# Design as an Activity

## THE ACTIVITY OF DESIGN

Herbert Simon defined design as being concerned with the processes and actions that lead to the systematic planning and creation of artifacts.[1] It is the opinion of this author that design can also be defined as a human activity that involves goal-oriented behavior, with the *intention* to produce a given result. That is, throughout the activity of design, the designer posits an objective and procures and utilizes the means to achieve it. As the discipline that is involved in the description and creation of the artificial, the matter of cause and effect, or causality, is of prime importance to designers. According to Alain Findeli:

> The act of designing, the intervention of the designer, is seen as the *cause* of the movement from problem to solution, just as the movement of an accelerator pedal is the cause of increased speed in an automobile.[2]

What constitutes the role of cause and effect in the activity of design—or in any productive activity for that matter—is not necessarily an obvious thing. An objective that determines the kinds of means to be used, for example, may also be considered to be a cause.[3] This is the case in the field of information technology. Although not immediately apparent, interactivity, for example, can be seen as a form of designed causation. According to Geoffrey Bowkers and Susan Leigh Star, every link in a hypertext script reflects the processes of comparison, evaluation, and decision about the condition of two or more objects. Are they similar? Are they linked together as part of a larger narrative?[4]

In his writings on the subject of technology, Martin Heidegger drew a distinction between cause and means. According to Heidegger, whereas a cause can be seen as that which has an effect as its consequence, a means can be defined as that "whereby something is effected and thus attained."[5]

But causality does not need to be limited to effecting. It can also be realized as emergence. In the opinion of this author, there is a relationship between design and the ancient concept of *techné* as that which reveals all that is gathered together in the act of making. An example of *techné*, cited by Heidegger, is the handcrafted object. In it, the instrumental hand of the artisan is present as the

agent of causality. It helps to shape and determine the manner in which revealing, or bringing forth takes place:

> ...what is brought forth by the artisan or the artist, e.g the silver chalice, has the bursting open belonging to bringing forth not in itself, but in another (*en alloi*), in the craftsman or artist.[6]

In our contemporary world, the artifact of design can disclose a world. From its boundaries, the virtual reality application of an archaeology site, for example, can conjure forth a physical environment into presence. In this manner, this author thinks that the artifact operates as an indexical pointer to a space of embodiment. It indicates and describes to us a world that no longer is. It may even single out those who were involved in its making. Even in the fragmented state of the archaeological find, as a mere trace, the object that is the product of design is an instance of *ekfrasis*, of an opening.[7] The artifact reveals something about the essence of the materials available, how they were used, consumed.[8]

The artifacts that result from the activity of design can be molded, or shaped, into the form of objects as diverse as tools, products, processes and, concepts. Thus, three-tiered hierarchy proposed by Marx Wartofsky can be of use to designers. For one, this classification allows one to examine and describe how different aspects that are unique to human culture, such as representation, are incorporated into the object of design.

In Wartofsky's classification, primary artifacts—such as a hammer, a cup, a pen or a paintbrush—are the first basic tools created that can have a *direct impact* on the world. A small bottle opener in the shape of an animal can also be classified as an object of design that is also a primary artifact. Secondary artifacts, on the other hand, are representations of primary artifacts and of modes of action of using them. They mediate between direct action and other higher order processes, such as memory and symbolic thinking. The immediate action involved in using an alphabet, for example, is that one of communication. Through the use of an artifact such as the alphabet, other forms of production and modes of action that are distinctly human, such as the permanent recording of history, become possible. Secondary artifacts play an important role in the preservation and transmission of modes of action.

Contemporary examples of primary artifacts are simple interface devices, such as the mouse, that facilitate so-called direct manipulation.[9] Human computer interface objects, such as graphical user interfaces (GUIs) and the myriad digital representations included within them, are examples of secondary artifacts. A graphical user interface represents the consolidation of a series of mental models regarding how a user might interact with a given program. A "folder", for

example, is a tool that stands for a directory of files in the virtual realm. It is also an example of a designed non-physical secondary artifact. An example of a secondary artifact that is both a digital and physical item is that of Computer Assisted Virtual Environment (CAVE). This type of artifact incorporates the direct manipulation aspect of primary artifacts, as well as makes use of symbolic systems for representation. Tertiary artifacts are those that come to constitute relatively autonomous worlds with their own rules. Digital networked environments (DNE), such as Multiple User Dimensions (MUDs) and MUD, Object-oriented (MOOs), with their ability to integrate diverse participants in real time and elicit myriad roles and actions, aspire to become tertiary artifacts.[10] According to Singhal and Zyda, Digital Networked Environments can also contain virtual representations, such as 3D models of architectural structures, renditions of landscapes extracted from the real world, as well as representations of human actors depicted in the form of avatars. They can also include multiple linear narratives that facilitate access and navigation through the world, as well as other possibilities for interaction between multiple participants.[11]

| | Material domain | Immaterial domain |
|---|---|---|
| Primary artifact | Mouse | Telecommunication networks |
| Secondary artifact | Computer Assisted Virtual Environment (CAVE) | Hypertext software application |
| Tertiary artifact | Networked Virtual Environments (MUDs, MOOs) | Artificial Life System |

Figure 24: Marx Wartofsky's three-tiered hierarchy as applied to digital artifacts.

Like art, the activity of design involves not only thinking, and creating, but also *acting.*[12] In this manner, the objects of design can also be processes that engage the life and activities of humans. According to Enzio Manzini:

> The matter of design and invention can therefore take the form of a process which allows one to produce, variously, a given composite, a computing method leading to a new approach to a structural problem, a flexible automated manufacturing process that imposes a new set of limitations while simultaneously creating new possibilities.[13]

Some information design products, however, may be processes that do not even assume the form of an artifact themselves. They may be involved, or evoked, to sustain and develop the classification, systematization, and standardization of other artifacts. The CIMI z39.50 Application Profile for Cultural Heritage Information, which seeks to standardize search and retrieval parameters for digital cultural information resources, is an example of one of these process design objects.[14] They may lead to innovation, to the creation of better products.

Financial products can also be characterized as immaterial, information-based artifacts. The re-engineering of the procedures involved in the transactions of financial products is an instance of how processes can be redesigned. A designer may work with the financial institution in reorganizing, simplifying, and updating the rules and regulation procedures of the firm. The implementation of these redesigned procedures can result in a renewed stimulus and better support for development and distribution of both new and already existing products.

Much like in the practice of art, the activity of design exists within discursive structures generated and sustained by communities that exist as pre-constituted networks and clusters of institutions. These networks bring together individuals, communities and, institutions. Figure 25 illustrates some of the different components of the activity, according to the point of view offered by the Activity System.

