structure that is more complex than itself? How can the development of complex structures be accounted by mechanisms that are not themselves highly intelligent or richly endowed with knowledge?[10] Learning is important because, at the most basic levels, and in the earliest learning experiences, it is a manifestation of the creative spirit in humankind. One of the forms that learning assumes is the process of internalization of external activity whereby cultural and social artifacts, such as tools and signs, come to influence the mental processes that subsequently develop. Lev Vygotsky, of the cultural-historical school in psychology and one of the earliest contributors to the theory, proposed that the psychological structure of basic processes, such as for example memory, are affected by such operations:

...the beginning of writing and simple memory aids all demonstrate that even at early stages of historical development humans went beyond the limits of the psychological functions given to them by nature and proceeded to a new culturally-elaborated organization of their behaviour.[11]

To the extent that they allow for the incorporation of artificial and self-generated stimuli, artifacts, such as signs, extend the operation of the organism beyond its biological dimensions. At the same time, though, in the process of mediation these artifacts are themselves transformed. This concept of *mediation*, as it is referred to, is one of the cornerstones of Activity Theory. It underscores the potential of mediating artifacts, such as tools and symbols, to change human activity. From the cultural historical point of view, Activity Theory seeks to understand the emergence of learning activity as a potentially expansive form of human behavior. Learning need not be limited to reactive tasks that occur in preset environments, but rather can, and should, include the possibility of finding and creating new contexts.[12]

The triangle in Figure 5, depicts the notion of mediation as conceived by L. Vygotsky. In the model, connecting lines describe relationships that should be understood as mediated relationships. According to Vygotsky, symbolic operations among humans are not direct, but rather mediated by signs.[13] For Vygotsky, the very essence of human civilization rested on this active capacity to manipulate use artifacts.[14]

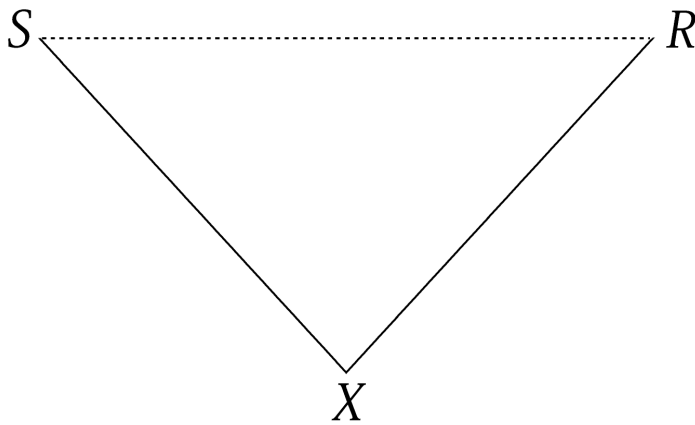


Figure 5: Diagram of the Stimulus-Response relationship by Lev Vygotski

The model used throughout this work, is a descendant of this triadic configuration. This model of the Activity System can be described as a sighting device, or artifact. As such, it possesses its own history:

In 1930, Vygotsky sketched his idea of mediation as a triangular structure where the Stimulus Response relationship (S-R) makes use of the sign as an intermediate link. This intermediate link is a second-order stimulus that is drawn into the relationship between terms S and R.[15]

The model presupposes an active engagement in the establishing of such a link. Because the sign possesses the characteristic of reverse action, it operates on the individual and not the environment:

Because of this function of reverse action, it transfers the psychological operation to higher and qualitatively new forms and permits humans, by the aid of extrinsic stimuli to control their behaviour from outside. The use of signs leads humans to a specific structure of behaviour that breaks away from biological development and creates new forms of a culturally-based psychological process. The tool's function is to serve as the conductor of human influence on the object of activity...[16]

Vygotsky's model, has been subsequently extended by Yrjö Engeström.

