

Sustainable Architecture in Context: STS and Design Thinking

Steven A. Moore and Andrew Karvonen

There has been little emphasis in STS scholarship to date on the design of the built environment. This paper attempts to address this oversight by examining alternative design practices in the growing field of sustainable architecture. We propose a geohistorical framework that includes three design dispositions—context-bound, context-free, and context-rich—and illustrate each with a prominent sustainable building practice. The principal argument of the paper is that each of these dispositions embodies distinct assumptions and attitudes about how to improve social and material conditions of the built environment, and as such, offers unique opportunities for STS scholars to shape the sociotechnical aspects of cities through intervention in design activities.

Keywords: Design thinking, context, sustainable architecture

Looking for a design perspective in STS

Most of us would probably consider design to be rational forethought involving creativity and intuition to solve the problem at hand (Cross, 1995: 106). Within this conventional definition of design there are a myriad of practices ranging from the planning of cities to computer chips, and from industrial machinery to haute coiffure, that should be of interest to Science and Technology Studies (STS) scholars. However, designers themselves have noted that practitioners of STS have tended to limit their investigations to engineering practice while neglecting other design-based practices like urban

design, architecture, and industrial design (Buchanan and Margolin, 1995).

One reason for such neglect may be the conventional association of these design fields with the fine arts rather than with the sciences. However, leaving the built environment to be interpreted solely through lenses constructed in the philosophy of art, rather than in the philosophy of technology or STS, is problematic at best because such optics tend to filter out the social and political consequences of design choices in favor of other criteria (Moore, 2001; Guy and Moore, 2005). A second reason for the neglect of design by social scientists may be because design is understood by scientists in general to be the

“application of knowledge created in their own discipline” (Buchanan, 1995: 18). From this perspective design is only the materialization and assembly of previously known truths. However, no matter the reason, from our perspective, the absence of a systematic study of design is troubling because we understand design not as the application of abstract knowledge but as the principal method used by society to envision how we want to live in the future.

This is not to say that STS scholars have neglected design as a whole but rather that the topic tends to lurk in the background of famous studies such as Langdon Winner’s bridges, Wiebe Bijker’s bicycles, Bruno Latour’s personal rapid transit system, and so on. The most explicit treatment of design has been in engineering studies where researchers often use ethnographic methods to follow engineering teams as they produce technical artifacts (e.g., Noble, 1977; MacKenzie, 1990; Ferguson, 1992; Bucciarelli, 1994; Henderson, 1999; Law, 2002; Vinck, 2003). Here, design is characterized as a messy, active form of sociotechnical production with experts being influenced by a variety of technical and non-technical constraints. Conversely, only a small number of STS studies have focused on the design of the built environment (e.g., Brain, 1993; Moore, 2001; Brand, 2005; Guy and Moore, 2005; Yaneva, 2005; Henderson, 2006).

A few brave philosophers of technology, notably Albert Borgmann, Carl Mitcham, and Langdon Winner, have trespassed the porous boundaries of STS to participate in the relatively new field of Design Studies. Historian Victor Margolin founded the field (along with a journal by the same name) in 1984 as a response to the public skepticism of professionals after World War II. Margolin (1989: 28) holds that “design is the result of choices,” prompting him to ask “Who makes these choices and

why? What view of the world underlies them and in what ways do designers expect a worldview to be manifest in their work?” This parallels Langdon Winner’s (1977) famous argument that choosing a technology is not choosing a thing, it is choosing a ‘form of life’ that necessarily favors living in one way over another. Design choices are, in this collective view, far from innocent aesthetic preferences. The built environment embodies human intentions and understandings of the world and design is about shaping the world, one artifact at a time. But it is also much more. The work of engineers, architects, and other designers of urban environments “provide stage settings upon which the ongoing dramas of political action are mounted” (Winner, 1995: 150). STS might be considered, then, an underutilized design tool that can help us to craft the settings appropriate to the dramas we desire to enact.

However, timing, as they say, is everything. The doctrines of path dependency and technological momentum warn us that we are not as free as we might like to think in constructing ideal settings for the lives we desire. We have been continually building and rebuilding our cities, and the institutions that inhabit them, for several thousand years and these obdurate interests will not be easily displaced.¹ However, because demographers insist that, in only a few decades, economic and population growth will double the size of our cities, we are provided with a very mixed blessing—the opportunity to deflect the trajectory of history. Put another way, Winner (1995: 150-151) argues that:

Speculation about design and alternatives in design can be especially fruitful because it pushes attention to the making or construction of technical artifacts back to the drawing

board, back to a point before choices have hardened in cement or in other finished material or organizational structures.