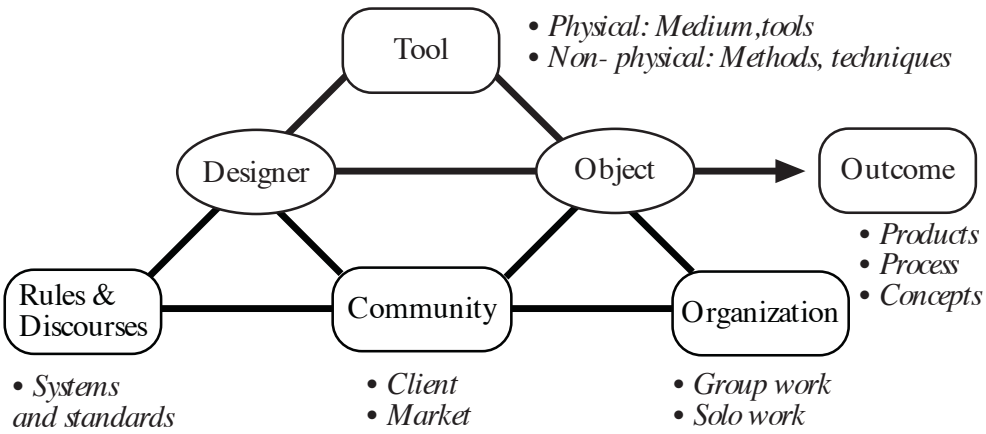


Figure 25: Visualization of the activity of design.

## WHO IS THE DESIGNER?

As the active participant in the activity, the designer engages in a series of actions that ultimately yield a design product. Though we have spoken briefly about the object of design in terms of products and processes, there is yet another aspect that is more difficult to grapple with. For

indeed, the object of design is embedded in the imagined life. Moreover, design is indicative of desire, wish, and fantasy. As Paul Greenhalgh has pointed out: "To have a design on something or someone suggests an insatiable want."[15] The author of this work thinks that, as the producer of objects of desire, the label of designer is as open a class or category as that of art objects. For in our postmodern eyes, design appears to be everywhere: In nature, we encounter the supreme Architect at work; in mathematics, we encounter the logic and structure of number sequences, in evolution we discern the hand of natural selection. The value of the participation of the nonprofessional as an integral component in the design process prompted Liam Bannon to say that "in a very real sense users are designers as well."[16] Notwithstanding the multiple definitions, and different terms used to designate the agent, this author thinks that the designer is one who engages in design to conceptualize and represent. S/he is involved in producing a synthesis from diverse sources. S/he is someone who produces visualizations that translate the abstract into the concrete. S/he is a planner and a producer, engaged and working in the world.

Richard Coyne has described how the notion of synthesis as a gathering in design, originates in ideas dating back to Galen's Medical Art. These themes can also be found in the work and methods of Descartes and Leibniz.[17] Per Galle, among others, has proposed that design itself is an activity that involves the creation of a design representation in the absence of the thing itself.[18] According to Galle, what is special about the types of representations produced by designers is that they allow us to formally describe what he labels as, "absent artifacts". The absent artifact is a thing that does not really exist anywhere. From this point of view, design representations are devices that embody within the ideas and interpretations of the several actors with respect to the item being created. Galle proposes that these representations, and the notion of causality, or that which makes something happen, come together in the actual production of an artifact.[19] Focusing on causality, may be one approach to understanding how disciplines can make use of the same tools for different approaches. In the next section, I present an examination, from this point of view, of the tools for representation that the designer uses.

Through an engagement in these processes involving knowledge acquisition, the designer acquires an understanding of the community that creates the content. In this author's opinion, because s/he is cognizant of the knowledge created, as well as how it is being produced and by whom, the designer comes to apprehend its ontological dimensions.[20] The designer is aware of the extent and shape of the boundaries of the knowledge being articulated, as well as the structural skeletons that support its configuration. Indeed, it could be said that the most significant task for the designer is to achieve an understanding of the client's understanding. This is why the task of the designer has been described as an activity of self-conscious artifact production that operates at the metaphorical level. According to Paniaridis Louridas:

> The designer proceeds by interpreting the effect his actions have on the situation. He tries to understand the effect of his materials and of his tools, to define their place in a structure. He wants to create a structure out of his means and the result of his actions.[21]

Additionally, the designer is also a specialist who works at a meta-level. In the process of coming to understand both the subject matter of the design, and the intended outcome, s/he must acquire an understanding of all the components in the activities of the different actors. In this process, s/he must also learn to negotiate with the rules and discourses of a community, as well as with the organization of labor. Many times, these rules and discourses enter the realm of ideology. In the case of work done with archaeological materials, for example, it may be that the content is one in which issues regarding ethnic, national, or religious identity converge. The choice of media, format, and the manner of presentation can influence the experience of the audience.

## THE TOOLS

The association of design with art is perhaps most evident in the emphasis on creativity and how this manifests itself through the production of sketches and other forms of representation about the object of design. The use of visual artifacts as part of the activities in other disciplines, such as engineering, has been documented. Edward Ferguson, for example, has clearly demonstrated how drawing used to be a part of the engineering practice and how the categorical distinction that limits the productive use of nonverbal tools, such as drawing and many forms of visualization, to the art-related domains is a recent phenomenon.[22] Presently, however, design is one of the few disciplines that consciously promote the use of visual artifacts and tools as part of the process of knowledge production.

Still, though they may share tools, and a preoccupation with aesthetics, there are differences between the activity of design and that of art. Some of these differences can be observed in how designers use conceptual, nonphysical, tools. As can be seen in Figure 27, in the modern context, as an instrument used in visualization and representation, drawing is an integral part of the designer's toolbox. These tools are used by the designer for providing cognitive access, as well as changing the form and configuration of the object and outcome of the activity. In the case of the present work, the object of design consists of representations of archaeology and culture heritage materials.