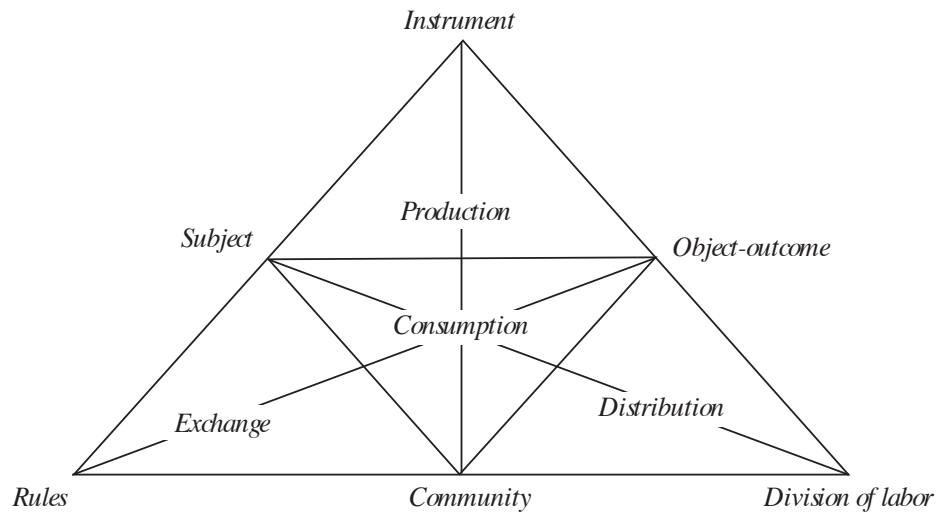


Figure 6: Diagram of the concept of activity by Yrjö Engeström

The triadic structure that Engeström presents illustrates individual action that is at the front, or most visible part, of a collective activity. The bottom part is occluded from immediate observation. This part consists of the community sharing the same general object, the division of labor between the members of the community, and the rules regulating the actions legitimately taken by the actors.[17] Engeström's model brings together the subject, the object, and the instruments into a unified whole. Because of the notion of mediation, the elements depicted in the model can be regarded as parts that are in interaction with each other. Throughout these interactions, which effect changes in the object, the elements are themselves transformed. The object constitutes the raw material and the problem space--at which the activity is directed--but which is also transformed. The instruments are devices of mediation. They are tools that carry within them the cultural heritage of the situation.[18]

The model provides a geometry that allows for visualization of complicated structures in a comparative manner and from different points of view. Through the use of the concept of mediation, the model also offers the diffracted perspective necessary to visualize the structuring of symbolic operations involved in knowledge production across diverse disciplines. Diffracted geometries and optics that consider the relations of difference have been proposed as alternatives to hierarchical domination, incorporation of parts into wholes, or symbiotic fusion. As Donna Haraway has noted:

Diffraction is a mapping of interference, not of replication, reflection or reproduction. A diffraction pattern does not map where the differences appear, but rather, maps where the effects of differences appear.[19]

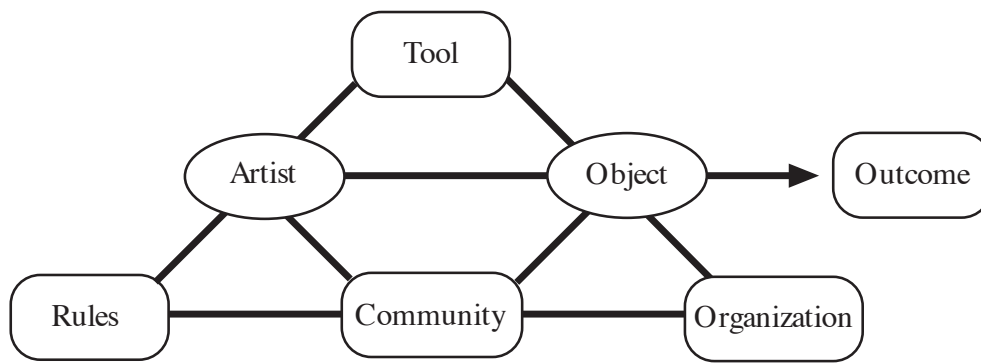


Figure 7: Diagram of the concept of the activity, by Kari Kuutti

The model, used throughout this work, is based on Kari Kuutti's adaptation of Yrjö Engeström's model of the concept of activity.[20] Like Engeström's, Kuutti's model depicts artifact-mediated action. Like Engeström's, the model contains the mutual relationships represented by a subject, tool, and object. In the model, for the sake of clarity, many of the systemic aspects of activity have been simplified. The model also depicts the basic units of the subject and object. The relationship between these two is of a reciprocal nature. It is a relationship that is mediated by tools.