STS, then, offers the design disciplines a way of thinking critically and analytically about the consequences of design choices. In a special edition of *Design Issues*, Ned Woodhouse and colleagues at Rensselaer Polytechnic Institute directly consider how STS might help others to “think systematically about how design can help shape a commendable society” (Woodhouse and Patton, 2004: 1). Where other STS-inspired projects have examined how built environments serve particular social interests, Woodhouse and his collaborators are intent upon examining the political implications of normative design practice itself.

Our purpose in this study is not only to encourage more STS-style analysis of design practices, but to also suggest that STS analysis can benefit from design thinking and particularly from the insights provided by Design Studies scholars who treat design as a distinct epistemological disposition. Our research question follows this logic to ask: What is the relationship between STS analysis and design thinking with respect to the built environment? To narrow the scope, we restrict our study to design practices within the growing field of sustainable architecture. Sustainable architecture as a whole has come to be dominated by energy efficiency and climate-change strategies that can improve the economic performance of buildings while providing little or no critique of architectural production, the role of experts and users, the cumulative impacts of buildings with respect to the larger urban fabric, and so forth. Guy and Farmer (2001) provide a starting point for interrogating the sociotechnical aspects of sustainable building. They identify

six logics within architectural discourse (technical, ecological, aesthetic, cultural, medical, and social) that describe competing conceptions of sustainability as it relates to buildings.

Our aim here is to append Guy and Farmer’s categories of sustainable architecture *discourse* by examining categories of sustainable architecture *production*. The distinction is to examine not what designers say, but what they do through interaction with the communities they serve. We further limit the examination to a single building type, housing, so as to compare commensurable practices. There is general agreement among architectural historians, cultural geographers, and anthropologists that dwellings symbolize and are spatially ordered as ‘microcosms’ of principal cultural constructs, so housing can be considered a representative building practice (Rapoport, 1969: 41; Glassie, 1975; Norberg-Schulz, 1979: 13; Oliver, 1987: 160; Davis, 2006: 29, 36). In a broad survey of design literature on housing, we note three common practices of sustainable building—straw bale construction, prefabricated construction, and design/build—and recognize that they are only indirectly represented by Guy and Farmer’s taxonomy. We also note that these practices embody particular conceptions of place and see an affinity with planning theorist Bent Flyvbjerg’s categories of context-dependent and context-independent knowledge (Flyvbjerg, 2001). Using this emphasis on housing and context as a starting point we characterize these three examples of sustainable building as context-bound, context-free, and context-rich.²

Although it is tempting to frame these dispositions as successive historical periods—as premodern, modern, and postmodern—we find that all three types of thinking about alternative

worlds are currently practiced, albeit in different locales. They are, then, best understood as geo-historical frames of design thinking. In what follows we do use the terms premodern and modern as historical periods, but these should not be conflated with epistemological and ontological dispositions of design thinking. We examine each disposition in turn and argue that they offer unique opportunities for STS scholars to engage in the shaping of the built environment.

Context-bound design thinking

Context-bound design thinking is commonly held to be the most basic form of sustainable development—environments that are crafted from local materials by local craftsmen with the limits of local ecologies. It can be understood as ‘vernacular making’—a type of place-based production through which value-associated groups (be they ancient or contemporary) materialize their vision of cosmological and social order by practicing tacit or craft knowledge. The social values contained within these practices are implicit or informal and serve to limit the choices made by the designer. This is to say that the form any project can take is bound to received patterns that define a way of life.

This interpretation of vernacular making is supported by philosophers Carl Mitcham (1995) and Albert Borgmann (1995), both of whom have been influenced by Martin Heidegger’s critique of modern technology (Heidegger, 1977).³ From their perspective, vernacular societies enjoy a propinquity of place-making in which designing and constructing are organically linked and indistinct from each other. Borgmann (1995: 15) goes so far as to hold that for vernacular makers there is no such thing as ‘design’ in the way we understand it as ‘rational forethought’

in anticipation of material activity. Were Mitcham and Borgmann correct in this claim, it would reinforce the commonly held notion that abstract thinking about the built world did not emerge until the Renaissance, or perhaps even the Enlightenment. However, in the face of historical evidence documenting highly rational forethought in the planning of everything from the Egyptian pyramids to Europe’s gothic cathedrals (Davis, 2006: 149) such a romantic view of vernacular cultures is difficult to defend. What might be said, however, is that many cultures reserved this kind of rational design thinking for environments of special significance. An alternative way to interpret vernacular making is supported by folklorist Henry Glassie. In his classic study of folk housing in Middle Virginia, he observed that:

The builder did not plan in a vacuum; the process of design was constricted and driven by the context that held him. In the concrete artifact is written the tense of conflict of what the designer could do and what he had to do.