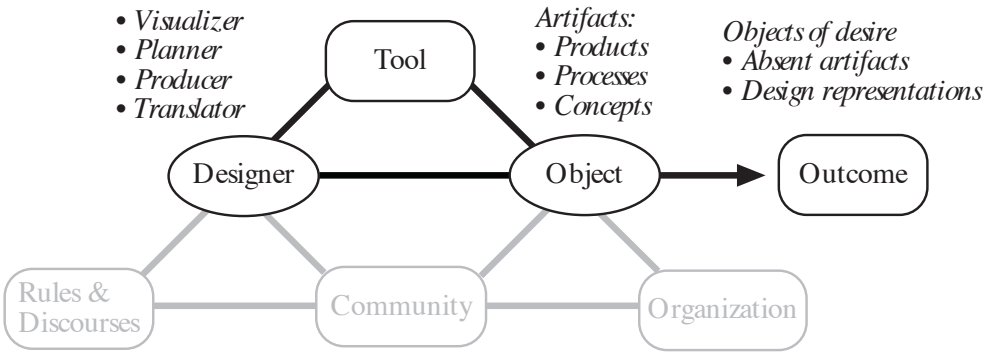


Figure 26: The identity of the designer, as well as that of the objects s/he produces is the subject of much discussion.

Though superficially they may appear to be similar in nature, the drawings of the designer differ radically from those of the artist. As Rudolf Arnheim has pointed out, these representations help to provide a center, and a sense of direction, or the "structural skeleton, namely the property that makes the pattern distinct, organized, identifiable."[23] However, unlike the case with art, where the object produced by drawing is usually intimately tied to the aura of its maker (i.e. the identity and personality of the artist, within a given historical context), the sketches and representations created by designers can be better described as ephemeral communication devices.

The term ephemeral, as used in this context, does not refer to either the immaterial or virtual domain. A physical prototype used to demonstrate the capabilities of a product can be of a material nature, and be used as an ephemeral communication device. Therefore, the term ephemeral is used to describe a mode of being in the world that is meaningful, situated yet non-persistent. It indicates how the existence of these items is short-lived, transitory, and to a large extent instrumental to the design process. Theirs is a microhistory, contingent upon a larger historical context within the design process. In the activity of design, they stand in place as idealized representations of a final product:

> A candidate design or partial design is a conjecture, much like a scientific hypothesis, that should contain within it the seeds of its refutation.[24]

As *absent artifacts*, these "stand-in representations" gather within them the self-reflections of the designer, the understanding of the client, and the interpretation of the producer. Through these, the three aforementioned actors communicate and acquire knowledge about an artifact that does not yet exist.[25] In a sense this artifact that is the object of design is produced with an idea that foreshadows it.

Other differences between design and art can be examined from the already discussed issue of the role of causality in design and its influence on the tools of the designer. The following paragraphs include an explanation of some of the instruments in the designer's toolbox. These have been grouped into a matrix that organizes them according to their causal dimension.

In using this term of causal dimension I intend to extend the notion of the *four causes* defined by the ancient Greek philosophers. These terms were brought into discussions of technology first through the work of Martin Heidegger, with his seminal essay "The Question of Technology," and more recently through the work of Brenda Laurel, who has used the metaphor of theater as a way of describing representation and narrative in human computer interaction.[26]

For the current discussion, this author has reinterpreted the four causes into four dimensions that, while delimiting the extent of reach and influence, also provide the designer with agency and scope of action. The *causa formalis* refers to the dimension of Form into which the material enters, the shape that it is given. The *causa materialis* refers to the Material dimension or the matter of which an object is made. The *causa finalis* refers to the dimension of Function or the end or purpose for which the item is created. The *causa efficiens* refers to the community and the Context in which the finished item emerges. The Material dimension, deals with the nature of the medium and the tools employed in fashioning the object of design. In the case of Information Design, the Material dimension can be described as a combination of electronic and digital media. The tools used involve the manipulation, storage and display of this aspect. The aspect of Form relates to the systematized processes that are gathered together and which bring the item into being. In the words of Brenda Laurel:

> Formal cause operates through an idea or vision of the completed work, which will undergo change and elaboration as the process of creation unfolds ... there is a reciprocal relationship between the formal cause and the work in progress.[27]

*Representation Tools in Design*
*Causal dimension*

| | Material | Form | Function | Context |
|---|---|---|---|---|
| Diagrams | | ✓ | ✓ | |
| Flowcharts | | ✓ | ✓ | |
| Drawings | ✓ | ✓ | | |
| Models | ✓ | ✓ | ✓ | |
| Demos | ✓ | ✓ | ✓ | ✓ |
| Prototypes | ✓ | ✓ | ✓ | ✓ |
| Scenarios | ✓ | ✓ | ✓ | ✓ |

Figure 27: Some of the representation tools used by the designer.

The aspect of Function is concerned with the relations of exchange in which the object is produced. Community and Context relates to how the activity of production is framed and determined.

## Examples of the representation tools of the designer

Throughout the process of design, the designer of information uses tools such as drawings and diagrams, scenarios, and prototypes as communication devices. They are meant to convey information about abstract concepts, provide a context, and further the decision-making process among all parties concerned. Depending on how thoroughly they are constructed, they may sometimes even allow for engagement in an actual interaction with the item being designed. Unlike the art object, the drawings of the designer do not represent the solution to a problem. As ephemeral communication devices, the drawings of the designer consist of *proposals* of the solution to a problem. Because theirs is a microhistory that is tied to the larger process of design, they exist mostly as primary signals, mute declarations of existence. The interpretation of these devices is closely tied to the vocabulary employed by the designer and the context in which they are presented. Indeed it is the designer who establishes the frame for a meaningful dialogical space. In the words of Klaus Krippendorff:

> The context of genesis consists basically of a complex process, a process *characterized in terms of communication*…. Within such a production-consumption network artifacts may be seen as temporarily frozen patterns, gestalts, forms or messages, that invite participation, suggest

> appropriate responses that transform them into another medium or passing them on to others.[28] (Italics added.)

This communal aspect of the design object may be one of the reasons why, unlike the artist, the designer is less dependent on institutionally sanctioned narratives, such as those of the art critic, or the historian. Sketches and models are among the most basic examples of the communication devices created by the designer. As Katherine Henderson has noted, they operate by creating a communication channel through which different types of information, such as tacit knowledge and experiential knowledge, can be shared:[29]

> The sketch or drawing used interactively can serve as a reference and collaboration ground to unite all these various forms of knowledge for negotiation.[30]

Because they create a shared context that can be understood by the specialist, as well as the generalist, they help to structure the work processes of design and its outcome. Sketches may be pictorial or pseudo-realistic, or of a diagrammatic nature. Pictorial sketches include perspective drawings and pseudo-realistic images created by illustrators. They do not convey the optical consistency required for production of design prototypes.[31] They are generally used for communication when the interaction is with an unspecialized audience. As we shall see later, archaeologists use pictorial sketches in presentations for general audiences.