The use of the model throughout this work is an attempt to illustrate and compare the similarities and differences (if any) among the activities of art, design, and archaeology. At the most basic level, these activities are distinguished from each other according to the objects that they produce. They also make use of artifacts and occur in collective environments. The artifacts that they use, the collective environments in which they occur, and the conditions that enable their production of discourses, are historically and culturally influenced. Among the issues that this work focuses on is that of how the space for potential collaboration among disciplines comes to be. Are there any aspects of the practice that they share in common? How are the actors defined? What constitutes the object of the activity? How are the tools created? Are the tools they use similar in any respect? What are the differences and how are they articulated?

THE ACTIVITY

As the basic unit, activity is a multifaceted concept that aims to cover all aspects of human practice. As a process that involves the individual actor, activity focuses on the relationship between the subject and the motivations and intentions that guide him through the forging of the object. The cognitive aspects of the human organism, such as perception, recognition, attention, memory, thinking, emotion, and imagination are not merely derived from activity, but rather, are interpreted as forms of activity.[21] From this point of view, activity can provide a glimpse into how the subject sees his/her practice. The subject, however, is not alone but operates as part of a community. Activity is, therefore, affected by the subject's participation within his/her community. The division of labor, or how the community is organized to achieve a common objective, influences the subject's relationship to the object of activity.[22] Thus, in the process of making, activity forms a system that is itself, at least partly, embedded in an already existing system of societal relationships.[23]

How these relationships weave themselves into a whole can be discerned by examining the object of activity and how it varies from one activity to another. In the sections ahead, for example, I will present the different ways in which graphic artifacts, such as drawings, are created in different disciplines such as art, design, and archaeology. The variations that exist among these is in accordance with the proposition that the object of the activity, how it is defined, manipulated, and transformed is what distinguishes one activity from another:

An activity is a form of doing directed to an object, and activities are distinguished from each other according to their objects.[24]

THE OBJECT AND THE ARTIFACT

In Activity Theory, the object is a transitional entity. It is the transformation of the object into an outcome, according to Kuutti that motivates the existence of an activity.[25] In the opinion of this author, an artifact is a conceptual structure used by scholars from diverse disciplines and which allows them to speak about how a multiplicity of influences of a cultural, social, and individual nature can converge in items that are created by human beings. For example, when speaking about artifacts as the artificial, manufactured objects created by humans, Herbert Simon did not distinguish between physical objects and immaterial items, such as symbol systems. He did, however, define a boundary between the inner environment as that which comprises the substance and organization of the artifact. The outer environment consisted of the surroundings

in which the artifact operated. According to Simon the interface was the meeting point between these two realms.[26] This author's opinion is that Simon's view reflects a problematic common to the use of instruments, namely that of where the boundary marking the place where the body ends and the tools begin?

Another interesting elaboration of the concept of the artifact can be seen in the three-level hierarchy developed by the philosopher Marx Wartofsky. For Wartofsky, the notion of artifact encompassed all sorts of mediating instruments such as technical tools, signs, and reflective thought. Man's incorporation of nature into the sphere of cultural constructions, for example, involved more than the cultivation of the land. Through cognitive artifacts, such as reflective thought, nature becomes transformed into an arena for action so that the forest itself becomes an artifact.[27]

Wartofsky's model was concerned with the historical development of both the concepts of perception and representation. As can be seen in Figure 8, below, he proposed a three-level hierarchy of primary, secondary, and tertiary artifacts. Primary, or first-level artifacts are artificial entities created by humans that allowed them to alter the nature of their environment. Primary artifacts are those used directly in production, such as axes, clubs, computers and telecommunication networks. Secondary, or second-level artifacts consist of representations of primary artifacts and of the modes of action using them. Examples of second-level artifacts are pictures, representations and the different modes of action that enable humans to transmit skill and information and to reflect upon their activities. Tertiary, or third-level artifacts consist of a class of artifacts that can come to constitute a relatively autonomous "world" in which the rules, conventions, and outcomes no longer appear directly practical in nature. Such imaginative artifacts can influence the way we see the actual world, acting as tools for changing current praxis. Examples of third-level artifacts are works of art, myths, visions, worldviews, and theoretical models.

Primary artifact	Pencil, hammer, computer
Secondary artifact	Alphabets symbol systems
Tertiary artifact	Artworks scientific paradigms

Figure 8: Visualization of Marx Wartofsky's three-tiered hierarchy of artifacts.