(Glassie, 1975: 114)

Glassie goes on to distinguish ‘context’ as being of two types: the immediate or ‘particularistic’ physical context and ‘the abstract context of mind’. It is this latter kind of lived context that:

...serves to control and prod the competence so that the things generated out of it will fit into their particularistic context—so that the house will protect its inhabitants from the weather and project the image that its maker desired...It relates the object being composed in the designing mind to the maker’s view of himself and to human, natural, and supernatural forces that exist beyond him.

(Glassie, 1975: 115)

Today, in lieu of using the term ‘abstract context’ as Glassie did, we might refer to the cultural context of a work as ‘structures in the thought of the artifact’s maker’. It is these structures, as Glassie puts it, which binds the designer to a palette of choices deemed desirable by his community. In the process of studying nineteenth century plastics, rather than nineteenth century folk houses, Bijker (1987: 172) developed the more nuanced notion of ‘technological frames’ which is “intended to apply to the *interaction* of various actors. Thus it is not an individual’s characteristic [as Glassie claimed], nor the characteristic of systems or institutions; frames are located *between* actors, not *in* actors or *above* actors” (emphasis in original). For our purposes here, Bijker’s term is the more helpful one. Of course, all cultural contexts attempt to restrict choices to the dominant ethos of the group. Our point is that it is the disposition of some cultures

to bind practices more restrictively than others.

A generic example of context-bound designing in sustainable building practice is the straw bale house as illustrated in Figure 1. Straw has existed as a building material for millennia and the use of straw bales as structural walls first emerged in the late nineteenth century as hay-baling machinery became commonplace and straw became a byproduct of agricultural production processes. Many straw bale buildings were built in various parts of the U.S. in the early twentieth century but became less common as industrialization made standardized building materials and processes readily available. Straw bale techniques were revived during the energy crisis of the 1970s as Appropriate Technology enthusiasts rediscovered the benefits of the practice, including the recycling of waste materials, superior energy efficiency, and most importantly,



Figure 1. Straw-bale house construction as an example of context-bound design. (Source: photograph by Charlotte Pickett, Visual Resources Collection, School of Architecture, The University of Texas at Austin)

its do-it-yourself qualities. By the 1990s, a veritable 'straw bale boom' was on in the USA (Minke and Mahlke, 2005) and today it "is perhaps the most visible part of a revival of interest in 'natural' building, generally understood to mean use of minimally-processed materials with roots in historic or indigenous (i.e., pre-industrial revolution) ways of building" (King, 2006: xxiv). Straw bale construction continues to face a number of formidable challenges, including a lack of standards, inflexible building codes, and unfavorable public perception but continues to comprise a small but visible segment of the sustainable building industry.

Most interesting to this study is not the material itself but rather the novel architectural production process that straw bale building entails. In their 'how-to' book, *The Straw Bale House*, Steen et al. (1994: xix) describe their search for "a more natural way of building" by which they mean that "building with straw bales also builds relationships among people and relationships of people to the place they live and the materials they use" (xvi). For these designers, building with straw bales is more a communal and spiritual practice than an instrumental material one. Kathryn Henderson has studied the link between cultural ethics and straw bale building practices (as articulated by Steen et al.) in her analysis of building code negotiations in Arizona and New Mexico. Respondents in Henderson's (2006: 268) ethnography reported that they are "driven" to build in this particular way by their own "planetary awareness." This is to say that their technological choices are bound to the qualities ascribed to straw bales—other technologies are rejected as inconsistent with cosmological order. The straw bale builders studied by Henderson certainly *designed* their homes, meaning that they employed rational forethought in planning material construction, but their

intentions were to conserve threatened ecological and social conditions for the future rather than to build new ones.

If, in contrast to Borgmann's claim above, 'design' does exist in vernacular contexts, we can still agree with him that the modern notion of progress does not. This is to say that context-bound designing is less about improving this world than it is about participating in the patterns of one's community so as to preserve it. In this sense, the greatest advantage of context-bound design thinking is that it produces time-tested and predictable results. The disadvantage of such conservative thinking is that it tends to be inflexible. So, although context-bound designing is similar to what we shall next describe as context-free design in its future orientation, its intention is not to perfect nature but to live in harmony with what is known of past natural, social, and cosmological order.

