of essence which combines the philosophical and the social scientific perspective." These tendencies distance the user from the lifeworld. Secondary instrumentalization, reinserts these abstracted technologies into a system of human relations, reconstituting a worldview based in or influenced by technology. Designers are agents of these reconnecting tendencies; often described as social construction.

In the case study, it was necessary to establish a discontinuity between the time before and the time after introduction; this becomes a basis for analyzing any technology. It was necessary to distinguish between two stages of technological development: the Working Design Phase (when most design and social construction occurs) and the Established Design Phase (when design might no longer be tolerated). In most of the analytical categories the artifact operates differently while it is open to modifying influence of design than while it finds itself an established part of a massive system of production and consumption.

Because secondary instrumentalization introduces social aspects, the time-based effects are considerable, however, these displace rather than erase properties. For example, in the case study, initiative is more limited today within the construction system (though the technique allows individual and regional variation), but overall there is more potential for initiative. The technique is simpler and requires less experience, making more people potential builders. Perhaps, one method would be to chart the relative strength of each aspect of instrumentalization in each period. However, this is not always straightforward. Initiative, for instance, remains possible in all periods since the building method is never proscribed or specified in a contract. In some ways it decreases and in other ways it increases.

Frameworks for cultural and other non-quantifiable analysis are, at best, 'loose fit' descriptions. They can help us discover and disabuse aspects of bias inherent in description and unravel specific technologies disguised by the ordinariness of everyday life. Both the hybrid metaphor and instrumentalization framework are models that abstract and generalize to suit a worldview. This seems particularly appropriate applied to designing for, as Feenberg says, "Design internalizes social constraints, condensing technical and social relations." Boundaries between technology and the social or cultural world are porous, making definition and analysis elusive. Good design refuses to grant technology any neutrality or view it as a simple instrument, tool or means to an end.

2.2 Instrumentalization of the Wood Frame

Interestingly, Feenberg (1999) uses houses and construction as examples of "richly signified technical artifacts" – an area of fruitful philosophical analysis. And again: "The tree conceived as lumber, and eventually cut down, stripped of bark and chopped into boards, is encountered for its usefulness rather than for its manifold interconnections with its environment and the other species with which it normally coexists."

The history of wood construction in North America can be approximated by three stages. These stages are identified with a wood product: log, plank, and lumber. Lumber is the result of the simple linear extrusion of the sawmill and includes particular parameters such as transport to the mill, forestry management, silvaculture, and land procurement. Each parameter reinforces the tendency in each other to normative practice. Building construction methods were designed based on the end product of the mill. Currently, North American wood frame determines lumber properties that, in turn, determine North American wood production creating an integrated system of production and consumption.

The following short descriptions sort some aspects of wood frame construction into the eight categories of instrumentalization. Each category is part of a pair, one primary and one secondary instrumentalization, Feenberg's key word for each is italicized. Each category is, in turn, divided into an a, b, and c representing the developmental stages of the technology; 'a' is just before its introduction, 18th century, 'b' is its working design stage, predominantly the middle half of the 19th century, and 'c' its established design stage, 19th century to date. The stages are: a) material of choice is whole wood, in the round or squared into timber, b) material of choice is plank or dimension lumber often only uniform in one dimension, c) material of choice is lumber and sheet plywood of standardized dimensions and properties.

2.2.1 Wood Production: Decontexturalization and Systemization

There is an increase in *decontexturalization* first trees come from the building site, then from the regional ecosystem and finally anywhere in the world. In the process, there is increased *systemization*, trees are organized into grading classifications to deal with individual, regional, and species variation.

Distribution widened. a) trees selected by the carpenter from the property or somewhere close to the building site and the wood is product of the local tradesman, b) trees are from upstream, wood is the product of the local sawmill, sold locally or downstream, c) trees are converted to lumber at the source, wood is the product of mills nationwide and sold at a national network of lumberyards.

Standards increased. a) Wood quality is established by an experienced eye judging the tree as it grows, b) grades of lumber are established between merchant and supplier, c) national grades of lumber are adopted, trade exports North American standards internationally.

2.2.2 Wood Production: Reductionism and Mediation

Forested land is *reduced* to a commodity. Initially woods are a necessary part of subsistence farming, then they are cleared for their exchange value creating new farmland, and now trees are planted as an agriculture-like crop. This exploitive orientation is *mediated*. Initially, trees indicate land fertility, next valued as national resource and now a subject of international scrutiny.