Colin Ware proposes that diagrams are non-pictorial representations that utilize easy-to-read, standardized graphic elements, such as lines, boxes, circles and arrows.[32] They are of use to designers because many times they can convey ideas in a simple direct manner. Venn diagrams, according to Joy Mountford, use circles and oval shapes to convey the concept of inclusion, a notion that is difficult to communicate with verbal language.[33] This author thinks that flow charts and schematic diagrams are examples of marks that can be used to represent the flow of events in a process. They may indicate branching, or key decision points, as well as probable outcome projections.

John Carroll describes scenarios as representations that are accessible to both users and designers. They can help to make communications more efficient by linking elements from design situation to hypothesized effects for users and their work.[34] Kari Kuutti has proposed that a scenario is a description of an activity, in narrative form, and a view of a system from the outside, or from the user's perspective.[35] Kuutti has noted how, in terms of its scope, a scenario can be more narrowly defined as:

> ...a description of one or more end-to-end transactions involving the required system and its environment.[36]

Scenarios are significant tools in that they can embody detailed information about activities, in their full context. According to Carroll, they can reflect the complex world of human interaction with artifacts:

> The defining property of a scenario is that it projects a concrete description of an activity that the user engages in when performing a specific task, a description sufficiently detailed so that the user engages in when performing a specific task, a description sufficiently detailed so that design implications can be inferred and reasoned about.[37]

This author's opinion is that the historical origin of scenarios as tools can be found in other analogical reasoning instruments used by scientists, such as thought experiments. These types of mental simulations, which have been documented, involve the construction of models that describes a sequence of events.[38] The reader/listener is asked to imagine a dynamic scene as it unfolds through time. The narrative abstracts from real-world phenomena exposes inconsistencies and exhibits paradoxes.[39] Scenarios can be textual, but can assume other forms, such as storyboards, annotated cartoon panels, video mockups, or scripted prototypes. "As We May Think," for example, is one of the most famous scenarios ever created. Written by the scientist Vannevar Bush as an essay, and published in a literary magazine in 1949, this scenario depicts a hypothetical user engaged with a hypermedia memory augmentation system.

Scenarios can be used not only as representation tools but also as part of the process of knowledge acquisition. From this point of view, Enzio Manzini proposed that the designer become a "conceiver of scenarios", and not just products.[40] However, as Alain Findeli has noted, this is a proposition that requires a radical revision of our assumptions regarding what technology is:

> Ultimately, this model implies that we imagine the possibility of a technology that greatly goes beyond the materialist point of view inherited from the nineteenth century (as a guideline, think of the technique or art of gardens, the art of bringing up children, all the techniques that address themselves to living and human beings, such as they are.[41]

As an agent involved in the production of material culture, the designer must be involved, from the human point of view, with the artifacts created. S/he must be aware and be able to assume

responsibility for the impact that these items may have on the natural as well as the cultural dimension.

A prototype, or device used to engage the user in interaction with a replica of an actual item, is yet another type of tool that the designer can use to gain knowledge about how the object being designed operates in the real world. The prototype can be a simplified version, as long as the basic behavior is the same as in the actual product. The idea behind the prototype is that it allows the designer to test a solution at an early stage of design. Also, the prototype illustrates direction where the design is headed. Prototypes can be used to decrease the complexity of a problem while showing how requirements are going to be met. In addition, a prototype allows the designer to test usability aspects and receive vital user input before committing a large amount of resources to a given solution.

## Knowledge acquisition tools and design

The designer also makes use of knowledge acquisition tools. Some examples of these tools are the diverse techniques used to acquire the knowledge necessary to create products for a given community. Among these is what is referred to as transverse knowledge or, conceptual knowledge that arises from the interaction of the designer with the matter to be designed. This transverse knowledge enables the establishing of "new channels of communication between different areas and with different technical world, languages, and dialects."[42] Transverse knowledge is different from multidisciplinary perspectives in that it is knowledge in action. As opposed to a single logic approach that seeks to discover one solution that applies to all cases, transverse is a type of second-degree understanding in which the designer strives to apprehend how different users understand and make sense of the artifacts around them.[43] It provides the designer with a field of action or launching pad from which to ask motivationally[44] structured questions such as, "Who is this for?" or "What do I need to know?" or "Who knows about this?"

When the need arises, the designer can also incorporate a whole set of tools used in other disciplines, such as anthropology, cognitive science, and psychology.[45] This practice of methodological opportunism is not privy to design, but rather it is practiced by many other disciplines. Archaeology, for example, makes use of the methods of other disciplines such as geology, ethnology, and linguistics.[46] From a research perspective, through the use of techniques from anthropology, such as ethnographic recording and description, the designer can also allow herself/himself to become an *initiate* into the culture of the community for whom the artifact is being designed. By placing herself/himself in an involved position, s/he can attempt to

steer the inquiry through a series of contacts and communicative exchanges which are meaningful for the path of the design to take.

## Cognitive modelling tools

Ontology has been described as the science of being; a "theory regarding the entities, especially the abstract entities to be admitted into a language of description."[47] Ontology can also be defined as a way of characterizing the world and its entities through language. As a tool for description, ontology can be used in defining parameters, as well as the artifacts and ecology that populate a given domain of knowledge. Formal classification systems are definitions of shared ontologies for particular knowledge domains.

Categorizing involves a juggling and attribution of meaning, an effort to make sense out of something. It denotes a process of organization, separation, selection, inclusion, and ultimately, also of exclusion. The manner and methods by which humans classify may vary among cultures and in different periods of time. However, the motion of gathering and separating, of bringing together and arranging seems to be found in all human groups engaged in activities that produce knowledge. That is, though the gesture of arranging and organizing may be universal, the act of classification, how it materializes, how it is implemented, and whether it is agreed upon, or imposed, is particular. Classification itself is not a given, pre-existing entity and classifications are made, rather than found.

Designers routinely use classification schemes to apprehend and also to outline the positioning and scope of a potential product. Taxonomies are also regularly used for understanding market segments and target audiences. Uday Athavankar, for example, has described how the study of categorization systems can assist the designer in managing the introduction of innovative concepts so that they make sense to a prospective audience.[48] In addition to traditional classification methods, designers also make use of metaphoric devices to create idealized cognitive models. The application of rhetorical devices, such as metaphors as cognitive mediators in the practice of human computer interface (HCI) design has been widely documented.[49] In the context of this project, aside from the title, the idea of illuminating with respect to the perceptual response of the organism is used as a metaphor that describes the process of knowledge acquisition.