Context-free design thinking

Context-free designing is thought to contribute to sustainable development by employing the most efficient technologies available. However, just as context-bound design thinking is place-based, we associate context-free design thinking with the opposite—production from a distance via what Howard Davis (2006: 200) refers to as "abstract documents of control." This is a type of increasingly globalized cultural production in which experts (engineers, architects, interior designers, and marketing analysts) design artifacts (based on formal knowledge), to be constructed by a second party (a contractor or manufacturer) at a distant locale (using the most efficient technology available), and purchased by yet a third party (a customer or consumer). The chain of production involves significant

spatial and social distancing between the designer, the builder, and the ultimate inhabitant.

The foundational assumption that drives the atomization of design and production is that specialized knowledge, the division of labor, and mechanization will lead to utopian levels of efficiency, availability, and perfection. Merritt Roe Smith (1994: 15) argues that by the mid-nineteenth century Americans came to see technology as “the *cause* of human well-being” [emphasis original]. And more than a century later Langdon Winner (1986: 106) still notes the “optimistic technophilia” of North Americans—by which he means the unflinching expectation that the appearance of each new technology will usher in “a new and glorious age.” Most sustainable building practices fall under this practice of context-free design thinking, with architects and engineers serving as agents of change in the name of societal progress.

The development of prefabricated housing in the twentieth and twenty-first centuries, as illustrated in Figure 2, is perhaps the most extreme example of context-free design thinking. Prefabricated buildings have a long history, first emerging in seventeenth century England to facilitate the transport of structures to various British Empire locales. In the twentieth century, prefab builders adopted Fordist mass production techniques to create kit houses (such as those sold by Sears, Roebuck and Company) and mobile homes that could be transported from factory to building site via the U.S. Interstate highway system. The principal advantage of prefabrication includes increased control in production and shorter construction times resulting in lower costs and greater affordability. Architects and designers have long experimented with prefab buildings, including such notables as Le Corbusier, Walter Gropius, Frank Lloyd



Figure 2. A prefabricated house as an example of context-free design. (Source: courtesy of Michael Sylvester, www.fabprefab.com)

Wright, Richard Neutra, and Buckminster Fuller. Despite their design intentions, prefab generally has the reputation of being cheap and ugly (e.g., the American trailer home), sacrificing aesthetics, quality, and comfort for the bottom line (Arieff and Burkhart, 2002).

Designers began to reinterpret the practice of prefabricated housing in the late 1990s as they recognized new potential to provide high quality, low cost, and attractive housing. Proponents argue that, "Prefabrication for the twenty-first century allows for repetition of the same systems without replication of the same house" (Arieff and Burkhart, 2002: 36). As such, prefabrication can be used to create building systems or components that can be pieced together into custom houses and then shipped to the building site for installation. The kind of flexible 'mass-customization' made possible by digital tools, it is argued, is inherently different from serial mass-production using mechanical tools because local conditions, or particularistic context as Glassie would have it, can be accommodated.

In spite of such attempts to soften the logic of prefabrication, it remains inherently context-free because a systems approach to building can anticipate only a limited number of preconceived variables that must be predetermined by the designer at a distance. In this sense, the prefab dwelling aspires to the abstract and free conditions of Cartesian space rather than to the known limits or opportunities of a particular place. In Davis' (2006: 200) perspective, prefabricated dwellings may be commendable because they improve objective standards for the poor but they "have removed people's ability to carefully apply human discretion to the making of the building and have contributed to the abstract and fragmented nature of the modern built landscape."

The house illustrated in Figure 2 is similar to the prefab designs featured in the April/May 2005 issue of the upscale American design magazine *Dwell*. Like the magazine itself, the fashionable prefab dwelling is intended to appeal to young urban professionals for whom local craft traditions and the dominant suburban alternative are either unavailable or unattractive. These individuals are, however, attracted to the future-oriented products of expert designers. The efficient mass production of flexible home designs, as this context-free logic goes, provides increased comfort, a progressive cultural identity (including environmental sensitivity), but at affordable costs. What could possibly be wrong with this scenario?