Following this historical approach, the psychologist and communications scholar Michael Cole, has further extended the scope of the term so as to include both the ideal and the material realms of culture. Cole has noted how artifacts embody in them the successful adaptations of earlier times (in the life of the individual who made them or in earlier generations). According to Cole, "in coming to adopt the artifacts provided by their culture, human beings simultaneously adopt the symbolic resources that they embody." [28]

In archaeology, the concept of the artifact has been a subject of much debate. A recent proposal by Michael Shanks contends that artifacts are active agents with their own life cycle:

The life cycle of an artifact is accompanied by physical changes and processes. An artifact wears in its use and consumption. Marks upon it attest to events it has witnessed, things that have happened to it. It can deteriorate. The artifact ages. [29]

When speaking about design artifacts, Adrian Forty argues that artifacts do not have a life cycle of their own, but that their existence is determined by the people and industries that create them, as well as by the relationship of these people and industries to society. [30] Throughout this work, I will propose that the artifact is a concept that can be used as a tool to reveal the indirect, and incidental, connections between the different aspects that come together in its creation. This is a view that is necessary when confronted by the fact that the meaning of an object cannot be fully explained through its technological specifications. The tool embodies the traditions and history resulting from the fact that the activity is a form of collective action. These traditions and history are, in turn, also embedded in the object of the activity and its resulting outcome. It may be possible, if only briefly, to have a glimpse of that boundary territory where culture, community, and artifact come together.

THE TOOLS

A tool is type of artifact. However, not all artifacts are tools. A tool is an artificial entity created for the purpose of changing the environment and facilitating adaptation and survival. According to Stephen Mithens, human tools differ from tools created by other species by virtue of their being systematically transmitted from one generation to another. [31] In Activity Theory a tool is defined as anything that is used in the transformation from object of the activity into an outcome. [32] The form that tools assume can be physical or nonphysical, internal or external.

Tools are both dependent on the object of the activity, and at the same time help to determine its final configuration:

Tool is both enabling and limiting: it empowers the subject in the transformation process with the historically collected experience and skill crystallized to it, but it also restricts the interaction to be from the perspective of that particular tool or instrument only...[33]

What tools are used, and how they are deployed, is related to what is the object of the activity. The presence of a tool does not indicate how it will be used. Tools are not only employed according to the nature of the object and the action to be performed on it. The selection of tools, how they come to be, is also molded by the discourses, the community, and the division of labour in which the activity takes place.[34]

Throughout this work, we will examine some of the tools and methods that archaeologists, artists, and designers use when creating the objects and artifacts of their activity.

RULES AND DISCOURSE

The individual's action towards the object of the activity is further affected by other factors. These include the explicit rules and laws that regulate the forms of interaction possible within the social setting in which the activity unfolds. In the opinion of this author, this aspect of the activity system can be extended to include the concept of discourse. Discourse is a term that was also used to by Michel Foucault to indicate, in space, the dimension where language and practice intersect, at a given point in history, and produce clearly identifiable ways of speaking, or depicting a given subject matter. According to Foucault, each period of history produced objects, subjects, and practices of knowledge.[35] Rules and discourse pertain forms of regulation that include practices that are implicitly accepted and which directly or indirectly promote, and enable, certain modes of action, or of speaking, while suppressing others.

For Foucault, discourse was instrumental not only in the construction of 'the topic,' but also, in the definition of the object of knowledge. As Foucault clarified through his concept of the episteme, at different points in history, there is an active set of relations that facilitates how knowledge is produced and rationally defined:

... [the] episteme may be suspected of being something like a world-view, a slice of history common to all branches of knowledge, which imposes on each one the same norms and postulates, a general stage for reason, a certain structure of thought that the men of a

particular period cannot escape—a great body of legislation written once and for all by some anonymous hand.[36]

Since discourse, in effect, regulates what rules and practices are deemed as meaningful, accurate, and true, it can also be said to influence the individual's action towards the object of the activity. The tools, and knowledge-building artifacts belonging to a given community, for example, can play an important role in defining the nature of the community, the extent of its boundaries, as well as the objects that it produces. In the case of archaeology, for example, particular vocabularies and methods may be institutionalized through the literature of the discipline. These in turn may play a significant role in determining the domain of knowledge, its form (or manner of expression), as well as how it is articulated in the object resulting in the outcome of the activity. The way the archaeologist uses these tools, in a sense, reflects and determines his/her membership and status within the community of archaeologists.