## Systems of signs

Aside from the tools used to produce a design, the information designer works with other artificial and culturally determined artifacts such as the systems of signs and graphic devices that support and convey the representation created. This labor requires that the designer become an expert in the methodical manipulation of second-order symbolic systems. This is necessary because, in order for them be successful, the digital representations that the designer creates must become signs for real entities and relations. Among the systems of signs that the designer has traditionally utilized are alphabets, symbols, and numerical systems. Alphabet items are combined into textual artifacts and used with the purposes of naming, identifying and assigning value and meaning. Gassée and Reinhold describe symbols as vehicles of creating that which has never been created.[50] Numerical systems are used in conjunction with culturally determined concepts such as quantification and ordering. Further, notions such as amount, size, position, and scale can be used to establish relations such as containment, or to indicate processes such as abstraction. They can also be used to order elements in the representation either in sequential or incremental order. An example of this is the use of structures, such as timelines, indexes, and table of contents.

## RULES AND DISCOURSES

At the moment, design still exists in-between disciplines, as an ancillary activity. Figure 28 illustrates the slippery foundation of design as a discipline. This is not to be regarded as a deficiency on the part of design. Neither should it be attributed to a legacy of a past in which design may have been seen as an auxiliary practice carried on in the context of other disciplines.[51] Rather, it should be seen as part of an inflexible institutional framework that refuses to accept design for what it is.

The current situation creates a precarious state of affairs for the practitioner, especially when s/he is working in collaborative environments with more established disciplines, and in situations where the work that s/he produces becomes embedded into a final product that is shared by all. How is the output of her/his labor recognized, judged, rewarded, implemented?[52] From the part of traditional academic structures new attitudes that recognize diverse forms of knowledge, and the contribution of the different disciplines, are necessary.

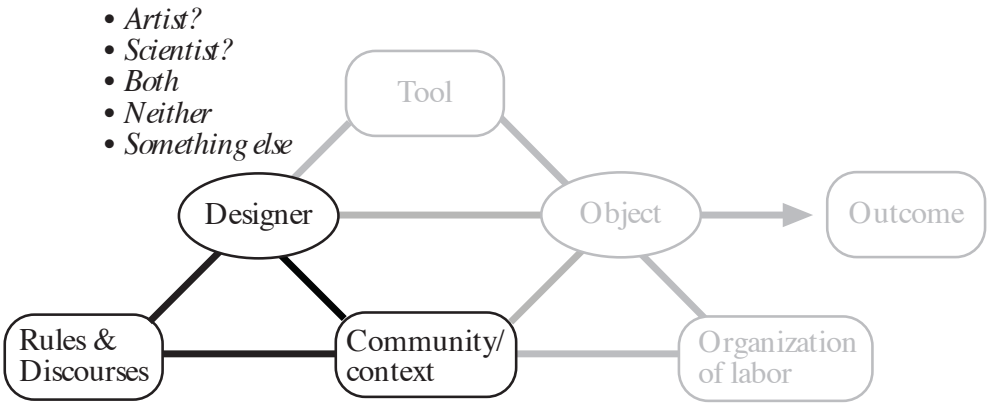


Figure 28: Discursive practices coalesce into rules that influence the identity and place of the designer in the community.

Yet in our contemporary post-industrial society the importance of design has grown, as the discipline becomes involved in the creation of a myriad of artifacts and processes beyond the usual conception of fashion and industrial design artifacts. Dynamic electronic advertisements, self-operating automobiles, intelligent fabrics, computer interfaces, communication networks, computer software and hardware, digital archives, smart domestic appliances, virtual games, to name a few, these are design artifacts of the future that make use of a combination of the material and the intellectual layers of society. In all there is the common thread of their being the product of design efforts. As the use design in the creation of digital products progresses further, there will be more need for understanding of its applications within diverse knowledge frameworks.

## COMMUNITY AND CONTEXT

Whether working alone, or as a team member, the designer is also a participant in a community of design. Participation in this community is a collective action that involves learning the codes of communication that are shared by those who are members. These codes are comprised of symbols and labels used to denote and describe the objects of the activity. It is used in the exchange of information about the activity. As the activity unfolds through time, the terms change. For example, in the old days of hand-produced mechanicals, terms such as 'pick-up' and 'scuzz-bag' were routinely used to indicate some of the instruments used in the cleaning of the surface of the mechanical.[53] These were terms frequently used by the designers as part of the everyday work session in the so-called 'bullpen.' In a sense it could be said that the codes act as agents of mediation to further communication between different actors involved in the activity. They come into being and are utilized as part of the process of regulating the flow of activity among different elements. Also, these codes are of a historical and situated nature. For example,

the physical configuration of the 'bullpen' has probably varied so tremendously during the past fifteen years, with the introduction of the different types of computer equipment and related paraphernalia, that it may warrant the creation of a new term to designate it.[54]

The activity of design, however, does not always take place within a permanent community. I use the term *ephemeral community* to define a transitory entity through which labor is organized. In this work the term describes how a community can come into being at different times for the purpose of engaging in an activity that has a projected result as its goal. The term is not indicative of the non-material aspects of virtual communities, though the activities of an ephemeral community can occur in the virtual dimension. Ephemeral communities rely on the use of implicit meanings, and a common context. Their foundations are built on shared memories and past association. Their strength lies in their ability to improvise and expand.

An ephemeral community was brought together in 1996 around the idea of creating a multimedia product based on the material finds of the Raisio archaeological excavations carried on during the years 1994--1996. The community that came together to bring about this project was composed of individuals from a number of different sectors. They brought with them their own methods and tools. There were academics from the humanities and sciences sectors. Many of these were students who had participated in the excavations done in the years 1994--1996 and who were completing their Masters' studies at the Department of Archaeology of the University of Turku. In addition, academic research personnel from the National Board of Antiquities and from the Radio Carbon Dating Institute participated in the project. From the academic design and technology sector, there was the designer who brought in the skills necessary to create the concept and product of a hypermedia archive. This idea was proposed by the designer, as way to disseminate the research resulting from the excavations. Aside from providing access to information, the designer saw an opportunity to develop knowledge about how to further collaborative endeavors involving the arts and the humanities.