Although we disagreed above with Mitcham and Borgmann's characterization of the vernacular world as being undesigned, we find it helpful to consider their critique of context-free design for two reasons: first, because it has some merit, and second, because it prefigures an alternative. For his part, Mitcham argues that the modern desire for individual autonomy is achieved through both the analytic thinking practiced by engineers and the poetic thinking of 'artist-architects'. In his view, vernacular making is an ontologically more satisfying practice than any type of 'design', be it analytic or poetic. For Mitcham, as for Martin Heidegger, "Design is properly seen as both a response to and a promotion of industrial production" (2001: 31).⁴ The abstract self-consciousness of design thinking necessarily distances us, he holds, from "our own particularity and concern-filled existence" (2001: 35). It is such distancing from the particular conditions of our lives that inevitably leads to the tragic separation of "an embodied, active form

of intending (design) and a nonreflective but methodological form of making (labor)” (Mitcham, 1995: 178).

This reasoning suggests that context-free design itself can be divided into two branches: aesthetic and functional. In this perspective, architects, landscape architects, graphic artists, and so on, tend to use design to improve the external appearance of an artifact in order to communicate with consumers while engineers are concerned with the operation of the artifact. Borgmann (1995: 15) laments this dualistic view, writing:

Aesthetic design inevitably is confined to smoothing the interfaces and stylizing the surfaces of technological devices. Aesthetic design becomes shallow, not because it is aesthetic, but because it has become superficial. It has been divorced from the powerful shaping of the material culture. Engineering has taken over the latter task. But it in turn conceals the power of its shapes under discreet and pleasant surfaces.

As we argued above, the characterization of modern aesthetic design as ‘superficial’ may contribute to the fact that STS scholars have tended to neglect the design disciplines other than engineering.

Borgmann and Mitcham’s critique of the unintended consequences that derive from context-free design and technology reflect their healthy skepticism of the endemic utopianism that many have associated with modern thinking. In this sense their critique has merit—the greatest asset of the prefabricated house illustrated in Figure 2, its relative affordability, brings with it a significant liability, a technological opacity that diminishes our engagement with community and place. However, this logic also has significant flaws. First, their position reproduces the modern juxtaposition of form versus

function and tends to interpret artifacts in simplistic, binary terms. Dichotomizing engineering and aesthetic design, as Borgmann does, or preferring making to design, as Mitcham does, is simply to turn modernity inside out and look backward to better times. Their critique of modern rationality remains uncomfortably within the modern subject/object split by being only ‘anti-modern’ (Moore, 2001).

Second, as in Heidegger’s critique of modernity (1977), both Mitcham and Borgmann emphasize the existential dilemmas of individuals thrown into the modern world. Although such dilemmas surely exist, limiting our understanding of design practice to such private choices neglects the social dimension of human existence in general, and the highly social nature of design practice in particular (Bernstein, 1992). It may be understandable that philosophers, viewing design practice from the outside, might fail to appreciate its social nature but those informed by experience or empirical evidence see it differently.⁵ Buchanan and Margolin (1995: xiv) argue that design is always a socially contested process, “where competing ideas about individual and social life are played out in vivid debate through material and immaterial products.” But it is Woodhouse and Patton (2004: 2) who stake this claim most clearly in stating:

Design is not a value-free process. Whether performed individually or in a group, design activities are inherently political. The overall process of design is far more complex than suggested by the relatively straightforward relationship between proximate designers and clients.

It is this highly social dimension of design thinking that brings us to a discussion of the third tradition of making and remaking

the world, the context-rich. Rather than staying within context-bound modes of making (as do the straw bale builders of the house illustrated in Figure 1), lament the loss of vernacular traditions (as do Mitcham and Borgmann), or opt for design at a distance (as in the prefabricated house illustrated in Figure 2), context-rich designers experiment with hybrid practices usually referred to as 'design/build'.

Context-rich design thinking

What is needed is a middle ground between science and intuition, a distinctive method of deliberation and presentation that is suited to the special knowledge and perspective of the designer and to the special ability of the designer to make concrete practical connections among diverse bodies of formal and tacit knowledge.

(Buchanan and Margolin, 1995: xii)

Context-rich designing is thought to contribute to sustainable development by relating advanced technologies to the social ecologies they might serve. Rather than emphasizing either traditional or advanced technological practices context-rich designing seeks eco-socio-technological change. In the late twentieth century, a handful of designers began to practice what we characterize as context-rich design thinking. They put forward an integrated and localized approach to designing and building structures that puts into practice precisely what Buchanan and Margolin propose above, namely a middle ground between science and intuition.⁶ In their view, the success of collaborations with various communities suffers neither from filtering out too many possibilities on the basis of past practices (as in context-bound thinking) nor from permitting too many possibilities on the

basis of future efficiencies (as in context-free thinking). This approach is generally referred to as design/build, but we refer to a particular type of design/build practice that also includes 'service learning' or 'project-based education'. Although context-rich design thinking promises to democratize architectural production through deliberate engagement with community and place, as we will see, it too suffers limitations.