As we pointed out in the introduction, discursive practices also have a bearing on how disciplines, such as design, are defined within the larger context of institutionalized knowledge. The question of whether the activity and objects produced by the designer exist within the realm of art or science, for example, has a direct bearing on the acceptance or rejection of the outcome as an artifact of knowledge alongside other disciplines.

COMMUNITY

Communities exist by virtue of their memberships. Being part of a community is something that can occur by virtue of being born in a particular family, ethnic group, or nation state. Becoming a member in a community can also happen through a process that involves learning and participation. The scope, areas of knowledge, and the tasks that determine how the activity of design is practiced, differs widely among communities and from one context to another. Whereas the community is embodied by the set of relations among people doing things together, the activity itself, with its routines and exceptions is what constitutes the structure of the community.[37]

Learning, for example, can take many routes, including the securing of an education via enrollment in an institution, such as a university. It can occur through affiliation with professional forums designed to foster cooperation among participants in the activity. Or it can happen as part of the work experience, by being part of a professional institution, such as a company. It may even be the case that an entity, such as a community, is brought forth into existence solely for the purpose of creating the essence of the concept, product, or artifact being designed.[38]

Human beings are social beings, and human consciousness itself develops within a social setting. The individual performing an activity is never an isolated part, but rather is part of a community. Even in the cases in which an activity is performed in solitude, the social context of human activity is evident in the tools utilized. The activity itself is affected by the individual's participation within a community. This is because to realize the object or outcome of the activity, the goals that motivate the community must work alongside those of the individual. In addition, the individual brings into the activity a body/mind that feels, experiences, thinks and acts. These equip the individual with the ability to shape, and transform the activity.[39]

ORGANIZATION

The division of labor mediates the community's relationship to the object of the activity. That is, the organization of labor defines how an activity is distributed among community members, what the role that the individual plays in the community, the influence that their actions bear on the activity, as well as the tasks for which they are responsible. This relationship occurs because in order for the community to reach its common objective, communication among the different members must be coordinated, and the individual activities must be organized.[40]

SUMMARY

The concept of mediation is important to anyone whose work involves the creation and sharing of knowledge. This is true insofar as knowledge in a discipline is not simply the result of thoughts occurring up there in the mind, but rather it is the outcome of the interaction between all the different elements that constitute the practice. This includes an embodied actor, working with physical tools, moving in a real world, and made of communities organized around productive activities. Artists, designers and archaeologists, for example, make use of systems of representation as mediating elements to communicate information about their practice among themselves, and with the outside world. Design itself involves the processing of symbolic structures for visualization.[41] The technologies of communicative representation that the designer uses are also constructed from tangible matter, such as the letter of the alphabet, the basic shapes of Euclidean geometry, etc. They can be described as Secondary Artifacts that allow for dialogue and reflection of items that do not yet exist. Archaeologists also utilize similar technologies to present hypotheses and communicate ideas about an ancient artifact.

Another key point for the relevance of Activity Theory to the practice of design has to do with how the notion of the artifact can help to create a comprehensive collaborative framework with which to approach and compare the activities of different disciplines. Also, for the designer who is creating artifacts and systems of artifacts that will influence, delimit, or even cut across the practice of others, it is crucial to understand how others create and use the artifacts of their practice. And though it is true that research through observation, interviews, and the use of diverse ethnographic and participatory techniques can yield a general knowledge about the practice and use of artifacts by the members of a particular community, there is still a need for knowledge about how goals, agendas, and discourses motivate the behavior of the actor. There is a need for rich and systematic descriptions that go deeper and elucidate how members of a community make sense and bestow meaning to the artifacts of their culture and community. These types of descriptions, that allow us to appreciate better the use of artifacts, will not be possible until one understands all the elements that constitute the activities of different practices.[42]

Notes to chapter three:

1. Y. Engeström, *Learning by Expanding* (Helsinki: Orienta-Konsultit Oy, 1987), 37.
2. Ibid.

3. Ibid.

4. Ibid.

5. Ibid., 39.

6. E. Christiansen, "Tamed by a Rose," in Context and Consciousness, Activity Theory and Human-Computer Interaction (Cambridge, Mass.: The MIT Press, 1997), 176.

7. Engeström, 39.

8. Ibid.

9. Christiansen, 194.

10. Engeström, 27.

11. L. S. Vygotski, Mind in Society: The Development of the Higher Psychological Processes, M. Cole, V. John-Steiner, S. Scribner, and E. Souberman, eds. (Cambridge, Mass.: Harvard University Press, 1978), 39.