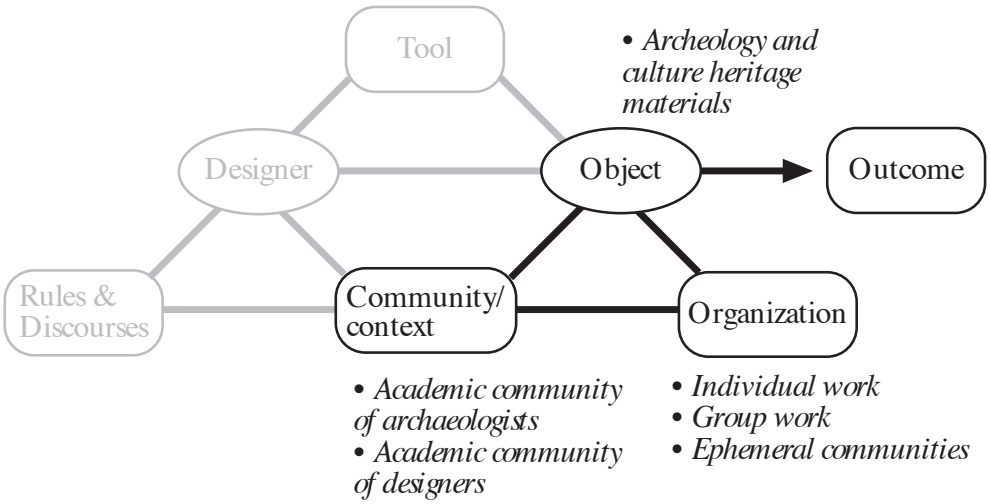


Figure 29: The object mediates between the community and the organization of design activities. Who does what with it and their relationship with it is determined by their position in the community as well as by the organization of labor.

In addition to the academic component, there was an active participation from Raisio City Hall. This is the government entity in charge of the land where Mulli, and related archaeological sites excavated by the students, are located. This municipality's involvement came from personnel involved in the culture and education offices, and also from professionals in areas such as the Land and Survey Engineering departments in the city of Raisio. For them, the archive, with its emphasis on archaelogical and historical material artifacts, is a platform that can be used to create educational materials that teach audiences about the history of their region.[55]

Ephemeral communities, can be an invaluable asset in a multidisciplinary project: they are instrumental in being able to create the type of shared context that is necessary to support a collaborative endeavor of this nature. Like the ephemeral communication devices mentioned earlier, their existence is short-lived and transitory. Although ephemeral communities can constitute themselves as tangible, physical, entities, they are not like virtual communities that have a persistent agency residing in the immaterial, electronic realm. Ephemeral communities can be thought of as emergent entities brought forth as part of the effort of planning and producing a design object. Their existence may be contingent on the execution of a given task. At a given point in time, they might rise to the topmost level of activity, only to recede, or vanish, once the assignment has been completed.

We must consider that to be perceived as information, artifacts must exist in a context. We know what noise is in the context of what silence is. Within the present reality of multiculturalism,

creating contexts that can be shared, are of relevance, and can be understood by all parties involved, is a challenging proposition. Information, knowledge and context, are not only a matter of abstractions that exist in the mind. They are the result of embodied interaction unfolding through time:

> We lack a good relational language here. There is a permanent tension between the formal and the empirical, the local and the situated, and attempts to represent information across localities. It is this tension itself which is under-explored and under-theorized. It is not just a set of interesting metaphysical observations. It can become a pragmatic unit of analysis. How can something be simultaneously concrete and abstract?[56]

Context has been cited as the most significant characteristic of archival materials.[57] Archives exist as proof of human activity. Archives are also artifacts of information. The contents of an archive are closely bound with the activities of those who produce them, and in a sense, Community is implicit in the notion of the archive, with its emphasis on the principle of provenance.[58]

Context is also the arena where knowledge is framed, that is, gathered together. It can, and has been, examined as that which occurs outside a system of activity, but which nevertheless influences the system.[59] Thinking in terms of context can force one to consider new ways of developing activity systems. Michael Cole has illustrated how this can occur through the metaphor of garden-as-culture:

> Broadly speaking, like the gardeners, activity theorists must attend simultaneously to two classes of concerns: what transpires inside the activity system ("garden") they study (or design and study) and what transpires around it.… Gardens do not, obviously, exist independently of the larger ecological system within which they are embedded.[60]

Aside from a unit of activity, an ephemeral community can also be seen as a tool that can be used to create the shared context that is, many times, necessary for collaboration. Some negative aspects about working with ephemeral communities are that it is easy to lose continuity as new members rotate in and out. In addition, it may be difficult to remain motivated and thereby lose focus on objectives after periods of inactivity, or as new projects come into being in the member's primary field of activity. Also, an instrumental use of community as a whole requires a sense of ethics as well as sensitivity on the part of the designer, or the artist. There must exist a sense of trust, a willingness to participate and adjust from all collaborators. Also, the activities

necessary to carry out the project have to be mapped very carefully. Ideally, they should resemble, or even concur, with activities that they are already engaged with, as part of their regular everyday work schedule.

## ORGANIZATION OF LABOR

The designer can work as a staff member in a corporation. The formal, and often hierarchical, structure of the corporation will have an effect on the amount of control that the designer has on the diverse tasks of design.[61] Designers can also work as members of a team in interdisciplinary projects. In this type of project, the activity of design has many levels and components. For example, in information design of digital network environments, such as the WWW, the designer might work as a type of translator that transfers knowledge from one domain to another. In this capacity s/he uses her/his tools and methods to ensure that a proper cognitive entrance is afforded to the audience for whom materials about a particular content (or subject matter) have been collected.[62] As a translator her/his task is also to bring out the essence of the content from within the confines of the specific discipline in which it is formulated. In doing so, the designer effects a transformation from one context to another. This is a strategy used by the designer in the cases where the content is the product of diverse minds, using different methods, and working in diverse disciplines:

> These are empirical or second generation methods. They assist designers in collaborating and being creative: brain storming, synectics and the use of tables and checklists as aids rather than rigid procedures.[63]

The activities of the designer can occur as solo work. They can be independent projects whose realization requires the use of the designer's abilities and skills. It is also possible for the designer to operate as a single entity within a large collaborative effort. In this type of situation, the way in which the activity unfolds might vary depending on the organization of the labor, the nature of the institutions, and the position from which the designer operates. The communication and exchange of information with the members of a given community, for example, is likely to vary depending on whether the designer is working within a company with a tight hierarchical organization, as an independent freelance designer with a set of clients, or whether s/he practices mostly as an educator within the realm of academia. Still, in all of these situations, the participation of the designer involves a process of naturalization. This process of naturalization can create a situation whereby the contingency of the categories and the codes of communication are so familiar that they become transparent, or invisible, to those within a community. In this situation, the freelance designer who frequently does projects, or works, for a given company

may no longer be thought of as a freelance designer. Indeed s/he may be thought of as another member of the community.

## SUMMARY

Like art, the activity of design can also be analyzed, at a meta-level, with the help of models borrowed from Activity Theory. Design can benefit from the conceptual and linguistic repertoire of the theory. For example, often we are unable to directly penetrate patterns that many times are naturalized, transparent, or subconscious. Concepts such as mediation can provide the deflected point of view needed to approach an understanding of how it is that others understand things.