Contemporary community-focused architectural models first emerged in the U.S. in the late 1960s and early 1970s as 'Community Design Centers'—part of the broader social movements focusing on social equity. These practices waned in the 1980s as financial support from the federal government decreased and then reemerged in the 1990s when universities and communities developed new pedagogical models for architecture schools (Pearson, 2002). The most well-known examples of this community-based architecture approach include Auburn University's Rural Studio founded by the late Samuel Mockbee and Dennis K. Ruth in 1992, the University of Washington's BaSiC Initiative founded by Sergio Palleroni in 1995, and Design Corps founded by Bryan Bell in 1999 (see Dean and Hursley, 2002; Pearson, 2002; Moos and Trechsel, 2003; Bell, 2004; Palleroni, 2004; Dean and Hursley, 2005).

In these programs, students engage in design/build projects as part of their professional degree programs. Their projects tend to be small in scale and are completed over one or two semesters, although the projects are sometimes spread out over longer periods with rotating groups of students. The idea of design/build is to increase the public role of the architect through advocacy and engagement with underserved communities. Design/build is a combination of community outreach,

formal education, and stimulating architectural design and production (see Figure 3). It is intended to be an inherently democratic process where “there is a mutual exchange between the designer and the client, and in the best cases, a mutual benefit to both. Through a participatory process these benefits are defined, clearly understood by all, and mutually sought” (Bell, 2004: 13).

The community engagement focus of design/build necessitates a place-based practice in which the ‘citizen architect’ replaces both the technical expert and the craftsman. The citizen architect practices a form of civic expertise that encourages discursive, inclusive, and multifaceted approaches to problem solving that incorporate formal and tacit forms of knowledge (Brand and Karvonen, 2007). Rather than delivering a document, or legal product, in which every possible decision is made at a distance before a

third party is contracted to build, the design/build process is understood as an educational process for all parties that leaves substantial discretion to locals for decision-making in-situ—when the consequences of choices made by clients and designers alike are more apparent. Unlike in the context-free disposition, where designers are elite experts, in the context-rich disposition, “every one designs who devises courses of action aimed at changing existing conditions into preferred ones” (Simon, 1969: 55). Such a flexible and situated process clearly flies in the face of contemporary legal and building standards yet variations of design/build practice are being adopted in increasingly large and complex projects outside of academic settings.

Context-bound and context-rich designers share some common attributes, including a rejection of the contemporary notion that a building is a commodity



Figure 3. Design/build in Xochitepec Mexico as an example of context-rich design. (Source: courtesy of Sergio Palleroni, www.basicinitiative.org)

that should be designed at a distance by experts. Instead, both create artifacts that are situated in their material and social contexts. And both depend upon the responsibility of designers to facilitate the production of civic knowledge in the process of building. However, where context-bound designers pursue an otherworldly future through the use of sacred knowledge available only to the faithful, context-rich designers pursue a worldly, yet contingent future, through the ongoing and inclusive process of socially constructing knowledge. In lieu of salvation or perfection, context-rich designers are more interested in hope.

As we hinted above, context-rich design is not without its drawbacks, especially when associated with university-based service-learning programs. The challenges associated with blurring the distinction between experts and ordinary citizens is of four principal kinds. First, in lieu of depending on spiritual or professional leaders, design/build is too often dominated by charismatic leaders who may inspire the community but ultimately fail to facilitate genuinely democratic forms of community engagement. In this schema, design/build has the potential to create yet another form of elite domination in architectural production (Ward, 1998; Ward and Wolf-Wendel, 2000; Brown, 2003). Second, the practice could lead to a lowest common denominator design if lay participants cling to aesthetic and technological conventions and are unwilling to embrace unexpected opportunities in the pursuit of common solutions. As such, the proverbial problem of “too many cooks in the kitchen” could result in the ideal of everyone designing with the reality of no one designing. Third, there is evidence to suggest that university students are not yet adequately trained to provide communities with technically competent

services (Barkham, 2006). This suggests that expertise is not solely a means of power and control but actually provides utility and value to society. And finally, university-based programs generally fail to provide the support and reward system required for faculty to engage in such work. Coordination of community-based projects requires a significant amount of legwork by faculty members that is not reflected in traditional academic performance metrics of publishing and grant writing success. If academics have found it difficult to create the time required to engage in community-based design projects it is not likely that conventional practitioners, already underpaid in North America, will easily find it within the existing economic framework.