12. Engeström, 2.

13. Vygotski, 39.

14. Ibid., 51.

15. Engeström, 58.

16. Vygotsky, in Engeström, 58.

17. Engeström, "When is a Tool? Multiple Meanings of Artifacts in Human Activity," in Learning, Working, and Imagining: Twelve Studies in Activity Theory (Helsinki: Orienta-Konsultit Oy, 1990), 171.

18. Engeström, “Developmental Studies of Work as a Test Bench of Activity Theory: The Case of Primary Care Medical Practice,” in Understanding Practice, Perspectives on Activity and Context, S. Chaiklin and J. Lave, eds. (Cambridge: Cambridge University press, 1993), 65.
19. D. Haraway, “The Promise of Monsters: A Regenerative Politics for Inappropriate/d Others,” in Cultural Studies, L. Grossberger, C. Nelson, and P. Treichler, eds. (London: Routledge, 1992), 300.
20. K. Kuutti, “Identifying Potential CSCW Applications by means of activity theory concepts: a case example,” in Proceeding of the Conference on Computer-Supported Cooperative Work (CSCW) (New York: ACM Press, 1992), 235.
21. V. Zinchenko, “Developing Activity Theory: The Zone of Proximal Development and Beyond,” in Context and Consciousness: Activity Theory and Human-Computer Interaction (Cambridge, Mass.: The MIT Press, 1997), 286.
22. R. K. E. Bellamy, “Designing Educational Technology,” in Context and Consciousness: Activity Theory and Human-Computer Interaction, B. Nardi, ed. (Cambridge, Mass.: The MIT Press, 1996), 124.
23. Christiansen, 176.
24. Kuutti, “A Framework for HCI Research,” Context and Consciousness: Activity Theory and Human-Computer Interaction, B. Nardi, ed. (Cambridge, Mass.: The MIT Press, 1996), 27.
25. Ibid., 27.
26. H. Simon, The Sciences of the Artificial, 3rd edition (Cambridge, Mass.: The MIT Press, 1996), 6.
27. M. Wartofsky, “Perception, Representation, and the Forms of Action: Towards an Historical Epistemology,” in Models: Representation in Scientific Understanding (Dordrecht, Holland: D. Reidel Publishing Co., 1979), 206.

28. M. Cole, "Cultural psychology: Some general principles and a concrete example," in Perspectives on Activity Theory, Y. Engeström, R. Miettinen, and R.L. Punamäki, eds. (Cambridge: Cambridge University Press, 1999), 90.

29. M. Shanks, "The Life of an Artifact in an Interpretive Archaeology," Fennoscandia Archaeologica, Vol. XV (1998): 15–29.

30. A. Forty, Objects of Desire: Design and Society since 1750, (London: Thames and Hudson, 1986), 9.

31. S. Mithens, The Prehistory of the Mind: The Cognitive Origins of Art and Science (London: Thames and Hudson, 1996), 76–77.

32. Kuutti, "A Framework for HCI Research," 27.

33. Ibid.

34. Engeström, "When is a Tool?" 189.

35. S. Hall, "The Work of Representation," in Representation, Cultural Representation and Signifying Practices (London: Sage Publications, 1997), 46.

36. M. Foucault, The Archaeology of Knowledge and the Discourse on Language (New York: Pantheon Books, 1982), 192.

37. G. Bowker, and S. L. Star, Sorting Things Out: Classification and its Consequences (Cambridge, Mass.: The MIT Press, 1999), 294.

38. M. Heidegger, "The Question Concerning Technology," in Basic Writings, D. F. Krell, ed. (London: Routledge, 1993), 319. The term bringing forth is used in the Heideggerian sense: "This revealing gathers together in advance the aspect, the matter...with a view to the finished thing envisaged as completed and from this gathering it determines the manner of its construction."

39. V. Kaptelinin, "Activity Theory: Implications," in Context and Consciousness: Activity Theory and Human-Computer Interaction, B. Nardi, ed. (Cambridge, Mass.: The MIT Press, 1996), 107–108.

40. Bellamy, 125.

41. M. McCullough, Abstracting Craft: The Practiced Digital Hand (Cambridge, Mass.: The MIT Press, 1996), 87.

42. Christiansen, 177.