The significance of the approach afforded through Activity Theory may reside in the possibility to observe not only the diverse aspects of the activity but also, the instruments of the practice and how they are constituted. Collaborative design occurs as part of a dialogue. The tools used by designers in this endeavor help to foster this condition.

As a tool for collaborative design, Activity Theory can be used to examine how the objects resulting from each activity differ. One can look at how the components of the activity—the Rules, Community and, Organization—vary across domains. Subsequent analysis of these variations can help to understand how factors such as ideology, social organization, and economics influence the object produced. Furthermore, by studying the tools used by different communities working together, one can gain an appreciation of their differences, how and why these may have developed, as well as their similarities. How do archaeologists, designers, and artists make use of visual representation in their practices? What is the difference between the drawings of the artist, the designer and the archaeologist? As a tool for collaborative design, the contribution of Activity Theory may reside in its ability to help us understand motivations behind action—what the actor is trying to achieve—and how they vary from one discipline to another. It can also help us to discern better how the different components of the activity influence the final outcome.

**Notes to chapter six:**

1. H. Simon, The Sciences of the Artificial, 3rd edition (Cambridge, Mass.: The MIT Press, 1996). On p. 9 Simon writes: "Description of an artifice in terms of its organization and functioning—its interface between inner and outer environments—is a major objective of invention and design activity."

2. A. Findeli, "Will Design Ever Become a Science?" in No Guru, No Method: Conference Proceedings, P. Strandman, ed. (Helsinki: University of Art and Design/UIAH, Helsinki, 1998), 66.

3. In this sense design is instrumental in a way that art can never be.

4. G. Bowker and S. L. Star, Sorting Things Out: Classification and its Consequences (Cambridge, Mass.: The MIT Press, 1999), 290.

5. M. Heidegger, "The Question Concerning Technology," in Basic Writings, D. F. Krell, ed. (London: Routledge, 1993), 313.

6. Ibid., 319.

7. Classicists and historians of art use the technical term *Ekphrasis* to indicate a verbal description of a work of art, or of a scene, as rendered in a work of art.

8. E. M. Segal, "Archaeology and Cognitive Science," in The Ancient Mind: Elements of Cognitive Archaeology, C. Renfrew and E. B. W. Zubrow, eds. (Cambridge: Cambridge University Press, 1994), 22–28. This article presents a hypothesis on the role of goal-directed behavior in the creation of ancient tools in prehistory.

9. B. Schneiderman, "Direct Manipulation: A Step beyond Programming Languages," in IEEE Computer, Vol. 16, No. 8, as cited in M. McCullough's Abstracting Craft, The Practiced Digital Hand, (Cambridge, Mass.: The MIT Press, 1996), 23–29.

10. "A MUD (Multiple User Dimension, Multiple User Dungeon, or Multiple User Dialogue) is a computer program which users can log into and explore. Each user takes control of a computerized persona/avatar/incarnation/ character. You can walk around, chat with other characters, explore dangerous monster-infested areas, solve puzzles, and even create your very own rooms, descriptions and items." http://www.lysator.liu.se/mud/faq/faq1.html (February 8, 2002), "MOOs are internet accessible, text mediated virtual environments…" http://www.itp.berkeley.edu/~thorne/MOO.html (February 8, 2002).

11. S. Singhal and M. Zyda, Networked Virtual Environments: Design and Implementation (Reading, Mass.: Addison-Wesley Publishing Company, Inc., 1999), 1–18.

12. P. Galle "Design as intentional action: A Conceptual Analysis," Design Studies, Vol. 20, No. 1 (January 1999): 58.

13. E. Manzini, The Material of Invention: Materials and Design (Cambridge, Mass.: The MIT press, 1986), 52.

14. For more information about the CIMI profile the reader is referred to the web site of the CIMI consortium: http://www.cimi.org/old_site/documents/_ProfileRevisedHTML_/profile.htm#1 (February 23, 2001). It is expected that different users will utilize the capabilities of the profile differently.

15. P. Greenhalgh, "The History of Craft," in The Culture of Craft, P. Dormer, ed. (Manchester: Manchester University Press, 1997), 39. This point, with respect to the design object, was also brought to my attention by Prof. Kari Kuutti.

16. L. J. Bannon, "From Human Factors to Human Actors: The Role of Psychology and Human-Computer Interaction Studies in Systems Design," as cited in K. Kuutti, "Activity Theory as a Potential Framework for Human-Computer Interaction Research," in Context and Consciousness: Activity Theory and Human-Computer Interaction, B. Nardi, ed. (Cambridge, Mass.: The MIT Press, 1996), 22.

17. R. Coyne and A. Snodgrass, "Problem Setting Within Prevalent Metaphors of Design," Design Issues, Vol. 11, No. 2 (Summer 1995), 38.

18. K. Henderson, On line and On Paper: Visual Representations, Visual Culture, and Computer Graphics in Design Engineering, (Cambridge, Mass.: The MIT Press, 1999), 33. In the context of design engineering Henderson, for example, says: "…designers join in the immutable information of drawings at centers of calculation and collect them into increasing iterations and sets of drawings, in order to hold pieces of information in the absence of the thing itself."

19. See Galle.

20. E. Svenonius, The Intellectual Foundation of Knowledge Organization (Cambridge, Mass.: The MIT Press, 2000), 31. Ontology has been described as the science of being. It is a way of characterizing the world through language, and a tool for description that can be used to define the parameters, as well as the artifacts, that populate a given domain of knowledge.

21. P. Louridas, "Design as Bricolage: Anthropology Meets Design Thinking," Design Studies, Vol. 20, No. 6 (November 1999): 530.

22. E. Ferguson, "The Mind's Eye: Nonverbal Thought in Technology," Science, Vol. 197, No. 4306 (August 1977): 833.

23. R. Arnheim, "Sketching and the Psychology of Design," in The Idea of Design: A Design Issues Reader, V. Margolin and R. Buchanan, eds. (Cambridge, Mass.: The MIT Press, 1996), 73. For a more in-depth treatment of the subject, see idem, The Art of Visual Perception, A Psychology of the Creative Eye, The New Version (Berkeley and Los Angeles: University of California Press, 1974).

24. Coyne and Snodgrass, 39.

25. Galle, 57–81.

26. B. Laurel, Computers as Theater, (Reading, Mass.: Addison-Wesley Publishing Company, Inc., 1993.

27. Ibid., 42.

28. K. Krippendorff, "Product Semantics: A Triangulation and Four Design Theories," Proceedings from the Product Semantics Conference in 1989, S. Väkevä, ed. (Helsinki: University of Art and Design Helsinki/UIAH, 1990), 17.