Contrasting the dispositions of design thinking

The dispositions of design thinking described above are summarized in Table 1. It will be helpful to emphasize three distinctions implied by our categories. First, each disposition creates a distinct technological frame that relates community individuals, designers, and the artifacts they design. In the building of the straw bale house, individuals are akin to clan members who subscribe to a shared belief in communal and spiritual aspects of architecture that tie design to place. Likewise, the straw bale designer is a craftsperson whose design knowledge has been passed down from other clan members and is inherent in the community's collective belief. This is in direct contrast to context-free design thinking where the community is composed of autonomous individuals and a formally trained expert derives his or her knowledge from universal principles of science or art. Finally, the context-rich disposition involves a civic

form of design where the distinction between designer and the community is less distinct. Design knowledge evolves through engagement in public talk and discursive processes that are intended to develop solutions to serve all of the project stakeholders.

Second, attitudes towards truth, place, and the future differ between the dispositions. The context-bound designer sees truth as derived from the sacred while the context-free designer finds truth in either science-based certainty or art-based uncertainty. In contrast, the context-rich designer understands that truth is based on situated uncertainty, similar to Donna Haraway's (1988) notion of situated knowledge. Place is socially constructed and contingent rather than sacred or infinitely malleable. As such, context-rich practice is worldly, contingent, and grounded; it is not an attempt to transcend the limits of the

world (as with context-bound practice) nor an attempt to perfect the world (as with context-free practice) but rather a means to solve immediate problems using the collective intelligence of the community.

Finally, each of the design dispositions entails different assumptions about the discourse of design and attitudes towards technology. With the context-bound disposition, faith in the sacred is required to design properly and new technology tends to be portrayed as either a threat to faith or a sacred practice of the faithful. Both building materials and processes are simplified in order to honor the sacred beliefs of the builders. The context-free design disposition, on the other hand, is restricted to educated experts who drive societal progress via technological means. Building users are merely the passive receivers of design improvements. Finally, the context-

	context-bound	context-free	context-rich
<i>assumptions about individuals</i>	clan member	autonomous	citizen
<i>assumptions about designers</i>	craftsperson	expert	community member
<i>design knowledge</i>	tacit	formal	civic
<i>attitudes toward truth</i>	faith-based certainty	science-based certainty vs. art-based uncertainty	situated uncertainty
<i>attitudes toward special places</i>	sacred	designed	socially constructed
<i>ideal future</i>	unworldly	perfected	worldly and contingent
<i>discourse</i>	exclusive to the faithful	exclusive to the educated	inclusive and discursive
<i>attitude toward technology</i>	threatens or reproduces cosmological order	increases the rate of progress	requires social management
<i>major benefit</i>	certain result	low cost	social engagement
<i>major liability</i>	inflexibility	social disengagement	time-intensive
<i>exemplar house</i>	straw bale	prefabricated	design/build

Table 1. Ideal types of design thinking as related to context.

rich design disposition is inclusive and discursive; the overarching aim of design is to come to consensus among the various involved actors and thus, design becomes a process of social management towards a shared but uncertain end goal.

Conclusions: Engaging STS scholars in the design of the built environment

As it should be clear in the discussion above, the three dispositions of design thinking offer different ways for STS scholars to engage in design activities related to the built environment. The context-bound and context-free dispositions are perhaps the most familiar to critical and constructivist critics because of their reliance on the cosmological order or the notion of societal progress to justify design decisions. STS scholarship has a long history of questioning such foundational assumptions using the various analytic approaches of the social sciences. Furthermore, the context-rich disposition is closely related to STS scholarship that engages with communities directly toward resolving their problems.⁷ Constructive Technology Assessment and other forms of democratic deliberation of scientific and technological knowledge and practices could be translated to design of the built environment with relative ease. Such approaches offer a platform from which STS scholarship can contribute to the continual making and remaking of our cities as 'enormous socio-technical artifacts' (Aibar and Bijker, 1997).