29. Henderson, 6.

30. Ibid., 54.

31. Ibid., 33.

32. C. Ware, Information Visualization: Perception for Design (San Francisco: Morgan Kaufmann Publishers, 2000), 10. Ware emphasizes the role of convention in diagrammatic representation.

33. J. Mountford, "Tools and techniques for Creative Design," in The Art of Human-Computer Interface Design, B. Laurel, ed. (Reading, Mass.: Addison-Wesley Publishing Company, Inc., 1990), 23.

34. J. M. Carroll, "Introduction: The Scenario Perspective on System Development," in Scenario-Based Design: Envisioning Work and Technology in System Development, J. M. Carroll, ed. (New York: John Wiley & Sons, Inc., 1995).

35. Kuutti, K., "Work-Processes: Scenarios as a Preliminary Vocabulary," in Scenario-Based Design: Envisioning Work and Technology in System Development, *op. cit.*, 21–22.

36. Ibid.

37. See Carroll, "Introduction: The Scenario Perspective on System Development."

38. J. R. Brown, "Thought Experiments Since the Scientific Revolution," in International Studies in the Philosophy of Science, Vol. 1 (Routledge, 1986); and W. Sellars, "Scientific Realism or Ireanic Instrumentalism," Boston Studies in the Philosophy of Science Vol. 2, R. Cohen and M. Wartofsky, eds. (1965), 171–204, in N. Nersessian, "How Do Scientists Think? Capturing the Dynamics of Conceptual Change in Science," in Diagrammatic Reasoning: Cognitive and Computational Perspectives, J. Glasgow, H. N. Narayanan, and B. Chandrassekaran, eds. (Menlo Park, Calif.: The AAAI Press, 1995), 137–182.

39. N. Nersessian, "How Do Scientists Think?" 137–182. This essay provides a cognitive-historical account of different analogic reasoning tools used by scientists, with historical examples of their use.

40. E. Manzini, "Prometheus of the Everyday: The Ecology of the Artificial and the Designer's Responsibility," as cited in A. Findeli's "Ethics, Aesthetics and Design," Design Issues, Vol. 10, No. 2 (Summer 1994), 58.

41. Findeli, 58.

42. Manzini, The Material of Invention, 54.

43. Krippendorff, ed., "New Design Principles," Design in the Age of Information: A Report to the National Science Foundation (NFS), Design Research Laboratory, North Carolina State University, 1997, 31.

44. A. N. Leontjev, Activity, Consciousness and Personality (Englewood Cliffs, N.J.: Prentice Hall Inc., 1978), 51. Leontjev's concept of motivation is being used to refer to "…the fact that in society a man finds not simply the external conditions to which he must accommodate his activity, but that these same social conditions carry in themselves motives and goals of his activity, his means and methods; in a word, society produces the activity of the individuals forming it."

45. G. Button, "The Ehtnographic Tradition and Design," Design Studies, Vol. 21, No. 4 (July 2000). This essay is a review of the uses of ethnography in engineering and systems design.

46. See the Mulli classification for examples of ancillary disciplines: http://www.mlab.uiah.fi/cgi-bin/mulli/classification/english/tree.pl

47. Svenonius, 31.

48. U. Athavankar, "Categorization… Natural Language and Design," Design Issues, Vol. V, No. 2 (Spring 1989).

49. Laurel, 1–33. This chapter contains a thorough discussion on the subject matter and its relation to representation.

50. J.-L. Gasseé, "The Evolution of Thinking Tools," in The Art of Human-Computer Interface Design, B. Laurel, ed. (Reading, Mass.: Addison-Wesley Publishing Company, Inc., 1990), 227.

51. K. Friedman, "Theory and Imagination in Design," in Useful and Critical: The Position of Research in Design, Proceedings from the International Conference, University of Art and Design Helsinki/UIAH, 1999. Friedman states that "the field of design has hitherto been an adjunct to art and craft," 5. He proposes that for design to become accepted as a scientific discipline, it must develop a body of theoretical knowledge.

52. Findeli, "Will Design Ever Become a Science?" Findeli, for example, refers to an editorial of the British Journal Design Studies, in which the editor, Nigel Cross, points out the

fact that "...certain North American colleagues, all design teachers, have seen their application for tenure refused under the pretext that research in design lacked the rigor or relevance," 64.

53. The mechanical is a term used by designers to indicate the layout. A pick-up is a square-shaped rubber instrument used to gather the remnants of cement from the surface of the mechanical. A scuzz-bag is a small pillow-shaped contraption containing pulverized eraser and used to clean leftover pencil marks from the surface of vellum plates. The bullpen is the common area in a design studio where most of the actual production work occurs. It is part of the apprenticeship of a professional designer to do time in a bullpen learning the necessary production skills.

54. Instead of the usually open space with drafting tables, it is possible that contemporary design spaces resemble more and more a traditional office space.

55. Jari Näränen, personal communication (April 2, 2001). (See Appendix 3.)

56. Bowker Star, 291.

57. M. J. Fox and P. Wilkerson, Introduction to Archival Organization and Description, S. Warren, ed. (Los Angeles: Getty Information Institute, 1998), 7.

58. Fox and Wilkerson, 6: Respect des fonds, or the principle of provenance is the central principle of the archival enterprise, "It is the formal expression of the principle that an archivist must respect, and reflects the origins of the assembled materials as an integral and organized corpus of documentation."

59. M. Cole, "Cultural psychology: Some general principles and a concrete example," in Perspectives of Activity Theory, Y. Engström, R. Miettinen, and R.L. Punamäki, eds. (Cambridge: Cambridge University Press, 1999), 87–106.

60. Ibid., 92.

61. R. Buchanan, "Myth and Maturity: Toward a New Order in the Decade of Design," in The Idea of Design: A Design Issues Reader, V. Margolin and R. Buchanan, eds. (Cambridge, Mass.: The MIT Press, 1996), 76. The essay makes a point to contrast the freedom of the designer who works as an entrepreneurial consultant with the designer, who is absorbed into the design department of a corporation.

62. Krippendorff, "On the Essential Context of Artifacts or on the Proposition that 'Design is Making Sense' (of Things)," in The Idea of Design: A Design Issues Reader, V. Margolin and R. Buchanan, eds. (Cambridge, Mass.: The MIT Press, 1996), 174: "Designers create highly individualized patterns in the forms of drawings, sketches, models, descriptions of possible uses, specifications (of materials and production processes needed to enable others)...."

63. Coyne and Snodgrass, 37.