Conversely, design thinking has much to offer the analytic position of STS scholars and social scientists in general. The analytic approaches of social science tend to separate the constituent elements of past events in order to examine and draw conclusions that will help to shape the future. In the plainest of terms, this is to say that we look toward the future

through the past with the assumption that all other current conditions remain equal and unchanged. We know, of course, that this is not the case – unacknowledged current conditions are increasingly dynamic. Design thinking, particularly in the context-rich disposition, offers an alternative to analytic thinking in the form of phronetic or abductive logic. Simon (1969: 58-8) argues that, "The natural sciences are concerned with how things are... Design, on the other hand, is concerned with how things ought to be." As such, design thinking has more in common with forms of logical reasoning that reflect Aristotle's phronesis, Peirce's abduction, Dewey's experimental thinking, as well as Haraway's situated knowledge, and Flyvbjerg's emphasis on rational deliberation and action (see Peirce, 1958; Haraway, 1988; Peirce, 1997; and Flyvbjerg, 2001). In short, we understand design thinking as the application of abductive or phronetic reasoning to the material conditions of community life (Cross, 1995: 110). In proposing that social scientists should help their fellow citizens elucidate 'where we want to go, and what is desirable', Flyvbjerg (2001) suggests that social scientists should help citizens to *design* their lives, to (as we defined the term above) 'employ rational forethought involving creativity and intuition to solve the problem at hand'. This is not to argue for the abandonment of the scientific method but rather that if our goal is to make the future better, we need to abandon the contemporary preference for knowledge over hope (Rorty, 1998: 36), and instead create hybrid practices of design and analysis.

And finally, we propose that design thinking offers what Coutard and Guy (2007) refer to as a 'politics of hope', where the social meaning of technological artifacts and systems be framed as more

ambivalent and their social effects more contingent than in contemporary forms of STS scholarship. As such, STS scholars can temper their pessimistic drift of analytic thinking with a dose of optimism provided by design thinking, while providing a counterbalance to the often overly optimistic stance of designers. Flyvbjerg (2001: 166) has argued that if social science is to regain legitimacy in the world, it will have to “drop fruitless efforts to emulate natural science’s success in producing cumulative and predictive theory,” and “take up problems that matter to the local, national, and global communities in which we live.” We see the engagement of STS scholars with designers in the production of the built environment as a perfect opportunity to take up these shared problems.

Notes

- 1 On the notion of urban obduracy, see Hommels (2005).
- 2 One very helpful (anonymous) referee of this paper suggested that our categories of design dispositions might be more effectively titled, ‘context-bound’, ‘abstraction bound’, and ‘deliberation-bound’. Such rephrasing, s/he suggested, would eliminate our apparent preference for the third disposition, ‘context-rich design thinking’. The referee’s comment provides an opportunity to clarify our own position by contrast. Like our referee, Foucault held that meaning is always bound by the frame through which phenomena are viewed, but that frames are in a constant state of evolution, except at those unfortunate moments in history when local politics is able to temporarily fix meaning. Ultimately Foucault’s position is that all frames bind observers, even if temporarily, to provisional meanings which are equally true or equally helpful. Although this position has merits in that tradition, our position runs more in line with Richard Rorty’s critique of Foucault’s *Archaeology of Knowledge* (1972). In that review Rorty rejects the Foucauldian notion “that there is nothing optimistic to say” (Rorty, 1994: 262). Inspired by Rorty, we hold that the very idea of sustainable development—which is a subject of our investigation—is an inherently hopeful story-line (Moore, 2007: 6-7) that depends on some dispositions being better, or more useful, than others in the project of achieving ecological health and social equity.
- 3 Within architectural discourse, Christopher Alexander has been a long-standing advocate for a sympathetic position of a contemporary vernacular, or ‘unselfconscious’ design method (see Alexander, 2007).
- 4 In *The Question Concerning Technology*, Heidegger similarly argues that the poetic possibilities for human Being are limited, or ‘enframed’, by the narrow and reductive categories constructed by modern technological thinking (see Heidegger, 1977).
- 5 See Mitcham’s (2005) illuminating article documenting his personal attempt to design and build a vernacular house.
- 6 Sally Wyatt, Brian Balmer, and others provide a recent discussion of the related concept of middle ground theory in the November 2007 issue of *Science, Technology, and Human Values*.
- 7 For a recent discussion of the turn towards public engagement in STS, see the March 2008 special issue of *Science, Technology, and Human Values*.

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- Steven A. Moore
The University of Texas at Austin
samoore@mail.utexas.edu
- Andrew Karvonen
The University of Texas at Austin
karvonen@mail.utexas.edu